ORGÃO OFICIAL DA SOCIEDADE BRASILEIRA DE VIDEOCIRURGIA
Brazilian Journal of Videoendoscopic Surgery - Vol. 4 - N. 1 - Jan/Mar 2011

ISSN 1983-9901
ISSN ONLINE 1983-991X

Brazilian Journal of Videoendoscopic Surgery

In this Edition:

LAPAROSCOPIC TRAINING CENTER

IRCAD, INNOVATION AND EXCELLENCE

- TRANING ON LIVE TISSUE OR ANATOMICAL SPECIMEN
- LAPAROSCOPIC AND ROBOTIC SURGERY – BARRETOS/BRAZIL

COURSES 2012

ARTHROSCOPY SURGERY (BASIC WRIST)	January 13th and 14th
GYNECOLOGICAL SURGERY (GYNECOLOGICAL ONCOLOGY)	March 1st to 3rd
BARIATRIC AND METABOLIC SURGERY (ADVANCED COURSE)	March 23th and 24th
GENERAL SURGERY (INTENSIVE COUSER)	April 30th to May 3Rd
COLORECTAL SURGERY (ADVANCED COURSE)	May 4th and 5th
ARTHROSCOPY SURGERY (KNEE)	June 8th and 9th
DIGESTIVE SURGERY (ADVANCED COURSE)	June 16th to 18th
GYNECOLOGICAL SURGERY (GYNECOLOGICAL ENDOMETRIOSIS)	July 23th to 25th
ARTHROSCOPY SURGERY (ADVANCED WRIST)	August 3rd and 4th
GI ENDOSCOPY (ADVANCED COURSE)	August 11th and 12th
DIGESTIVE SURGERY (ADVANCED COURSE)	August 13th to 15th
GYNECOLOGICAL SURGERY(GYNECOLOGICAL ADVANCED TECHNIQUES)	October 4th to 6th
UROLOGICAL SURGERY (ADVANCED COURSE)	October 25th to 27th
COLORECTAL SURGERY (ADVANCED COURSE)	November 2nd and 3rd
SKULL BASE SURGERY (ADVANCED COURSE)	November 28th to 30th
PEDIATRIC SURGERY (ADVANCED COURSE)	December 6th to 8th
GENERAL SURGERY (INTENSIVE COURSE)	December 10th to 13th

SCHEDULE YOURSELF

amits

ircad
France - Taiwan - Brazil

STORZ KARL STORZ – ENDOSKOPE

COVIDIEN

SEE ALL THE INFORMATION ON:
WWW.AMITS.COM.BR

IRCAD
AMITS - American Institute of Telesurgery
Rua Antenor Duarte Villela, 1650
14784-400 Barretos São Paulo Brazil
Phone / fax: +55 17 3321 7000
e-mail: contact@amits.com.br

Year 4

Vol. 4
Number 1

Brazilian Journal of Videoendoscopic Surgery

January / March 2011

Official Journal of the Brazilian Society of Videosurgery

Brazilian Journal of Videoendoscopic Surgery
Periodicity: Trimestral
Circulation: 3.500 exemplares
Free Distribuiton to:
SOBRACIL Associate Members

Subscription and Contact:

revista@sobracil.org.br

ISSN 1983-9901 (press) / 1983-991X (on-line)
Eletronic version at:
www.sobracil.org.br

Production and Distribution - Brazilian Society of Videosurgery
Headquarters: Avenida das Américas n. 4801, s/ 308
Centro Médico Richet - Barra da Tijuca - Rio de Janeiro, RJ - Brasil
CEP: 22.631-004
Telephone and Fax: + 55 21 3325-7724 - sobracil@sobracil.org.br

Printing and Publishing: ***Press Graphic & Publishing Ltd***
Rua João Alves, 27 - Saúde - Rio de Janeiro - RJ - Brasil
CEP: 20220-330
Phone: + 55 21 2253-8343 edprensa@uol.com.br

Grafic Design and Production
Márcio Alvim de Almeida
alvimtrabalhos@hotmail.com

References Norms Standardization
Luciana Danielli de Araújo
CRB-7 5024
ldanielli@uol.com.br

Cataloging-in-Publication Data

Brazilian Journal of Videoendoscopic Surgery. Brazilian Society of Videosurgery. Sobracil -- v.4, n1, jan./mar. 2011 --- Rio de Janeiro: Brazilian Journal of Videoendoscopic Surgery. 2011.

Published Quaterly
Abstract

n. 1; 28 cm.

1. Medicine, Videosurgery - Periodicals I. Brazilian Society of Videosurgery.

CDD 617

Brazilian Journal of Videoendoscopic Surgery

CONTENTS

January / March 2011

Visibility

Future is present at the BJVS
Your opinion, experience and scientific investigation are here.

Dear Contributors,

Publish your manuscript:
Original Article, Case Report, Review or Actualization, Preliminary Communications , Technique Protocol.
Also publish your "Original Image" in videoendoscopic surgery.

Bring and share your experience.
Our Journal is On-line!

Manuscript Submission to:

Brazilian Journal of Videoendoscopic Surgery
Avenida das Américas nº 4801, sala 308
Centro Médico Richet - Barra da Tijuca
22.631-004 Rio de Janeiro - RJ , Brasil

Eletronic Version and fully instructions for submission at:
www.sobracil.org.br
revista@sobracil.org.br

Brazilian Journal of Videoendoscopic Surgery

Editorial

Basics of Biostatistics

Noções Básicas de Bioestatística

MARCO AURELIO P. OLIVEIRA; RAPHAEL CAMARA

[1.] Doutor em Epidemiologia pelo Instituto de Medicina Social da Universidade do Estado do Rio de Janeiro. Chefe do Setor de Ginecologia da UERJ; [2.] Doutor em Ginecologia pela UNIFESP (Reprodução Humana). Mestre em Epidemiologia pelo Instituto de Medicina Social da Universidade do Estado do Rio de Janeiro.

Bras. J. Video-Sur, 2011, v. 4, n. 1: 001-004

When you commence the statistical analysis of data the first obvious question is: "What does statistics mean?" Quite simply, statistics is the set of calculated relationships based on data from an adequate sample that should be a representative part of a population.

We can divide statistics, didactically, into two groups: 1 - Descriptive; 2 - Inferential. In descriptive statistics, the goal is simply to describe the sample in question. The description is usually seek to summarize the data obtained in frequencies expressed as a percentage, means, and standard deviations through graphics. With most scientific work, what you see are these descriptive statistics. Most of these studies are limited to reviews of patient charts and records, and do not involve hypotheses to be tested. The role of inferential statistics is to transfer or generalize the findings of the sample to the population. To be more specific, our primary routine interest is to compare data between two or more groups to see if there was a statistically significant difference.

It is worth commenting a little about what is statistical significance. If someone says that the chance of something happening is 1 in 100 (which we express as a probability of 0.01 or $p = 0.01$), should this be considered a high or low probability? It depends. If this were the chance/probability of a plane crashing, one would have to agree that chance is high. But if this is the chance of failure in improvement of headache after taking an aspirin, the probability of failure is low. Who determines the level of significance is the researcher. In the academic world, by convention, if the chance of something happening is less than 5% ($p < 0.05$) then it is considered unlikely to happen. For example, in a study of a new diuretic, we randomly assigned 30 people to the active drug group and 30 people to the placebo (inert medication) group. The mean 24 hour urine volume in was 3600 ml in the first group and 3400 ml in the second group.

As there is a difference of 200 ml, *on average*, in urine output, can we say that the drug actually works as a diuretic? Of course not! It is necessary to perform the appropriate statistical test (in this case we can use the Student's *t*-test) and see what the probability is that this distribution had occurred entirely by chance.

At the time of composition of the two groups, it is possible that *by chance* we had chosen for the group that received the active drug individuals who naturally have a higher 24 hour urine output? Or is it possible that this did not occur and the drug was indeed really effective?

To help resolve this question, statistical tests are used so that we can know in a given study, what is the probability that the distribution of subjects (which yielded the observed difference in urine output) had occurred by chance alone. After performing the Student's *t*-test, we found that the probability of finding a difference of 200 ml (1600 ml - 1400 ml) in this sample of 60 (30 + 30) subjects is 3% ($p = 0.03$), therefore $p < 0.05$.

As already stated, we consider this unlikely occurrence, i.e., *it is unlikely ($p = 0.03$) that this distribution occurred by chance*, so we should must have another explanation for the question and until proven otherwise the 200 ml difference in the average was because of the active drug.

And note: we still have a 3% chance that this difference had occurred by chance and not because of the active drug. This is the risk (type I error or alpha) that one runs in any hypothesis testing.

However, if after performing the Student's *t*-test we were to find a $p = 0.15$ (and thus a $p >$

0.05) instead of p = 0.03 (that we calculated in the example above), we would conclude that the chance that the distribution of subjects into the two groups was random is not small (p> 0.05), therefore we could not affirm that the active drug had an effect. In this scenario, because the result is not significant, one should consider the power of the statistical test, which should be calculated *a priori* (before conducting the study).

The smaller the sample, the weaker the power to affirm/say that the treatment *does not work*, i.e., the treatment can be in fact effective, but the small number of participants in the does not allow us to say that statistical significance was attained. If the power is less than 80% (there are specific formulas to calculate it) we may be faced with a *false* p > 0.05, that is, *p* could be less than 0.05, but the sample may have been too small to achieve such a probability – which is a Type II error or beta.

How to choose the appropriate statistical test

Since we now know what the *p* provided by statistical tests is used for, let us now turn our attention to when to use a particular test. For this it is essential that we know what level of measurement of the variables involved. We can divide into three groups: 1 - Nominal, 2 - Ordinal, 3 - Interval/Ratio.

For nominal variables, the number is not a numerical value, but rather corresponds to a category, for example: 1 = single, 2 = married, 3 = separated, 4 = divorced, and 5 = widowed. These numbers merely designate different categories. You cannot add or subtract them or calculate means. The statistical tests most commonly used in these cases are the chi-square ($\div^2$) and Fisher's test, the latter used mainly for very small samples.

With ordinal numbers, the values can be ordered (e.g. from lowest to highest), but one should not calculate means or standard deviations. For example, in the classification of endometriosis, the patient who receives 40 points does not have twice the endometriosis of patient who received 20 points, although it can be said that the first has more endometriosis than the second.

Another example is the score that is given to a scale of post-operative pain: 1 = low, 2 = medium, etc. The most commonly used tests are the Mann-Whitney U (for two groups) and Kruskal-Wallis (three or more groups). These statistical tests do not use the parameters of the population (and thus don't require, for example, a normal distribution) and are called non-parametric tests.

The third group includes interval and ratio variables. The basic difference is that with ratio variables the zero is absolute (e.g., weight) and with interval variables the zero is relative (e.g., temperature in Celsius). The statistical tests used for these two types of variables are usually the same. In this group the numbers are actually numbers; they can be summed, subtracted, divided, multiply, can means and standard deviations calculated. They can be continuous (e.g. weight in kg) or discontinuous (e.g. number of children: 1, 2, 3, etc.).

In these cases, 4 kg is twice 2 kg, just as four children is the product of two times two. The statistical tests most commonly used are the Student's *t*-test (for two groups) and the test of analysis of variance (three or more groups). As these tests use the population parameters (notably mean and standard deviation), and assume that the population has a normal distribution, they are called parametric tests.

Understanding confidence intervals

Another issue that deserves to be addressed is the confidence interval. In order to understand the confidence interval we must first understand the standard error of the mean (SEM). It was already mentioned that a researcher works with samples of a population, and that through the data of these samples seeks to understand the population (by extrapolation of the data or generalization). The best samples are those selected at random from the population in question. It turns out that these samples are different from each other. For example, suppose that researcher A wants to know the average weight of the doctor of a given hospital. In this hospital 100 doctors work in five different specialties (a, b, c, d, e), each with 20 physicians.

Researcher A decides to randomly select five doctors in each specialty, a total of 25 doctors – a sample stratified by specialty. The average weight encountered with this sample was 68 Kg. Another researcher, called B, decides to do a study identical to that of Research A. Researcher B obtained an average of 70 kg pounds. Since he also selected his subjects randomly, obviously were not the same individuals.

Researcher C in an identical study found an average weight of 72 kg. Is there something wrong with the averages obtained? No, it is merely that the individuals selected at random for each sample are

not the same. Therefore, when a researcher selects his sample, he knows that there are many other samples that will yield means different from that which he will obtain. The number of different samples is practically infinite. If we continue to generate other similar samples, we will have various means (e.g., 66 kg, 68 kg, 70 kg, 72 kg, and 74 Kg) which collectively have the property of a normal distribution.

There is a statistical property that says the *average of all these averages* is equal to the average of the population, which would be the true mean if all 100 doctors were weighed. Let's say that another researcher D with more time decided to measure the weight of all the doctors and found a mean 70 kg. The various means calculated for the samples obtained by the other researchers will have a normal distribution around the actual average population. We know its 70 pounds thanks to researcher D.

The average standard deviation of the possible means is called the **standard error of mean (SEM)**. This error expresses the variability that can be found in the mean of a sample of a certain size, because, as we already discussed, the average of a sample is usually not identical to the true mean of the population. The confidence interval is nothing more than the degree of confidence that the researcher has that the population mean (true mean) is contained within that interval. Usually the confidence interval used is 95% (a = 5%).

The researcher who obtained an average of 68 kg in his sample would say the average of population (100 physicians) must be between 68 kg plus or minus some error. This error can be calculated using the correct value of the t distribution for a range of 95%, or an a = 5%. For a sample of 25 individuals the value provided by t-distribution table is 2.06. This value must be multiplied by the standard error of the mean (SEM), which can be calculated by dividing the standard deviation of the sample by the square root of the number of individuals in the sample.

If the SEM was equal to 1, the error would be equal to 2.06. Therefore we would have 95% certainty that the population mean was between 68 ± 2.06 kg, or approximately between 66 and 70kg. In this case the 95% confidence interval includes the true mean - 70kg.

We must not confuse the SEM with the standard deviation (SD). The first, as was already explained, expresses the variability, the uncertainty, of the average obtained from a sample. The SD expresses the variability of the individuals (not the averages) selected around the sample mean. In the case of Researcher A, the SD is calculated as follows: take the weight of each of the 25 physicians chosen, subtract the mean found (68 kg), and calculate the square of this difference. If a person weighs 98 m kg, you should subtract 68 Kg from 98 Kg and raise this result to the square, or 30^2.

Next, sum of all these squares of the differences and divide by the number of individuals minus one (in this case: 25-1 = 24). The resulting value is called the variance. Then just find the square root of the variance. This number is the standard deviation of the sample. As noted above, to obtain the SEM, divide the SD by the square root of N (in this case the square root of 25).

The smaller the sample the wider the confidence interval, with consequently less credibility for the value obtained. For example, say Researcher A obtained a mean of 68 kg and a 95% confidence interval of ± 2 kg. Therefore, he can have a 95% confidence that the population mean is between 66 kg and 70 kg. In this example the true mean (70 kg) really is within this range.

If instead of five doctors, he selects only one physician from each specialty (a total of 5 doctors) and by chance obtains the same average of 68 kg, the 95% confidence interval would rise, for example, from ± 2 kg to ± 8 kg, and the researcher would have to publish his results as 68 ± 8 kg (95% CI), a range which also includes the true mean. The problem is that most of the time we don't know what is the true mean; thus, the less uncertainty, reflected by a narrower confidence interval, the better.

Common problems with statistical tests

Let us now review some common problems in the application of statistical tests. One of the most widely used is the Student's *t*-test. This test is used to compare means of two groups when the variable measured is an interval or ratio variable and the sample has a normal distribution. It is not appropriate to use this test for ordinal variables (e.g. scoring postoperative pain) or if the sample data does not have a normal distribution. In the case of ordinal variables we should use a non-parametric test similar to the Student's *t*-test (for example, the Mann-Whitney test) and in the second case we can use the Mann-Whitney or transform the variable (log, square root, among others...) so that it assumes a normal distribution.

Another common mistake made with the Student's *t*-test is the two-by-two comparisons made sequentially when you have three or more groups. For example, when comparing the average weight of three different groups (A, B, C) the researchers used the Student's *t*-test to compare the average in group A with the average of group B, then B with C, and later A with C. The researcher typically assumes a 5% error for each comparison, with an overall error of 15%, which is unacceptable. The correct approach would be to use the analysis of variance (ANOVA) to compare the average of the three groups and see if there are differences. Using ANOVA we can detect that there is an overall difference, but do not know which group differs from which. To determine which group differs from the others we could use the Student's *t*-test comparing each pair of groups, taking care not to commit the error of multiple comparisons.

For this you can use various statistical artifices, such as corrections proposed by Bonferroni, Tukey and Student-Newman-Keuls, among others. Another error in the choice of statistical tests is not considering whether the groups are dependent (paired) or independent. There is a different Student's *t*-test for each of these situations. The incorrect use can lead to a distortion of the results and consequently of the conclusions. The paired groups usually are formed by comparing a group before treatment with the same group after treatment.Listen

Finally it is important to mention some advantages of multivariate analysis over univariate analyses. So far we commented only about univariate statistical tests. The principal disadvantage of tests such as chi-square, Fisher's test, and the Student's *t*-test, is that they do not do provide a comprehensive approach to the problem. Most biological experiments are complex and often there are interactions between the causal factors.

For example, in a study to determine whether a drug is effective for losing weight, obese individuals are selected into the treatment group and control group. After statistical analysis with Student's *t*-test compared the decrease in weight in both groups, it was determined that the treatment group's weight loss is superior.

However, when analyzed with multivariate tests, one finds that the medication in question had no effect on weight loss when the analysis controlled (or adjusts) the experiment for the degree of desire to lose weight, which was measured in the questionnaire.

This statistical control is possible using techniques like multiple regression. With this technique it is possible to evaluate several variables at simultaneously - one controls the effect of the other. Even if the Student's *t*-test has been applied correctly, the conclusion of the test was flawed because it does not take into account other variables that influence weight loss.

By univariate analysis the desire to lose weight was also statistically significant and, therefore, the researcher publishes that both the desire to lose weight and the medication are effective. However, as was verified in the multivariate analysis, the effect of the desire to lose weight (for example if the patient adheres more rigorously to a diet) nullified the effect of the medication.

This is because almost all of the weight loss effect could be explained by the desire to lose weight; the additive effect of the medication was not enough to be significant. This scenario can only be detected by the multivariate technique.

The multivariate statistical tests are more complex and laborious, and require a good knowledge of statistics for their proper use and interpretation. Poorly implemented and interpreted they can confuse rather than help. But without doubt, they are valuable resources in the pursuit of the scientific truth.

FURTHER READING

1. Glantz SA. Primer of Biostatistics 4th Edition. McGraw-Hill., New York, 1997.
2. Glantz SA, Slinker BK. Primer of Applied Regression and Analyses of Variance. McGraw-Hill., New York, 1990.
3. Greenhalgh T. How to read a paper. BMJ Publishing Group, London, 1997.
4. Munro BH. Statistical Methods for Health Care Research 3rd Edition. Lippincott, Philadelphia, 1997.

Correspondence Address:
MARCO AURELIO PINHO DE OLIVEIRA
Rua Coelho Neto, 55 / 201
Tel.: (21) 9987-5843
E-mail: maurelio@infolink.com.br

Brazilian Journal of Videoendoscopic Surgery

Noções Básicas de Bioestatística

Basics of Biostatistics

MARCO AURELIO PINHO DE OLIVEIRA[1]; RAPHAEL CÂMARA MEDEIROS PARENTE[2]

[1.] Doutor em Epidemiologia pelo Instituto de Medicina Social da Universidade do Estado do Rio de Janeiro. Chefe do Setor de Ginecologia da UERJ; [2.] Doutor em Ginecologia pela UNIFESP (Reprodução Humana). Mestre em Epidemiologia pelo Instituto de Medicina Social da Universidade do Estado do Rio de Janeiro.

Bras. J. Video-Sur, 2010, v. 4, n. 1: 005-008

Quando se inicia a análise estatística dos dados a primeira pergunta óbvia é: "o que quer dizer estatística?". Simploriamente, a estatística significa o conjunto de relações calculadas com base nos dados de uma amostra adequada, que deve ser parte representativa de uma população.

Nós podemos dividir a estatística, didaticamente, em dois grupos: 1- Descritiva; 2-Inferencial. Na estatística descritiva, o objetivo é simplesmente descrever a amostra em questão. A descrição normalmente é feita na tentativa de se resumir os dados obtidos, seja através das freqüências em percentual, médias e desvios padrão ou gráficos. Na maioria dos trabalhos científicos o que se vê é apenas esta estatística descritiva. Estes trabalhos na sua maioria se limitam a revisões de prontuários ou fichas apropriadas, e não envolvem hipóteses a serem testadas. O papel da estatística inferencial é transferir, generalizar as conclusões da amostra para a população. Para sermos mais objetivo, o interesse maior no dia-a-dia é de comparar dados entre dois ou mais grupos para saber se houve diferença estatisticamente significativa. Vale a pena comentar um pouco sobre o que é significância. Se alguém disser que a chance de algo acontecer é de 1 em 100 (probabilidade de 0,01 ou $p = 0,01$), isto é pode ser considerado muito ou pouco? Depende. Se esta for a probabilidade de um avião cair, há de se concordar que é alta. Mas, se esta for a chance de falha na melhora da cefaléia após a tomada de uma aspirina, a probabilidade da falha é baixa. Quem estipula o nível de significância é o pesquisador. No meio acadêmico ficou tradicionalmente estipulado que se a chance de algo ocorrer é menor que 5 % ($p < 0,05$) então ela é pouco provável de acontecer. Por exemplo, no estudo de um novo diurético distribuímos aleatoriamente 30 pessoas para o grupo de medicamento ativo e 30 pessoas para o grupo placebo (medicamento inerte). A média do volume urinário em 24 horas foi de 3600 ml no primeiro grupo e de 3400 ml no segundo grupo.

Como existe a diferença de 200 ml, em média, logo podemos afirmar que o medicamento realmente funciona como diurético?. Claro que não! É necessário realizar o teste estatístico apropriado (neste caso poderia ser o t de student) e ver qual é a probabilidade desta distribuição ter ocorrido apenas ao acaso. No momento da composição das amostras, pode ser que por acaso tenhamos escolhido para o grupo medicamento ativo os indivíduos que naturalmente apresentam maior diurese nas 24 horas - ou será que isso não ocorreu e o medicamento foi realmente eficaz? Para ajudar nesta decisão, os testes estatísticos são usados para que possamos saber, num determinado estudo, qual a probabilidade da distribuição ter ocorrido apenas pelo acaso. Após a realização do teste de t de student, verificamos que a probabilidade de encontrarmos uma diferença de 200 ml (1600 ml - 1400 ml) nesta amostra de 60 (30 + 30) pessoas é de 3 % ($p = 0,03$), portanto $p < 0,05$. Como já foi colocado, nós consideramos esta ocorrência pouco provável, ou seja, é pouco provável ($p = 0,03$) que esta distribuição tenha ocorrido pelo acaso, logo, devemos ter outra explicação para a questão e até que se prove o contrário a diferença de 200 ml na média foi por causa do medicamento ativo. E atenção: ainda temos 3 % de chance desta diferença de ter sido pelo acaso e não pelo medicamento ativo - esse é o risco (erro tipo alfa ou tipo I) que se corre nos testes de hipóteses. Porém, se após a realização do teste de t de student nós encontrássemos $p = 0,15$ ($p > 0,05$) ao invés de $p = 0,03$, chegaríamos à conclusão de que a chance da distribuição ter sido ao acaso não é peque-

na ($p > 0,05$), portanto não poderíamos afirmar que o medicamento ativo teve efeito. Neste caso, por conta do resultado ser não-significativo, deve-se observar o poder do teste estatístico, que deve ser calculado *a priori* (antes da realização do estudo). Quanto menor a amostra, menor o poder para se afirmar que o tratamento não funciona, ou seja, o tratamento pode ser de fato eficaz, porém o pequeno número de participantes na amostra não é permite atingir a significância estatística. Se o poder for menor que 80% (existem fórmulas específicas para calculá-lo) podemos estar diante de um $p > 0,05$ falso, ou seja, p poderia ser menor que 0,05, porém a amostra pode ter sido pequena para atingir tal probabilidade - erro tipo II ou beta.

Como escolher o teste estatístico apropriado

Como já sabemos para o que serve o p fornecido pelos testes estatísticos, vamos nos preocupar agora em quando utilizar determinado teste. Para isto é fundamental que saibamos qual o nível de mensuração das variáveis envolvidas. Podemos dividir em três grupos: 1- Nominal ; 2 - Ordinal; 3 - Intervalar/Razão. Na variável nominal, o número não vale como número e sim como categoria, por exemplo: 1 = solteiro; 2 = casado; 3 = divorciado 4 = desquitado e 5 = viúvo. Não se pode somar, subtrair ou tirar médias. Esses números representam apenas categorias diferentes. Os testes mais usados nestes casos são o qui-quadrado (X^2) e o teste de Fisher, este usado principalmente para amostras muito pequenas. Na variável ordinal, os números já podem ser ordenados (p.ex. do menor para o maior), porém não se deve tirar média ou desvio padrão, como p.ex.: na classificação da endometriose, a paciente que recebe 40 pontos não tem o dobro de endometriose do que a paciente que recebeu 20 pontos, porém pode-se dizer que a primeira tem mais endometriose que a segunda. Outro exemplo é a pontuação que se dá para dor no pós-operatório (fraca = 1; média =2, etc..). Os testes mais usados são o U de Mann-Whitney (para dois grupos) e o teste de Kruskal - Wallis (três ou mais grupos). Estes testes não se utilizam de parâmetros da população (não requerem, por exemplo, distribuição normal) e são denominados de não-paramétricos. O terceiro grupo inclui variáveis intervalares e de razão (a diferença básica é que na razão o zero é absoluto (p.ex, peso) e na intervalar o zero é relativo (p.ex., temperatura em Celsius) - os testes estatísticos costumam ser os mesmos para esses dois tipo de variáveis. Neste grupo os números são realmente números, podendo-se somar, subtrair, dividir, multiplicar, tirar médias e desvio padrão. Podem ser contínuos (p.ex. peso em Kg) ou descontínuos, p.ex. número de filhos (1, 2, 3, etc..). Nestes casos, 4 Kg é o dobro de 2 Kg, assim como quatro filhos é o dobro de dois. Os testes mais usados são o t de student (para dois grupos) e o teste de análise de variância (três ou mais grupos). Como estes testes utilizam parâmetros da população (notadamente média e desvio padrão, assumindo que a população apresente uma distribuição normal), eles são chamados de testes paramétricos.

Entendendo intervalo de confiança

Outro assunto que merece ser abordado é o intervalo de confiança. Para que possamos entender o intervalo de confiança é necessário o conhecimento prévio do erro padrão da média. Já foi comentado que o pesquisador trabalha com amostras de uma população, e que através dos dados destas amostras deseja conhecer a população (extrapolação dos dados ou generalização). As melhores amostras são aquelas selecionadas aleatoriamente da população em questão. Acontece que estas amostras são diferentes uma das outras. Por exemplo, digamos que um pesquisador A deseja saber qual é o peso médio dos médicos de um determinado hospital. Neste hospital trabalham 100 médicos de cinco especialidades diferentes (a , b , c , d , e), com 20 médicos cada . O pesquisador A resolve selecionar ao acaso, cinco médicos de cada especialidade, totalizando 25 médicos - amostra estratificada por especialidade. A média encontrada foi de 68 Kg. Outro pesquisador, chamado de B, resolve fazer um estudo idêntico ao do A. Ele encontrou uma média de 70 Kg já que obviamente os indivíduos selecionados ao acaso não foram os mesmos. O pesquisador C num estudo idêntico encontrou 72 Kg de média. Existe alguma coisa errada com as médias encontradas? Não, apenas os indivíduos selecionados ao acaso não são os mesmos nas três pesquisas. Portanto, quando um pesquisador seleciona a sua amostra, ele sabe que existem muitas outras amostras e que vão fornecer médias diferentes da que ele vai encontrar. O número de amostras diferentes é praticamente infinito. Se continuássemos a fazer outras pesquisas idênticas, teríamos várias médias (p.ex., 66 Kg, 68 Kg, 70 Kg, 72 Kg e 74 Kg) que no seu conjunto apresentam a propriedade da distribuição normal. Existe uma propriedade estatística que diz que

a média de todas estas médias é igual à média da população, ou seja, a média verdadeira, caso fossem pesados todos os 100 médicos. Digamos que um outro pesquisador D com mais tempo resolveu medir o peso de todos os médicos e encontrou 70 Kg de média. As várias médias encontradas nas amostras pelos outros pesquisadores vão ter distribuição normal em torno da média real da população. Nós sabemos que é 70 Kg graças ao pesquisador D.

O desvio padrão das possíveis médias é chamado de erro padrão da média (EPM) ou standard error of the mean (SEM). Este erro expressa a variabilidade que pode ser encontrada na média de uma amostra de um determinado tamanho, pois, como já discutimos, a média de uma amostra normalmente não é idêntica à média real da população. O intervalo de confiança nada mais é que o grau de confiança que o pesquisador tem que a média da população (média verdadeira) está contida naquele intervalo. Habitualmente se utiliza o intervalo de confiança de 95% (a=5%). O pesquisador A, que encontrou uma média de 68Kg na sua amostra, diria que a média da população (100 médicos) deve estar entre 68 Kg e mais ou menos algum erro. Este erro pode ser calculado usando-se o valor correto da distribuição t para um intervalo de confiança de 95%, ou um a = 5 %. Para uma amostra de 25 indivíduos o valor fornecido pela tabela da distribuição t é igual a 2,06. Este valor deve ser multiplicado pelo erro padrão da média (EPM), que pode ser calculada dividindo-se o desvio padrão da amostra pela raiz quadrada do número de indivíduos na amostra. Se o EPM fosse igual a 1, o erro seria igual a 2,06. Portanto teríamos 95% de certeza que a média da população estaria entre 68 + 2,06kg, ou seja, aproximadamente entre 66 e 70kg (neste caso o intervalo de 95% incluiu o valor verdadeiro – 70kg).

Não devemos confundir o EPM com o desvio padrão (DP) ou standard deviation (SD). O primeiro, como já foi explicado, expressa a variabilidade, a incerteza, da média obtida através de uma amostra. O DP, expressa a variabilidade dos indivíduos (e não das médias) selecionados em torno da média da amostra. No caso do pesquisador A, o DP é calculado da seguinte forma: pegar o peso de cada um dos 25 médicos escolhidos, subtrair da média encontrada (68 Kg), e elevar ao quadrado esta diferença. Se um indivíduo pesa 98kg, você deve subtrair 98 Kg - 68 Kg e elevar este resultado ao quadrado, ou seja, 30^2. Em seguida deve ser feita a soma de todas essas diferenças e dividir pelo número de indivíduos menos um (nesse caso seria 25-1 = 24). Este valor é chamado de variância. Depois disso basta encontrar a raiz quadrada da variância. Este número é o desvio padrão da amostra. Como foi colocado anteriormente, para obter o EPM basta dividir o DP pela raiz quadrada de N (neste caso seria a raiz quadrada de 25).

Quanto menor a amostra maior será o intervalo de confiança, com conseqüente menor credibilidade do valor encontrado. Por exemplo, digamos que o pesquisador A encontrou 68 Kg de média e um intervalo de confiança de 95% de $\pm$ 2 kg . Portanto, ele pode ter uma confiança de 95% que a média da população se encontra entre 66 Kg e 70 Kg. Neste exemplo, a média verdadeira (70 Kg) realmente se encontra neste intervalo. Se ao invés de 5 médicos, ele selecionasse apenas 1 médico de cada especialidade (total de 5 médicos) e por acaso encontrasse a mesma média de 68 kg, o intervalo de confiança de 95% poderia subir, por exemplo, de $\pm$ 2 kg para $\pm$ 8 kg e o pesquisador teria que publicar seu resultado como 68 $\pm$ 8 Kg (IC 95%), que inclui também a média verdadeira. O problema é que na maioria das vezes nós não sabemos qual é a média verdadeira e, quanto menos incerteza, refletida pelo menor o intervalo de confiança, melhor.

Problemas comuns com os testes estatísticos

Vamos comentar agora alguns problemas comuns na aplicação dos testes estatísticos. Um dos testes mais usados é o t de student. Este teste é utilizado para comparar médias de 2 grupos quando a variável é medida em nível intervalar ou de razão e a amostra tem uma distribuição normal. Não é adequado usar este teste para variáveis com mensuração em nível ordinal (p.ex. pontuar dor no pós-operatório) ou que os dados da amostra não tenham uma distribuição normal. No caso das variáveis ordinais devemos utilizar um teste não-paramétrico similar ao t de student (por exemplo o teste de Mann-Whitney) e no segundo caso podemos usar o Mann-Whitney ou transformar a variável (log , raiz quadrada, entre outras..) para que ela assuma uma distribuição normal. Outro erro comum no teste de t de student é a comparação dois a dois quando se tem três ou mais grupos. Por exemplo, ao se comparar a média de peso de três grupos diferentes (A, B, C) os pesquisadores usaram o t de student para comparar a média do grupo A com a do grupo B, depois B com C e posteriormente A com C. O pesquisador assume habitualmen-

te um erro de 5% para cada comparação, tendo um erro global de 15%, o que é inaceitável. O correto seria usar a análise de variância (ANOVA) para comparar a média dos três grupos e constatar se há diferenças. Com o uso da ANOVA nós podemos detectar que existe uma diferença global, mas não sabemos qual grupo difere de qual. Para saber qual grupo difere dos outros poderíamos usar o teste t de student comparando cada dois grupos, tendo o cuidado de não incorrer no erro de múltiplas comparações. Para isso pode-se usar vários artifícios estatísticos, como a correção de Bonferroni, Tukey e Student-Newman-Keuls, entre outros. Outro erro na escolha dos testes estatísticos é não levar em consideração se os grupos são dependentes (pareados) ou independentes. Existe um teste t de student diferente para cada uma dessas situações. O emprego errôneo pode levar a um falseamento dos resultados e consequentemente das conclusões. Os grupos pareados normalmente se formam pela comparação de um grupo pré-tratamento com o mesmo grupo pós-tratamento.

Para finalizar é importante citar algumas vantagens da análises multivariadas sobre as análises univariadas. Por enquanto comentamos somente sobre testes estatísticos univariados. A desvantagem básica destes testes como o qui-quadrado, Fisher e t de student, é que eles não fazem uma abordagem global do problema. A maioria dos experimentos biológicos são complexos e muitas vezes existem interações entre os fatores causais. Por exemplo, numa pesquisa para determinar se um medicamento é eficaz para perder peso, selecionam-se obesos para o grupo tratamento e grupo controle. Após análise estatística com o teste t de student em relação à diminuição do peso nos dois grupos, verifica-se que o grupo tratamento é superior. Porém, quando se analisa com testes multivariados observa-se que o medicamento em questão não influencia a perda de peso quando se controla (ou se ajusta) o experimento pelo grau de vontade de emagrecer, que foi medido no questionário. Esse controle estatístico é possível com uso de técnicas como a regressão múltipla. Nesta técnica é possível a avaliação de várias variáveis ao mesmo tempo – uma controla o efeito da outra. Mesmo que o teste t student tenha sido aplicado corretamente, a conclusão do teste foi equivocada porque não se levou em consideração outras variáveis que também influenciam na perda de peso. Pela análise univariada a vontade de emagrecer também foi estatisticamente significativa e, por isso, o pesquisador publica que tanto a vontade de emagrecer quanto o medicamento são eficazes. Porém, como foi verificado na análise multivariada, o efeito da vontade de emagrecer (p.ex., o paciente faz dieta mais rigorosa) anulou o efeito do medicamento. Isto ocorre porque quase todo efeito do emagrecimento pôde ser explicado pela vontade de emagrecer e o efeito aditivo do medicamento não foi suficiente para ser significativo. Este cenário só pode ser captado pela técnica multivariada. Os testes estatísticos multivariados são mais complexos e trabalhosos, necessitando bom conhecimento de estatística para sua aplicação e interpretação. Mal aplicados e interpretados podem confundir mais que ajudar. Porém, sem dúvida, são valiosos recursos na obtenção da verdade científica.

LEITURAS SULPEMENTARES

1. Glantz SA – Primer of Biostatistics 4th Edition. McGraw-Hill., New York, 1997.
2. Glantz SA, Slinker BK – Primer of Applied Regression and Analyses of Variance. McGraw-Hill., New York, 1990.
3. Greenhalgh T – How to read a paper. BMJ Publishing Group, London, 1997.
4. Munro BH – Statistical Methods for Health Care Research 3rd Edition. Lippincott, Philadelphia, 1997.

Endereço para Correspondência:
MARCO AURELIO PINHO DE OLIVEIRA
Rua Coelho Neto, 55 / 201
Tel.: (21) 9987-5843
E-mail: maurelio@infolink.com.br

Brazilian Journal of Videoendoscopic Surgery

Original Article

Transumbilical Laparoscopic Surgery: An Option Without Visible Scars

Cirurgia Laparoscópica Transumbilical: Uma Opção sem Cicatrizes Visíveis

ANTÔNIO ALVES JÚNIOR[1]; IZABELE RABELO DE OLIVEIRA[2]; MILENA PASSOS LIMA[3]; JOSÉ JEOVÁ DE OLIVEIRA FILHO[4]; HERNAN AUGUSTO CENTURION SOBRAL[5]

The research was carried out at the University Hospital of the Federal University of Sergipe and in the São Lucas Hospital, Aracaju, Sergipe.

[1.] Adjunct Professor in the Department of Medicine of the Federal University of Sergipe (Surgery Service); Coordinator, Bariatric Surgery Service of the University Hospital of the Federal University of Sergipe; [2.] Doctoral candidate in Medicine, Federal University of Sergipe. Researcher in the areas of General Surgery and Occupational Medicine; [3.] Doctoral candidate in Medicine, Federal University of Sergipe. Researcher in the areas of General Surgery and Occupational Medicine; [4.] General Surgeon and proctologist. Master in Gastrointestinal Surgery (Escola Paulista de Medicina); [5.] General Surgeon and proctologist.

ABSTRACT

Objective: To describe the results of transumbilical laparoscopy surgery using standard laparoscopic instruments. **Patients and methods**: Twenty six patients underwent cholecystectomy, inguinal and umbilical herniorrhaphy, liver biopsy and appendectomy using a transumbilical approach as the main and/or single access. The mean age was 42.32; average body mass index (BMI) was 27.92. A 10mm trocar (with 30° optic) and 3mm and 5mm trocars were introduced in umbilical scar. A 2mm trocar was introduced in right flank in cholecystectomies when necessary. **Results***:* Single-port transumbilical laparoscopic surgery was performed in 17 patients. In nine, two ports were used. One patient with BMI of 44.01 required conversion to a conventional laparoscopic cholecystectomy. No major complication was observed. All patients had excellent postoperative outcomes and cosmetic results. **Discussion**: Transumbilical Endoscopic Surgery (TUES) procedures have been conducted in an attempt to reduce postoperative pain, and to promote satisfaction with the cosmetic result and a faster recovery. **Conclusions**: Transumbilical laparoscopy is a promising surgical option still under development; we expect future studies will confirm it as safe and reproducible. This procedure offers patients a better cosmetic result, with fewer, smaller and even imperceptible scars.

Key words: Laparoscopic surgery, NOTES, TUES, Umbilical Scar.

Bras. J. Video-Sur, 2011, v. 4, n. 1: 009-014

Accepted after revision: January, 20, 2011.

INTRODUCTION

Since they were introduced into surgical practice, videolaparoscopic procedures have become widely used around the world. The rapid integration of these procedures into routine practice reflects the fact that when compared to surgeries performed via laparotomy these procedures offer less surgical injury, a reduction in post-operative pain, and a good aesthetic result.[1-3]

In this context of videolaparoscopic surgery, minimally invasive surgery through natural orifices, as known as Natural Orifice Transluminal Endoscopic Surgery (NOTES), arose as a surgical innovation to provide a smaller surgical wound for the patient, with a reduction in the size and number of access ports.[4,5]

ZORRÓN and cols[6], in March 2007, performed the first cholecystectomy using natural orifices, in humans, using a transvaginal route. The next month, JACQUES MARESCAUX[1], in France, carried out a similar procedure with success in a 30 year old patient. Thereafter other procedures have been performed as NOTES procedures, even using other natural orifices such as the mouth and anus.[7]

Besides the natural orifices, the umbilical scar also has been used for surgical access. With

transumbilical surgery – known as Single-Port Access (SPA) or Transumbilical Endoscopic Surgery (TUES) – only one incision in the umbilicus – which is already a natural scar – is usually necessary. In this way, the transumbilical approach is used as the principal and sometimes only access; as a result of the procedure, there is only one scar that is barely visible or even imperceptible.[1,5]

Surgical procedures using the transumbilical approach have been performed with success.[7-9] Since October 2008, Dr. Antônio Alves Junior, has performed these procedures at the University Hospital of the Federal University of Sergipe using conventional videolaparoscopic surgery instruments.

In this study, we report the initial experience with patients undergoing various surgical procedures using the transumbilical approach and conventional videolaparoscopy equipment.

PATIENTS AND METHODS

The study was carried out with 26 patients who underwent: cholecystectomy, inguinal herniorrhaphy, umbilical herniorrhaphy, liver biopsy and appendectomy. The transumbilical approach was used as the principal and often only access. Eleven were men and 15 women. Ages ranged from 20 to 77 years (mean: 42.32). Body mass index (BMI) ranged from 18.73 to 44.01 (mean: 27.92), with only one patient exceeding a BMI of 35 (Table 1).

The research protocol was presented to and approved by the Ethics Committee for Research Involving Human Subjects of the Prof. João Cardoso Nascimento Jr Health Campus of the Federal University of Sergipe (CAAE number: 0031.0.107.000-09).

Surgical technique

The patient was placed in dorsal decubitus in reverse Trendelemburg position and left lateralization with the lower extremities in leg holders. After general anesthesia, the surgeon positions himself between the legs of the patient with the assistant to the left of the patient. The monitor was positioned at the level of the right shoulder of the patient and, the instruments, to the right.

The umbilicus was incised approximately 1.5 cm horizontally. Next, the pneumoperitoneum was established and maintained at 14mmHg by insufflation with carbon dioxide (CO_2). A 10mm trocar was positioned into the umbilicus and a 30° optic was attached. A second trocar, this one 3mm, was introduced under the vision of the optic above and to the right of the first, approximating/broaching the fascia of the rectus abdominus for positioning of the hook or scissors, among other instruments. A third (5 mm) trocar was introduced to the left and at the same height as the second trocar for the positioning of the clamps (Figures 1 and 2).

In the cholecystectomy surgeries where it was necessary, a 2mm trocar was introduced in the right flank for positioning of pressure clamps, aiding in the exposure of the Calot's triangle and the dissection of the cystic duct and cystic artery (Figure 3).

When available, a 5mm 30° optic was used when placing clips in the cystic duct and artery, introduced through the 5mm trocar, giving passage to

Table 1 - Transumbilical Laparoscopic surgical (TUES) procedures performed using the transumbilical approach as a sole access (1 site) or as the principal access (2 sites).

	Nº of sites	n	Sex (M/F)	Age(mean)	BMI(mean)
Cholecystectomy (w or w/o U.H. or Liver Bx.*)	12	106	4/12	40.46	28.17
Liver Biopsy (w or w/o U.H.+)	1	7	5/2	44.57	27.95
Inguinal Herniorrhaphy (w/ U.H.+)	2	2	1/1	43.50	28.75
Appendectomy	2	1	1/0	52	___

w = with w/o = without

** Liver Bx.= Liver biopsy*

+ U.H. = umbilical herniorrhaphy

§ In one patient who underwent cholecystectomy (BMI=44.01) there was a conversion to a laparoscopic approach (from 1 to 4 access points)

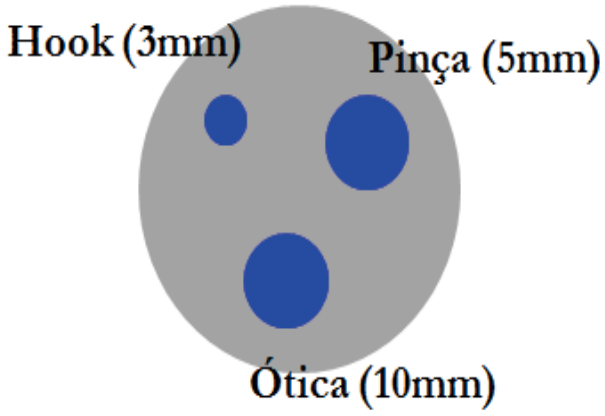


Figure 1 - *Transumbilical surgical access in cholecystectomy. Schematic for placing the trocars in the umbilical scar.*
Pinça (5mm) → 5mm clamp
Ótica (10mm) → 10mm optic

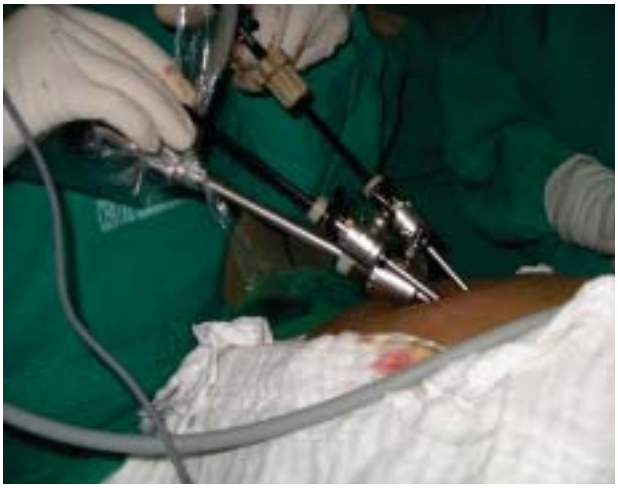


Figure 2 - *Transumbilical Cholecystectomy with conventional videolaparoscopy instruments.*

the *clip applier* through the 10mm trocar previously introduced in umbilical scar. When not available, a second 10 mm trocar was introduced in place of the 5mm trocar. The cystic duct was then clipped and cut, with two clips closing the proximal stump and one clip on the distal stump (near the gall bladder). The cystic artery was clipped in the same fashion. Next, the gall bladder was dissected in an anterograde manner and freed from the liver bed; the umbilical fascia was approximated and intradermal suturing performed.

For the inguinal herniorrhaphy and appendectomy cases two (a 10mm and a 5mm) intraumbilical trocars were used and one 2mm trocar in the flank opposite to the pathology. For the liver biopsy cases, two trocars (5mm and 10mm) were placed in intraumbilical positions.

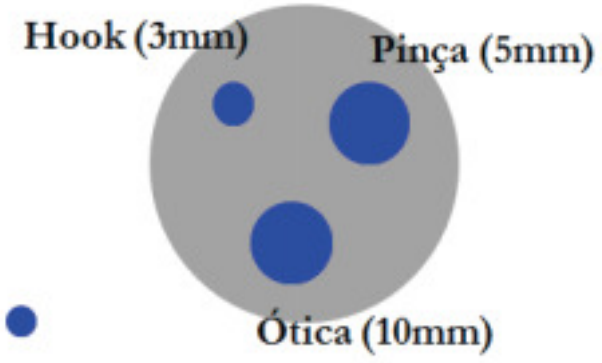


Figure 3 - *2mm Trocar accessory for mobilizing the gall bladder (infundibulum) in a Transumbilical Cholecystectomy.*
Right Flank (FD) (2mm)
Clamp for traction of the infundibulum
Pinça (5mm) → 5mm clamp
Ótica (10mm) → 10mm optic

RESULTS

The present study involved 26 cases using a transumbilical approach: sixteen cholecystectomies, seven liver biopsies, two inguinal herniorrhaphies and one appendectomy. In 16 patients the transumbilical port was the only access. In nine, two point of access were used. All of the procedures were performed by one surgeon. Patients were informed regarding the surgical technique employed.

In only one patient, who was morbidly obese (BMI = 44.01), was conversion to conventional videolaparoscopy necessary; four access points were used. No major complication was observed.

In two patients who underwent cholecystectomy, the availability of a 5mm optic, concomitantly with a 10mm optic, facilitated the performance of the surgery at the moment of the placement of the clip in the cystic duct and artery. Thus, the clip applier was used in the 10mm trocar and in the 5mm trocar, lateral to the clip applier, a 5mm optic was used. In one patient a 2 mm trocar was necessary.

All patients were discharged the day after undergoing the surgical procedure.

Since discharge all patients are being followed as outpatients. To date no complications have been observed. In all patients' wound closure proceeded appropriately with the formation of good looking intraumbilical scars, without signs of infection. All

patients responded to a questionnaire that the cosmetic result was satisfactory.

DISCUSSION

In the past the maxim "great incisions, great surgeries" prevailed in medical practice. Today, we will seek techniques that are increasingly less invasive. It is against this backdrop that Natural Orifice Transluminal Endoscopic Surgery (NOTES) is gaining popularity. NOTES procedures provide a degree of satisfaction about the cosmetic result that exceeds even conventional laparoscopic techniques, until now considered the gold standard for some surgical procedures, such as cholecystectomy. Besides the favorable aesthetic result, it is believed that NOTES procedures cause less injury, with less metabolic response to the surgical stress, and fewer postoperative complications.[10,11]

In 2004, the American surgeon KALLOO[11,12] published the first report related to the topic, using transgastric access in pigs to remove the gall bladder. In 2007, ZORRÓN and cols[6] performed surgery through a transvaginal approach, utilizing the umbilical scar for access to the peritoneal cavity solely for induction of the pneumoperitoneum. Currently, most procedures employing Natural Orifice Transluminal Endoscopic Surgery (NOTES) use the transluminal approach in association with at least one transparietal access, a process known as the hybrid technique.[6,7,13]

Transumbilical surgery (TUES) has been considered a transition between conventional videolaparoscopy and surgery through natural orifices, since there still are barriers to overcome such as the lack of appropriate instruments, difficulties of access, and the potential for infection.[1,7,12,14,15] The first transumbilical surgery was reported by ZHU and cols, in 2007, using the umbilicus as the sole surgical access.[8,12] TUES can be performed using instruments for mini-laparoscopy or those used in conventional videolaparoscopy, without posing risks or additional costs.[1,4,5] The incision is made in the umbilicus, decreasing the number of access ports when compared with conventional videolaparoscopy, resulting in a scar that is barely visible or virtually imperceptible (figures 4 and 5). The aesthetic advantages, in addition to less post-operative pain, earlier discharge from the hospital, and a more rapid return to work activities are the observed benefits.[1,4]

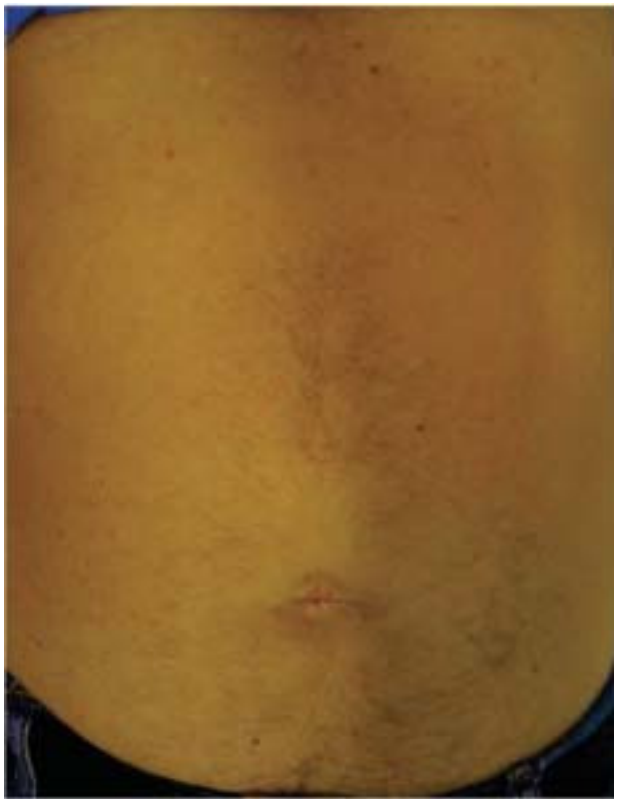


Figure 4 - *Excellent aesthetic result 3 months after a transumbilical videolaparoscopic procedure.*

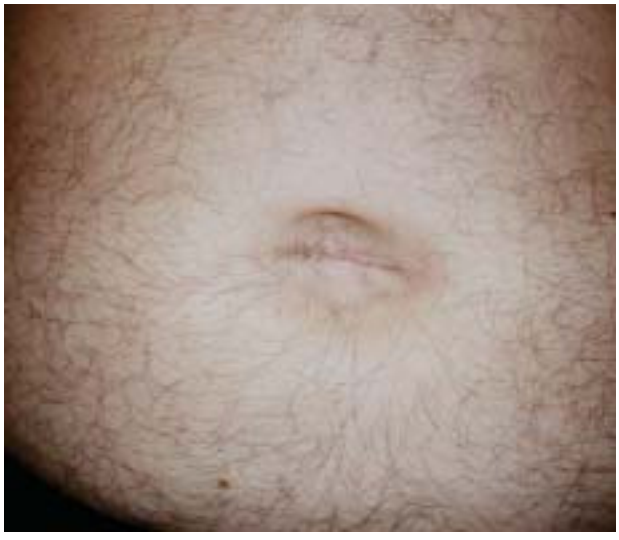


Figure 5 - *Excellent aesthetic result 6 months after a transumbilical videolaparoscopy procedure.*

Several studies describe the use of a single trocar – also known as Single Trocar Access - SITRACC – a special flexible instrument, which permits the surgeon greater freedom of movement.[12,16] In the present study, the fact that we did not have articulated instruments did not prove to be a limiting

factor for performing procedures using the transumbilical approach. All were performed with instruments used in conventional videolaparoscopy or in minilaparoscopy without posing risks or additional costs.

With TUES, conversion to conventional videolaparoscopy is possible whenever necessary.[1,4,15] In our study, of the 26 patients, only one with morbid obesity (BMI=44.01) where there was bleeding of the cystic artery – which proved to be difficult to control – required conversion to conventional videolaparoscopy (four access ports). Despite the difficulties experienced, the bleeding was controlled. This case notwithstanding, an elevated BMI probably will not represent a limiting factor for using the technique, as recent publications describe natural orifice surgery being performed in obese patients.[17,18]

Although transumbilical videolaparoscopy is a promising surgical option that is still developing, new studies are likely to establish the reproducibility and safety of the technique. The use of instruments employed in conventional videolaparoscopy permits patients immediate access to this new technique. This procedure offers patients a better cosmetic result, with fewer and smaller scars, or even scars that are imperceptible. The improvement of surgical instruments is of great importance, and will accelerate the routine use of this approach by most surgery services.

RESUMO

Objetivo: Descrever, preliminarmente, os resultados com a cirurgia videolaparoscópica via transumbilical utilizando equipamentos de videolaparoscopia convencional. **Pacientes e Métodos:** Vinte e seis pacientes submetidos à colecistectomia, herniorrafia inguinal, herniorrafia umbilical, biópsia hepática e apendicectomia utilizando a via transumbilical como principal e/ou único acesso. O índice de massa corporal (IMC) médio foi de 27,9 e a idade média foi de 42,3. Foram utilizados um trocarte de 10 mm (ótica de 30°), um trocarte de 3mm e outro de 5mm, introduzidos via transumbilical. Nas colecistectomias, quando necessário, um trocarte de 2mm foi introduzido em flanco direito. **Resultados:** Em dezessete pacientes utilizou-se a via transumbilical como acesso único. Em nove, foram utilizados dois sítios. Um caso foi convertido para videolaparoscopia convencional em paciente com IMC de 44,0. Nenhuma complicação maior foi observada. Todos os pacientes tiveram excelente evolução pós-operatória e efeito estético. **Discussão:** Os procedimentos por TUES (Transumbilical Endoscopic Surgery) têm sido realizados na tentativa de promover satisfação estética, menor dor pós-operatória e recuperação mais rápida. **Conclusões:** A videolaparoscopia por via transumbilical é opção cirúrgica promissora que ainda está em desenvolvimento, no entanto, novos estudos poderão ratificar a reprodutibilidade e segurança da técnica. Tal procedimento possibilitou aos pacientes um melhor resultado cosmético, com cicatrizes em menor número, de menor tamanho ou mesmo não visíveis.

Palavras-chave: Cirurgia laparoscópica; NOTES. TUES. Cicatriz umbilical.

REFERENCES

1. Tacchino R, Greco F, Matera D. Single-incision laparoscopic cholecystectomy: surgery without a visible scar. Surg Endosc 2009; 23: 896-9.
2. Ferraz ED, Lacombe D. Estado atual da cirurgia híbrida colorretal. Rev bras vídeo-cir 2003; 1(1): 29-37.
3. Maciel R, Barreto SSM. Tromboprofilaxia na colecistectomia videolaparoscópica. J bras pneumol 2004; 30(5) 480-4.
4. Hong TH, You YK, Lee KH. Transumbilical single-port laparoscopic cholecystectomy: scarless cholecystectomy. Surgical Endoscopy 2009; 23(6): 1393-7.
5. Cuesta MA, Berends F, Veenhof AAF. A. The "invisible cholecystectomy": A transumbilical operation without a scar. Surgical Endoscopy 2008; 22(5): 1211-3.
6. Zorrón R, Filgueiras M, Maggioni LC, Pombo L, Carvalho GL, Oliveira AL. Notes Transvaginal Cholecystectomy: Report of the First Case. Surg Innov 2007; 14: 279-83.
7. Nguyen NT, Reavis KM, Hinojosa MW, Smith BR, Wilson SE. Laparoscopic transumbilical cholecystectomy without visible abdominal scars. J Gastrointest Surg 2009; 13: 1125-8.
8. Zhu JF, Hu H, Ma YZ, Xu MZ, Li F. Transumbilical endoscopic surgery: a preliminary clinical report. Surg Endosc 2009; 23: 813-7.
9. Rivas H, Varela E, Scott D. Single-incision laparoscopic cholecystectomy: initial evaluation of a large series of patients. Surg Endosc. 2010; 24(6): 1403-12.
10. Rosenberg, J.; Kehlet, H. Surgical physiopathology. New results of importance for optimization of the postoperative course. Ugeskr. Laeger 2001; 163(7): 908-12.

11. Seid, V. E. NOTES: presente e futuro – uma breve revisão. Einstein 2008; 6(1): 99-101.
12. Martins MVDC, Skinovsky J, Coelho DE. Colecistectomia videolaparoscópica por trocarte único (SITRACC®) - Uma nova opção. Rev Col Bras Cir 2009; 36: 177-9.
13. Bucher P, Pugin F, Buchs N, Ostermann S, Charara F, Morel P. Single port access laparoscopic cholecystectomy (with video). World J Surg 2009; 33: 1015-9.
14. Gumbs AA, Milone L, Sinha P, Bessler M. Totally Transumbilical Laparoscopic Cholecystectomy. J Gastorintest Surg 2009; 13: 533-4.
15. Chamberlain RS, Sakpal SV. A comprehensive review of Single-Incision Laparoscopic Surgery (SILS) and Natural Orifice Transluminal Endoscopic Surgery (NOTES) techniques for Cholecystectomy. J Gastrointest Surg 2009; 13: 1733-40.
16. Guo W, Zhang ZT, Han W, Li JS, Jin L, Liu J, et al. Transumbilical single-port laparoscopic cholecystectomy: a case report. Chin Med J 2008; 121: 2463-4.
17. de la Torre RA, Satgunam S, Morales MP, Dwyer CL, Scott JS. Transumbilical single-port laparoscopic adjustable gastric band placement with liver suture retractor. Obes Surg 2009; 19: 1707-10.
18. Huang CK, Houng JY, Chiang CJ, Chen YS, Lee PH. Single incision transumbilical laparoscopic Roux-en-Y gastric bypass: a first case report. Obes Surg 2009, 19: 1711-5.

Correspondence Address:
ANTÔNIO ALVES JÚNIOR
Avenida Pedro Valadares 940, Apt. 103
Bairro Jardins, Aracaju, SE 49025-090 Brazil
Tel.: 79 3211-1698
Cel.: 79 9982-7557
E-mail: aalves@infonet.com.br

Brazilian Journal of Videoendoscopic Surgery

Original Article

Laparoscopic Anti-Reflux Surgery Promotes Regression or Disappearance of Barrett's Esophagus, but does not Eliminate the Risk of Esophageal Adenocarcinoma

Cirurgia Anti-Refluxo Promove a Regressão ou Desaparecimento do Esôfago de Barrett, mas não Elimina o Risco de Adenocarcinoma de Esôfago

GUSTAVO L. CARVALHO, MD, PHD[1]; LUÍS HENRIQUE L. LIRA[2]; EDUARDO FELIPE DE CARVALHO CHAVES[3]; JOSÉ SERGIO NASCIMENTO SILVA[4]; REBECA GONÇALVES ROCHA[5]; CARLOS T. BRANDT, MD, PHD[6]

University of Pernambuco (UPE), Faculty of Medical Sciences, Recife, and Clínica Cirúrgica Videolaparoscópica Gustavo Carvalho, Recife, PE, Brazil.
1. Associate Professor of General Surgery, University of Pernambuco (UPE), Faculty of Medical Sciences, Member of SAGES, SOBRACIL, ELSA and Brazilian College of Surgeons (CBC); 2. Medical Student, University of Pernambuco (UPE), Faculty of Medical Sciences; 3. Medical Student, University of Pernambuco (UPE), Faculty of Medical Sciences; 4. Medical Student, University of Pernambuco, Faculty of Medical Sciences; 5. Medical Student, Universidade de Pernambuco (UPE), Faculty of Medical Sciences; 6. Head Professor of Pediatric Surgery – Federal Universidade, Pernambuco (UFPE).

ABSTRACT

Background: Barrett's Esophagus (BE) is a complication of gastroesophageal reflux disease (GERD) and can be a pre-malignant condition. Nevertheless, there is no consensus about the effectiveness of surgery in preventing malignant transformation in patients with BE. The impact of Laparoscopic Anti-Reflux Surgery (LARS) on those suffering from BE is still not understood. The objective of this study is to prospectively evaluate clinical, endoscopic and histopathological results after LARS in patients with BE. **Methods**: 372 patients suffering from GERD underwent Laparoscopic Nissen Fundoplication (LapNissen). Among them, 95 (25.5%) presented BE. Follow-up using endoscopic biopsy was performed in all patients. The average follow-up was 59.8 months. **Results**: The control of symptoms was effective in 92 patients. Three patients remained symptomatic, and BE remained unaltered in these patients. Regression of BE occurred in 58 patients (63.9%). Of these, 26 (28.9%) showed no further signs of BE in endoscopic or histopathological examinations. In one patient, who remained asymptomatic after surgery, the degree of dysplasia increased to high-grade dysplasia, and another asymptomatic patient developed adenocarcinoma. Both underwent endoscopic mucosectomy of the BE area. **Conclusions**: LapNissen is safe and effective in the control of symptoms in a significant number of patients with BE. In spite of the control of GERD attained by most patients and regression occurring in a high percentage of the patients who underwent LARS, the development of high-grade dysplasia and adenocarcinoma is not fully prevented by anti-reflux surgery. Routine endoscopy follow-up with biopsy is recommended for all patients with BE after LARS.

Key words: Barrett's esophagus, laparoscopy, Nissen fundoplication, dysplasia, cancer.

Bras. J. Video-Sur, 2011, v. 4, n. 1: 015-020

Accepted after revision: January, 12, 2011

1. INTRODUCTION

In 1950, Norman Barrett mistakenly believed that he was observing a congenitally short esophagus and an intra-thoracic stomach. However, in 1953, Phillip Allison after examining esophagectomy specimens concluded that what was observed by Barrett was the tubular esophagus lined with columnar epithelium.[1] Barrett's esophagus (BE) is known to be an acquired condition in which the normal squamous epithelium of the distal esophagus is replaced by an abnormal columnar mucosa containing intestinal metaplasia.[2]

Endoscopic studies have shown that 5–15% of patients with gastroesophageal reflux disease

(GERD) can develop BE. The high incidence and the correlation with the esophageal adenocarcinoma make BE as an important public health problem.[3]

The treatment of patients with BE, especially those with long segment of columnar epithelium, is difficult, mainly for those who present a more serious GERD, typically associated with a large hiatal hernia, shortened esophagus, or because they have lesions considered premalignant.[4]

With the introduction of minimally invasive surgeries through laparoscopy, interventions which once were associated with high morbidity and mortality have been replaced with safer procedures. Anti-reflux surgery, which previously required a thoracotomy or a laparotomy, today is performed efficiently by a laparoscopic procedure, with lower rates of infections and other complications, shorter hospital stays, and lower costs. Patients recuperate faster and are able to return to work and other activities sooner.[5]

In patients with Barrett's Esophagus, the results of the anti-reflux medical therapy have not been satisfactory. Laparoscopic anti-reflux surgery (LARS) is becoming a more popular procedure, with increasingly good results, with multiple reports showing regression of the pre-malignant columnar epithelium.[1-11]

However, the real impact of surgical anti-reflux procedures in patients with Barrett's Esophagus has not been completely elucidated. The objective of this study is to show that LARS has the potential to considerably reduce GERD symptoms and to promote the regression of Barrett's Esophagus, or at least to reduce the likelihood of – or at least slow – progression of pre-malignant BE to malignancy.[3-6]

2. MATERIALS AND METHODS

2.1 Study Population

From January 2000 to January 2009, 372 patients who presented with GERD were subjected to LARS, by the same surgeon (GLC). Pre-operatively all patients were evaluated with upper endoscopy with biopsy and manometry. Of the 372, 95 (25.53%) were found have Barrett's Esophagus. Patients received a diagnosis of BE when they were found to have specialized intestinal metaplasia in the esophagus with columnar epithelium.[1] Patients without evident histological evidence of intestinal metaplasia in the specimens of the biopsy of the gastroesophageal junction were excluded from further analysis, as were patients with histopathologic evidence of invasive carcinoma. The median age was 50.5 years (range: 14 to 82). 74 (78%) patients were men, 21 women.

2.2 Surgical Technique

All patients underwent laparoscopic Nissen fundoplication; none required conversion to open surgery. The positioning of the surgical team, patient, and trocars is illustrated in figure 1. The pneumoperitoneum was performed by open technique at the umbilical site where a 10-mm trocar was inserted and maintained at an intra-abdominal pressure of 8–12 mmHg throughout the procedure. After the pneumoperitoneum was established, a 30°/10 mm scope was inserted through the umbilical trocar. Four other trocars were inserted. After hepatic retraction, the diaphragmatic hiatus was evaluated. The surgery proceeded with the sectioning of the short gastric vessels to create a window behind the esophagus. After the sectioning of the gastric–hepatic and phrenic ligaments, the esophagus was isolated and traction applied using a latex catheter. The diaphragmatic hiatus was repaired by interrupted sutures of polyester 2-0 (Ethibond 2-0-Ethicon), maintaining an intra-esophageal bulgie as a mold (Figure 2). Next, the 360 degree fundoplication was made short and floppy. Intraoperatively, upper endoscopy was done to confirm the correct positioning of the fundoplication; if

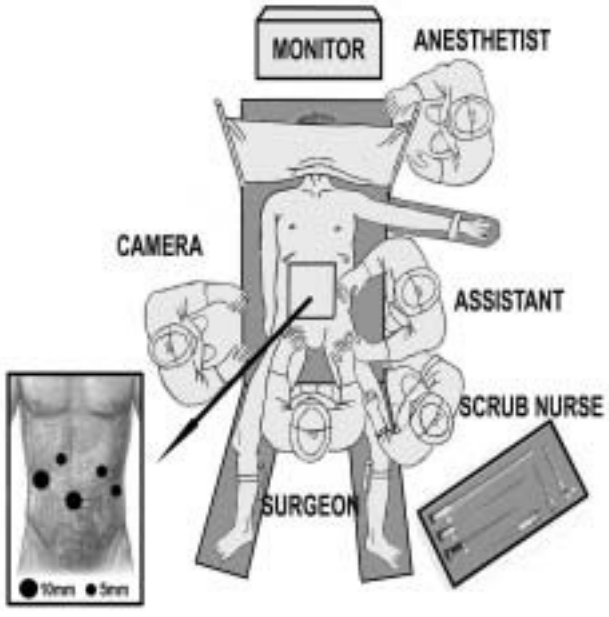


Figure 1 - *Positions of the patient, surgical team, and trocars.*

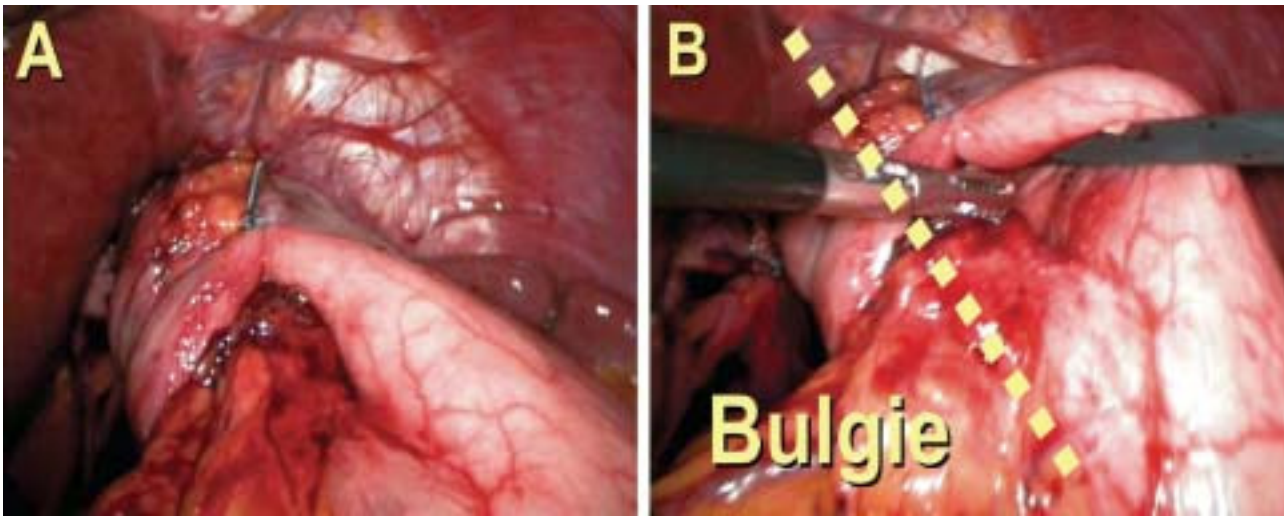


Figure 2 *- Videolaparoscopic views of the laparoscopic Nissen fundoplication. (A) Nissen fundoplication completed. (B) Bulgie as mold to aid the closure of the hiatus and the construction of a short and floppy Nissen.*

necessary, the fundoplication was redone. The trocars were removed and the orifices were closed, ending the procedure.

2.3 Upper Endoscopy and Histopathology

All patients underwent upper endoscopy with biopsy before and after the surgery. A transoperative endoscopy without biopsy was also performed confirming the correct positioning of the fundoplication. A columnar-lined esophagus was visually identified when the squamocolumnar junction or any part of its circumference extended above the gastroesophageal junction, and its presence was confirmed by a biopsy.

The presence of intestinal metaplasia and dysplasia was determined according to conventional histopathologic criteria. The condition was considered to have regressed or progressed if two consecutive biopsy samples at least six months apart showed a significant change in the mucosal characteristics as assessed by two pathologists. The endoscopic criteria were combined with histopathologic criteria and regression of the Barrett's Esophagus was classified as: total regression, partial regression or no regression.

2.4 Esophageal Manometry

The manometric study was carried out after an overnight fasting with the patient in the supine position. A structurally defective sphincter was defined by a resting pressure of less than 6 mmHg, overall sphincter length of less than 2 cm, abdominal length of less than 1 cm, or a combination of these.

Manometry was performed one month before the surgery, six months after, one year after the procedure, and in some cases five years after the surgery.

3. RESULTS

3.1 Clinical Results

The average follow-up was 59.8 months. There were no conversions from the laparoscopic to the open technique. Most patients were discharged within 24 hours; three were observed for 48 hours. Only three patients, among our first ten BE patients, had no symptomatic relief, and are still in treatment with proton pump inhibitors. In these cases, the BE persists unaltered.

3.2 Endoscopy and Histopathologic Examination

After the endoscopy and biopsy, the Barrett's Esophagus of 32 patients (33.7%) was found to be unaltered. Fifty eight patients (63.9%) presented regression of the intestinal metaplasia; 27 (28.9%) of these 58 patients had a total regression (disappearance) of the BE disease, and 31 (32.5%) had a partial regression of BE. In one patient who remained asymptomatic after surgery, the degree of dysplasia increased from medium-grade to high-grade dysplasia six months after surgery). An endoscopic mucosectomy of the BE area was performed and two years after the procedure there were no signs of BE. Another patient developed adenocarcinoma two

months after surgery, and also underwent endoscopic mucosectomy of the BE area, and continues to be monitored with periodic endoscopic surveillance.

4. DISCUSSION

There are four aims of therapy for patients with BE and they should be the same for both surgical or nonsurgical treatments: provide long-term relief from the symptoms; allow healing of the esophageal mucosa injury; prevent progression to more advanced mucosal injury or dysplastic changes; and establish the conditions which permit regression of dysplastic to nondysplastic Barrett's, or of intestinalized to nonintestinalized columnar epithelium.[1]

In spite of several controversies that exist about the use of clinical or surgical therapy, several recent studies been demonstrated the effectiveness of LARS in these patients. DEMEESTER *et al.*[1] showed that after LARS, the patients presented an improvement in reflux symptoms; all patients were considered improved or cured. In 14% of the patients the intestinal metaplasia disappeared. Adenocarcinoma and high-grade dysplasia were prevented from developing in almost all of them. In our study, intestinal metaplasia disappeared in 28.9% of the 95 patients. Nevertheless, although BE regressed or disappeared in most cases, one patient developed high grade dysplasia and another developed adenocarcinoma. The duration of follow-up did not make these data statistically significant. ABBAS[4] reported that of 49 patients with BE who underwent LARS, the functional results were classified as excellent in 69% patients, good in 19%, regular in 10%, and poor in 2%. They also demonstrated that LARS is effective in the control of the symptoms in most of the patients with BE, and that disappearance of columnar epithelium could happen in some cases, but that the risk of evolution adenocarcinoma was reduced, but not eliminated, with the procedure.[4] In our data, only three (3.6%) of patients did not obtain satisfactory symptomatic control, and most patients stopped taking medications for symptoms of reflux.

In those patients who lesions evolved and developed into high grade dysplasia and adenocarcinoma, several therapeutic options exist. We believe that mucosectomy is the preferred option as it removes the abnormal tissue and also provides ample tissue for histopathology, which is not possible (except for small biopsies) when argon plasma laser, or other techniques that treat by destroying the BE are used. Not much is known about the evolution and the pathophysiology involved in the emergence of esophageal adenocarcinoma. JAMIESON has raised some doubts about the origin of adenocarcinoma,[5] asserting that Barrett's mucosa alone does not clearly provoke esophageal adenocarcinoma, since most patients with BE do not develop cancer. Adding support to Jamieson's questioning is the curious observation that the incidence ratios for white males versus white females, for reflux disease, is approximately 1:1, and 1:1 for the development of Barrett's mucosa, and yet the incidence ratio for adenocarcinoma of the esophagus is about 10:1. Jamieson also notes that in any surgical series of esophagectomy for adenocarcinoma, Barrett's mucosa is found in only about half of the patients, leading him to pose the following questions: "Is Barrett's mucosa really so important in the development of adenocarcinoma, other than as a marker of severe reflux disease? Does our persistent concentration on it divert our attention from finding an as yet unidentified, but much more important, cause of adenocarcinoma involving the esophagus?" Our answers are: We still do not know.

CSENDES *et al.*[2] performed a study accompanying 78 patients for more than five years. The radical anti-reflux procedure performed by the surgical team combined vagotomy, antrectomy, and Roux-en-Y gastrointestinal reconstruction. BE regressed in approximately 60%; however, the results obtained were similar to the Nissen fundoplication in the patients with short segment BE. The radical procedure is a more invasive surgery with greater morbi-mortality without benefits superior to simpler procedures such as the LapNissen.[2]

ROSSI *et al.*[6] published a prospective study comparing Nissen fundoplication with medical therapy and considering the regression of BE, observed a statistically significant difference ($p < 0.03$), favoring the surgical treatment (93.8%) over medical management (63.2%). This study also suggested that surgery can be more effective than the medical management in modifying the natural history of the low-grade dysplasia, in the 35 patients with BE. Chang *et al.*[7] performed a systematic review of MEDLINE literature in order to compare the effectiveness of the surgical therapy against medical therapy. They found surgical treatment to be superior to medical management in patients with BE. The probability of progression was 2.9% (95% CI: 1.2%–5.5%) in surgical patients, and 6.8% (95% CI: 2.6%–12.1%) for medical patients (p=0.054). They also found a

more compelling difference in the probability of regression of BE with 15.4% (95% CI: 6.1%–31.4%) in surgical patients and 1.9% (95% CI: 0.4%–7.3%) in medical patients (p=0.004). However, evidence suggesting that surgery reduces the incidence of adenocarcinoma in these patients was not found.

These results suggest that the control of the acid reflux alone probably does not have the capacity to halt or reverse the dysplastic transformation. Considering that the concomitant control of biliopancreatic reflux – which is also achieved by anti-reflux surgery – may be important, there is support for the hypothesis that combined reflux is part of the etiology of the BE dysplasia. In spite of studies with good results using proton pump inhibitors – presenting partial regression in the form of squamous islands – medical therapy does not act where the origin of the dysplasia was thought to be located. Based on these findings, surgical procedures can be considered more effective than medical management for BE.[8,9]

Some technical aspects of LARS warrant mention because they can partly explain the better therapeutic response of our patients who underwent anti-reflux surgery. These include: 1) the use of a bulgie during the construction of the fundoplication (Figure 2), and 2) intraoperative upper endoscopy, which is done in all patients. The intraoperative endoscopy is done to ensure that the fundoplication would not hide the Barrett metaplasia, and would allow an effective post-operative evaluation to assess regression. This assessment is especially important in patients with dysplasia, who face the possibility of progression of the dysplasia and development of a malignant process. These precautions aim to make sure the fundoplication does not twist the esophagus – which could conceal the Barrett's Esophagus – ensuring that any regression is a real change in the esophageal epithelium made possible by the suppression of noxious stimulation.

The advent of new laparoscopic surgical procedures has aroused great interest on the part of both surgeons and patients seeking better treatment options for Barrett's Esophagus. Superior results of the surgical therapeutics when compared with medical management of BE can be attributed to the fact that surgical procedures which once were quite invasive, can now be performed with minimally invasive surgery, with better aesthetic results, shorter hospitalizations, less post-operative pain. These characteristics have made LARS the best option for the treatment of the patients with Barrett's Esophagus.[10,11]

5. CONCLUSIONS

LapNissen is safe and effective in the control of symptoms in a significant number of patients with BE. In spite of regression occurring at a high percentage level in patients operated and the control of GERD attained by most patients, the development of high-grade dysplasia and adenocarcinoma is not fully prevented by anti-reflux surgery. Periodic surveillance with endoscopy with biopsy is highly recommended for all patients with BE after LARS.

RESUMO

Introdução: O Esôfago de Barrett (EB) é uma complicação da doença do refluxo gastroesofágico (DRGE) e pode ser considerada como uma condição pré-maligna. Contudo, ainda não existe consenso acerca da eficácia da cirurgia anti-refluxo laparoscópica (CARL) na prevenção da transformação maligna do epitélio esofagiano em pacientes com EB, ademais, o impacto da CARL em portadores de EB ainda não é bem compreendida. O objetivo deste estudo é avaliar, prospectivamente, a evolução e os resultados clínicos, endoscópicos e histopatológicos de pacientes com EB submetidos a CARL. **Métodos:** 372 pacientes portadores de DRGE foram submetidas a CARL. Destes, 95(25,53%) apresentaram Esôfago de Barrett. Biópsia endoscópica foi realizada em todos os pacientes durante todo o acompanhamento o qual teve duração média de 59.8 meses. **Resultados**: O controle dos sintomas foi efetivo em 92 pacientes. 3 pacientes permaneceram sintomáticos e sem regressão do EB. A regressão do EB ocorreu em 58 (63,85%) dos pacientes. Destes, 26 (28,91%) não demonstraram aumento das lesões metaplásicas em exames endoscópicos e histopatológicos. Em um paciente, assintomático após a cirurgia, ocorreu aumento para displasia de auto grau e em outro, também assintomático, houve evolução para adenocarcinoma. Ambos foram tratados por mucosectomia endoscópica nas áreas de lesões. **Conclusão**: CARL é segura e efetiva no controle dos sintomas em significante número de pacientes portadores de EB. Apesar da regressão ocorrida em percentual elevado de pacientes operados e do controle da sintomatologia da DRGE na maioria dos pacientes, não houve total impedimento do desenvolvimento de displasia de alto grau e nem de adenocarcinoma esofagiano. A Endoscopia de rotina com biópsia é altamente recomendado para todos os pacientes com EB submetidos a CARL.

Palavras-chave: Esôfago de Barrett; Laparoscopia; Fundoplicatura à Nissen; Displasia; Câncer.

6. REFERENCES

1. Hofstetter WL, Peters JH, DeMeester TR, Hagen JA, DeMeester SR, Crookes PF, et al. (2001) Long-term outcome of antireflux surgery in patients with Barrett's esophagus. Ann Surg. 234(4):532-8.
2. Csendes A, Bragheto I, Burdiles P, Smoke G, Henriquez A, Parada F, et al. (2006) Regression of intestinal metaplasia to cardiac or fundic mucosa in patients with Barrett's esophagus submitted to vagotomy, partial gastrectomy, and duodenal diversion. A prospective study of 78 patients with more than 5 years of follow up. Surgery 139(1):46-53.
3. Desai, K. (2003) Efficacy of laparoscopic antireflux surgery in patients with Barrett´s esophagus. Am J Surg. 186(6):652-9.
4. Abbas AE. (2004) Barrett's esophagus: the role of laparoscopic fundoplication. Ann Thorac Surg 77(2):393-6.
5. Jamieson GG. (2007) Antireflux surgery, Barrett's esophagus, and adenocarcinoma: there is still room for doubt. Ann Surg 246(1):22-3.
6. Rossi M, Barreca M, de Bortoli N, et al. (2006) Efficacy of Nissen fundoplication versus medical therapy in the regression of low-grade dysplasia in patients with Barrett's esophagus. Ann Surg 243(1):58-63.
7. Chang EY, Morris CD, Seltman AK, O'Rourke RW, Chan BK, Hunter JG, et al. (2007) The effect of antireflux surgery on esophageal carcinogenesis in patients with Barrett's esophagus: a systematic review. Ann Surg 246(1):11-21.
8. Gurski RR, Peters JH, Hagen JA, et al. (2003) Barrett's esophagus can and does regress after antireflux surgery: a study of prevalence and predictive features. J Am Coll Surg 196:706-12.
9. Oelschlager BK, Barreca M, Chang L, et al. (2003) Clinical and pathologic response of Barrett's esophagus to laparoscopic antireflux surgery. Ann Surg 238:458-64.
10. Ozmen V. (2006) Histologic and clinical outcome after laparoscopic Nissen fundoplication for gastroesophageal reflux disease and Barrett's esophagus. Surg Endosc 20(2):226-9.
11. Hayden J. (2006) Optimization of outcome after laparoscopic antireflux surgery. ANZ J Surg 76(4):258-63.

Correspondence Address:
GUSTAVO CARVALHO, MD, PhD.
Avenida Boa Viagem 5526B Apt. 1902
Recife, PE 51030-000
Brazil
Tel: +55 81 9971-9698 Fax: +55 81 3325-3318.
E-mail: gc@elogica.com.br, glcmd1@gmail.com

Brazilian Journal of Videoendoscopic Surgery

Original Article

Is Intrafascial Laparoscopic Hysterectomy a Surgical Option?

Hysterectomia Laparoscópica Intrafascial: É uma Opção Cirúrgica?

ROBERTO ZAMBONATO MD[1]; JOSÉ PEDRO MOREIRA MD[2]

Universidade Federal de Pelotas / Federal University of Pelotas.
[1.] Preceptor of the residency program of the Teaching Hospital of UFPelotas; [2.] Gynecologist, Professor, UFPelotas.

ABSTRACT

The search for less invasive and surgically satisfactory treatments is part of current practice. We present the results of a technical variation of laparoscopic hysterectomy (LH). First performed in the United States by Harry Reich in 1987, regularly performed since 2002, and described in the Brazilian literature by Namir Cavalli in 2003, (5) Intrafascial Laparoscopic Hysterectomy has the advantages of a lower incidence of complication, shorter hospitalization, less blood loss, and a reduction in surgical time. We also note the lower cost as compared to abdominal or vaginal approaches.(13,15) We used this technique in 320 cases between 2005 and 2009. The modification of the technique is in the intrafascial approach with a monopolar bisturi, thereby avoiding the risks of the other approaches, such as lesions of the bladder, intestine, vessels and especially of the ureters.(1,4,5,15) Another advantage of the method is its easy assimilation by those learning videolaparoscopic procedures.(11) We had a lower rate of complications (7.5%), faster discharges (at most 48 hours), and excellent acceptance by our patients.

Key words: Laparoscopic hysterectomy, laparoscopic surgery, minimally invasive hysterectomy.

Bras. J. Video-Sur, 2011, v. 4, n. 1: 021-024

Accepted after revision: January, 05, 2011.

INTRODUCTION

Patients with benign uterine diseases that have indication for surgical procedures such as hysterectomy represent a large percentage of the indications for gynecological surgery. In 2003, 602,457 hysterectomies were performed in the United States, 538,722 for benign indications. Hysterectomy is the second most frequently performed surgery, after cesarean section (3,7,8,18), with an incidence of 4.8 surgeries/1000 women. The abdominal approach is the most commonly used: 66% versus 21.8 % using a vaginal approach, and 11.8 % laparoscopically (2003 data). Thus thee laparoscopic approach is not replacing indications for the vaginal approach; rather it has supplanted the abdominal approach, with the numerous benefits(17), as discussed below. Since we began to perform this technique, we have noted the facility of its execution, savings in the surgical time such as the anchoring of the vaginal vault, and important advantages such as less blood loss, a quicker return to the patient's routine activities, a lower frequency of paralytic ileus, and the option of a vaginal approach if defects of the pelvic floor are encountered (because the patient is already in the gynecologic position).(14) Since 1995 we have opted for the laparoscopic approach; thus in last 15 years – with the possibility of visualizing the ureters, and treating diseases of the uterine adnexa - we have attained great confidence as well as a high degree of patient satisfaction. Because the ligation of the uterine vessels is done laparoscopically, it satisfies the conditions for the procedure to be considered laparoscopic(15), even though the anatomic specimen is removed from the cavity vaginally and the suturing of the vault often carried out via this route. Nowadays, when abdominal hysterectomy is still the most frequently performed, it is worth emphasizing that minimally invasive procedures have become the more common.(4, 16)

PATIENTS AND METHODS

320 laparoscopic hysterectomies were performed from January 2005 through December 2009: 58 in 2005, 63 in 2006, 66 in 2007, 73 in 2008,

and 60 in 2009. All patients with an indication for hysterectomy seen by the authors either in their private practices or at the residents' service at the Teaching Hospital of the Federal University of Pelotas were included in this study. Patients with an indication for hysterectomy because of premalignant or malignant pathologies were excluded. There was no special preoperative preparation other than an eight-hour fast. Private patients typically arrived at the hospital on the morning of the procedure.

Technique: the patients received general anesthesia, and at induction received intravenously 100 mg of Ketoprofen and 2 grams of Cephalothin. Patients were placed in a lithotomy position with protective shoulder and lower extremity padding. After routine antisepsis and placement of sterile fields, a number 16 Foley catheter was introduced. Access for the Veres needle was made with a 10 mm umbilical incision, with the appropriate safety measures. The equipment for insufflation of the pneumoperitoneum was regulated for a maximum pressure of 15 mmHg. Upon completion of the pneumoperitoneum, an umbilical port was established with a 10 mm trocar. After placement of the optic and visualization of the cavity, two other auxiliary trocars – one 5 mm and the other 10 mm – were introduced in the region of the iliac fossas. At this point a uterine manipulator was placed; we used the Valtchev lifter. The utero-ovarian ligaments, tubes and round ligaments are clamped with a bipolar coagulation forceps; these structures are then cut. The large ligament is dissected by traction; the uterine vessels are identified, individualized, and coagulated with a bipolar forceps and cut. All of these procedures are performed bilaterally. Blunt dissection of the bladder is performed using a roll of gauze introduced through the 10 mm accessory port. Upon reaching the parametrium we seek to dissect the fascia with the monopolar instrument and make the procedure intrafascial, in this way trying to conserve the retinaculum that supports the vaginal vault in order to prevent future problems of the vault falling, and to make our dissection safer, as we are further from the ureter and bladder. With the vaginal vault open, the uterus is removed through the vagina (sometimes requiring fragmentation) and the closure is done through this approach with 0 chromic catgut sutures. In some cases we closed the vault through the laparoscopic route with internal sutures, in order to maintain the training of the team in this technique. Inspection of the pelvic cavity followed by rigorous hemostasis is a critical step. The trocars are removed under direct vision and the portal orifices are sutured with 000 Mononylon. The patients remain at bedrest with venous access and a urinary catheter for eight hours after the procedure. Once the IV access and catheter are removed the patients are encouraged to ambulate. Most women are discharged on the same day of the procedure; the remainder within 24 hours of the procedure. No disposable material is used and only two surgical sutures (one chromic catgut and one mononylon) are consumed. This offers the possibility of reducing costs, relative to a vaginal hysterectomy, in which there is use of a greater variety of surgical sutures.(13)

RESULTS

The indications for surgery are listed in table 1. Table 2 presents the frequency distribution of cases according to decade of life. The surgery was most indicated in the fifth and six decades of life.

The results seems excellent when evaluated in terms of decreasing postoperative pain, the speed of returning to daily activities, and principally by the small number of complications (Table 3). Lacerations of the bladder were sutured laparoscopically intraoperatively with a urinary catheter maintained for a minimum of 10 days. The patients with operative wound infections, in the case of vaginal vault, were treated with antibiotic therapy on an outpatient basis. The total complication rate of 7.5% can be considered low. Mortality, which reaches rates in the literature of up to 0.2 % (8, 19), did not occur in this series of patients. The average weight of the uteri was 154.7grams, varying between 30 and 1206 grams. The mean surgical time was 68 minutes, varying between 32 and 170 minutes. There was no conversion in this series of patients. The longest hospital stay was 48 hours.

Table 1 - Indications.

Indication	Patients	%
Fibroids	215	67.1
Adenomyosis	31	9.6
Metrorrhagia	27	8.4
Pelvic pain/Dysmenorrheia	27	8.4
Hyperplasia/recurrent polyps	20	6.2

Table 2 - Age.

Age Range	Patients	%
20-29	6	1.8
30-39	46	14.3
40-49	180	56.2
50-59	58	18.1
60-69	12	3.8
70-79	4	1.2

Table 3 - Complications.

Complication	Cases	%
Infection of vaginal vault	12	3.7
Laceration of the bladder	4	1.2
Late hemorrhage of the dome	4	1.2
Wall Hematoma	2	0.6
Portal Bleeding	**2**	**0.6**

DISCUSSION

The **laparoscopic intrafascial hysterectomy** technique constitutes an excellent alternative for this procedure, as there is a consensus in the literature that in avoiding the abdominal approach we will have less post-operative pain, less trauma to the abdominal wall, and a quicker return to the routine activities. It is, therefore, a good alternative to abdominal hysterectomy when you want to have safe access to the adnexa, avoiding the risks of peritoneal adhesions and lesions of organs of the urinary tract, which in the extrafascial technique and in vaginal hysterectomy have a statistically significant increase.(4,6,15) With the patient already positioned for vaginal access, this technique facilitates the approach to pelvic floor defects. The training of gynecologists and the use of the laparoscope will gradually reduce the already low complication rate. The difficulty of this improvement in videosurgery procedures is, in our view, the limiting factor in the appropriate development of the various laparoscopic techniques for hysterectomy.

RESUMO

A busca por terapêuticas menos invasivas e cirurgicamente satisfatórias faz parte da atualidade, apresentamos os resultados de uma variante técnica da histerectomia por via laparoscópica (TLH). Executada pela primeira vez nos Estados Unidos em 1987, por Harry Reich, e sendo esta variante executada desde 2002, descrita no nosso meio por Namir Cavalli (5), como vantagem do método está o seu menor índice de complicações, menor tempo de hospitalização, menor perda sanguinea e redução do tempo cirúrgico, também salientamos o mais baixo custo em relação as vias abdominal ou vaginal (13, 15). Utilizamos esta variante técnica em 320 casos entre os anos 2005 e 2009, a modificação da técnica está na abordagem com o bisturi monopolar de maneira intrafascial, evitando portanto os riscos das outras abordagens, como lesões de bexiga, intestino, vasos e principalmente do ureter (1,4,5,15). Outra vantagem do método é sua fácil assimilação pelos aprendizes de procedimentos videolaparoscópicos (11). Obtivemos um baixo índice de complicações (7.5%), com alta precoce, em no máximo 48 hs, e excelente aceitação pelas pacientes.

Palavras-chave: Hysterectomy laparoscópica, cirurgia laparoscópica, hysterectomy minimamente invasiva.

REFERENCES

1. Andersen T F, Loft A., Bronnun-Hansen, et al. Complications after hysterectomy. Acta Obstet Gynecol Scand 1993; 72:570-7
2. Candiani M, et al. Laparoscopic vs vaginal hysterectomy for benign pathology. Am J Obstet Gynecol 2009; 200: 368.e1-368.e7
3. Clarke A, Black N, Rowe P, et al. Indications for and outcome of total abdominal hysterectomy for benign disease: a prospective cohort study. Br J Obstet Gynecol 1995; 105(8):611-20.
4. Conde- Agudelo. Intrafascial abdominal hysterectomy: outcomes and complications of 867 operations, Int J Gynecol Obstet 2000; 68(3):233-9.
5. Cavalli N, Sória H, et al. Hysterectomy vaginal assistida por videolaparoscopia associada à técnica intrafascial em 579 operações. Rev Bras Videocir, 2003; 1 (4):128-34.
6. Elkington NM, Chow D. A review of total laparoscopic hysterectomy: role, techniques and complications. Obstet Gynecol 2006; 18:380-384.

7. Falconi T, Walters M. Hysterectomy for Benign Disease. Obstet Gynecol 2008; 111: 753-67
8. Farquhar CM, Steiner CA. Hysterectomy rates in the US 1990-1997. Obstet Gynecol 2002; 99:229-234.
9. Jacoby VL, et al. Nationwide use of Laparoscopic Hysterectomy compared with Abdominal and Vaginal Approaches. Obstet Gynecol 2009; 114, 5 : 1041-48
10. Jacobson GF, Shaber RE, Armstrong MA, Hung Y. Hysterectomy rates for benign indications. Obstet Gynecol 2006; 107: 1278-83
11. Lowel L, Kessler. Laparoscopically assisted vaginal hysterectomy – a suitable substitute for abdominal hysterectomy? The Journal of Reproductive Medicine 2000; 45(9):738-742.
12. Koh CH. A new technique and system for simplifying total laparoscopic hysterectomy. J Am Obstet Assoc Gynecol Laparoscop. 1998;(5):187-92
13. Mittapalli R, Fanning J, Flora R, Fenton B. Cost-effectiveness analysis of the treatment of large leiomyomas: laparoscopic assisted vaginal hysterectomy versus abdominal hysterectomy. Am J Obstet Gynecol 2007; (5) e19-e21
14. Rahn D D, et al. Abdominal hysterectomy with or without angle stitch: correlation with subsequent vaginal vault prolapsed. Am J Obstet Gynecol 2008; 199: 665.e 669.e4
15. Reich H. Total laparoscopic hysterectomy: Indications, techniques and outcomes. Curr Opin Obstet Gynecol 2007; 19:337-344, Lippincott Williams & Wilkins
16. Reich H, Roberts L. Laparoscopic hysterectomy in current gynecological practice. Rev Gynecol Pract 2003; (3):32-40.
17. Wattiez A, Cohen S, Selvaggi L. Laparoscopic hysterectomy. Obstet Gynecol 2002; 14: 417-422.
18. Wu J M, et al. Hysterectomy rates in the US - 2003. Obstet Gynecol 2007; 110 (5):1091-95.
19. Zambonato R. et al. Hysterectomy: uma revisão de 307 casos entre 1993 e 1996. Rev da Soc de Medic de Pel, 1998, 43-45.

Correspondence Address:
ROBERTO ZAMBONATO
Rua Major Cícero 564
Pelotas, RS, 96015-190
E-mail: zambonato@uol.com.br

Brazilian Journal of Videoendoscopic Surgery

Original Article

Transvaginal Endoscopic Tubal Sterilization – Surgical Technique

Esterilização Tubária Endoscópica Transvaginal – Técnica Cirúrgica

WILLIAM KONDO[1]; RAFAEL WILLIAM NODA[2]; ANIBAL WOOD BRANCO[3]; MARLON RANGEL[4]; SATURNINO RIBEIRO DO NASCIMENTO NETO[5]; ALCIDES JOSÉ BRANCO FILHO[6]

Department of General Surgery. Red Cross Hospital, Curitiba, Paraná, Brazil.
[1.] General Surgeon and Gynecologist from Red Cross Hospital; [2.] General Surgeon and Endoscopist from Red Cross Hospital; [3.] Urologist from Red Cross Hospital; [4.] General Surgeon from Red Cross Hospital; [5.] General Surgeon from Red Cross Hospital; [6.] General Surgeon from Red Cross Hospital.

ABSTRACT

Tubal sterilization is one of the most widely used options for female contraception. It can be performed in association with pregnancy or as an interval (not pregnancy-related) procedure. The latter is usually performed by laparotomy, laparoscopy, or hysteroscopy. Compared to open surgery, laparoscopy has been demonstrating some benefits due to its minimal invasiveness such as better cosmetic result, shorter hospitalization, decreased pain and faster return to work and to regular activities. Recent developments regarding laparoscopic surgery have been directed toward reducing the size or the number of ports or even eliminating abdominal incisions to achieve the goal of minimal invasive surgery. In this paper we describe the technique of transvaginal endoscopic tubal ligation in an attempt to minimize surgical morbidity and to offer an alternative approach to perform tubal sterilization.

Key words: laparoscopy, tubal sterilization, natural orifices translumenal endoscopic surgery, transvaginal surgery.

Bras. J. Video-Sur, 2011, v. 4, n. 1: 025-029

Accepted after revision: December, 10, 2010.

INTRODUCTION

The availability and use of contraception have contributed greatly to women's health. Despite the development of newer contraceptive technologies, tubal sterilization continues to be among the methods most widely used globally[1].

Tubal sterilization can be performed in association with pregnancy or as an interval (not pregnancy-related) procedure. The latter is usually performed by laparotomy, laparoscopy, or hysteroscopy. The transvaginal approach is used infrequently in the United States[2].

Laparoscopy is a minimally invasive surgery associated with many proven advantages over traditional open surgery[3] such as smaller incisions; decreased risk of local and systemic complications; decreased operative time, shorter hospital stay, and less postoperative pain, with faster recovery[4-6]. Most interval procedures (89% of outpatient and 53% of inpatient interval procedures) are performed by laparoscopy[7] with the use of coagulation, clip application, or band application as the method of occlusion[1].

Recently, a novel, minimally invasive approach to the abdominal and pelvic cavity has been described, using a transvaginal endoscopic approach. We have previously demonstrated the feasibility and the safety of this access to perform hybrid transvaginal cholecystectomy[8] and nephrectomy[9] in human beings. The transvaginal endoscopic approach provides excellent visualization of intra-abdominal and pelvic structures, and the ability to perform therapeutic maneuvers. The aim of this paper is to report the technique of transvaginal endoscopic access to perform tubal ligation.

SURGICAL TECHNIQUE

The patient is positioned in the dorsal lithotomy position with the legs in stirrups and the arms tucked at her sides. A 14F Foley catheter is inserted to empty the bladder, and the balloon is inflated. A prophylactic antibiotic (1g of cefazolin) is used after induction of

anesthesia. The surgical field is prepared with povidone iodine, including the vaginal cavity.

The patient is placed in a Trendelenburg position. The vaginal walls are retracted by 2 lateral retractors and the posterior lip of the cervix is grasped by a Pozzi clamp. Anterior traction is given to the cervix to stretch the posterior fornix. The vaginal mucosa in the posterior cul-de-sac is opened at the cervico-vaginal junction by a semilunar 1.5-cm incision and the posterior cul-de-sac peritoneum is identified and opened (Figure 1).

The double-channel upper gastrointestinal flexible endoscope (Karl Storz Endoskope, Tuttlingen, Germany) is introduced into the peritoneal cavity, and carbone dioxide is instilled (via a nasogastric tube anchored to the endoscope) to obtain the pneumoperitoneum (abdominal pressure is maintained between 12 and 14 mmHg). A U-turn can be made to see the exact entrance point of the endoscope and to identify the pelvic structures (Figure 2). A uterine manipulator is used to mobilize the uterus anteriorly, exposing the posterior uterine wall, the Fallopian tubes, the ovaries, the pouch of Douglas, and the rectum.

The left tube is identified, electrocauterized with a 40W coagulation current (Valleylab, Tyco Healthcare Group LP, Boulder, Colo) using a hot biopsy forceps (Boston Scientific, Natick, Mass), and sectioned (Figure 3). The same procedure is performed in the right tube (Figure 4).

The pelvic cavity is checked for bleeding and the cul-de-sac is closed with a running 2-0 polyglactin 910 suture.

The patient is given a regular diet 6 hours after the procedure and after that she can be discharged home. The patient is advised to avoid vaginal intercourse for 40 days.

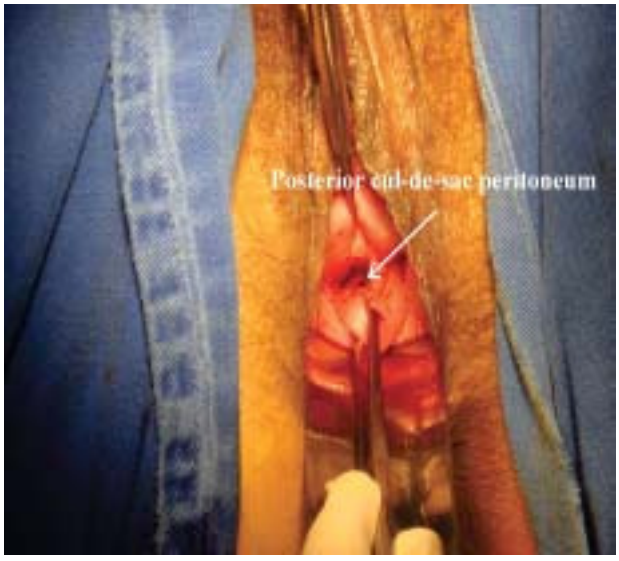


Figure 1 - *Opening the posterior cul-de-sac peritoneum to access the abdominal cavity.*

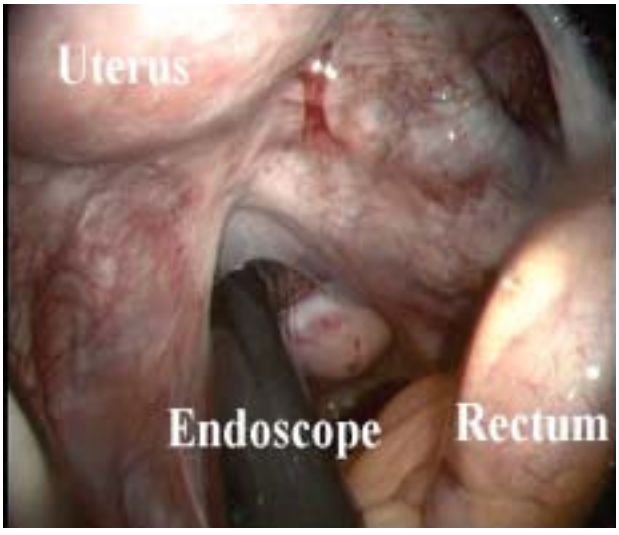


Figure 2 - *U-turn to identify the pelvic anatomy and to check the exact point of entrance of the endoscope.*

DISCUSSION

In the last 6 years, exponential development of therapeutic endoscopy has been realized. There is interest now in developing surgical procedures that enter the peritoneum or through hollow viscera that can be accessed via natural body openings precluding skin incisions[10,11]. The new approaches, coined natural orifice translumenal endoscopic surgery (NOTES), aim to further reduce surgical treatment morbidity and may represent the next frontier in minimally invasive surgery[12].

The idea of using natural orifices to perform abdominal surgeries is based on three main justifications: improved cosmetic appearance, ease of access, and the concept that human ingenuity and technological advance can continue to reduce the trauma and discomfort associated with effective surgery[13]. Intra-abdominal organs would be accessed by passing an endoscope into the peritoneal space via a transgastric, transvaginal, transvesical or transcolonic approach[14].

The first report of NOTES was published in 2002 when GETTMAN e cols.[15] demonstrated the feasibility of performing transvaginal laparoscopic

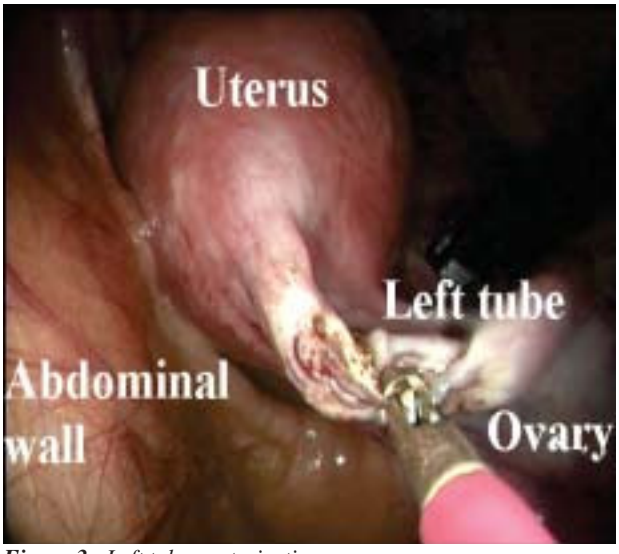


Figure 3 - *Left tube cauterization.*

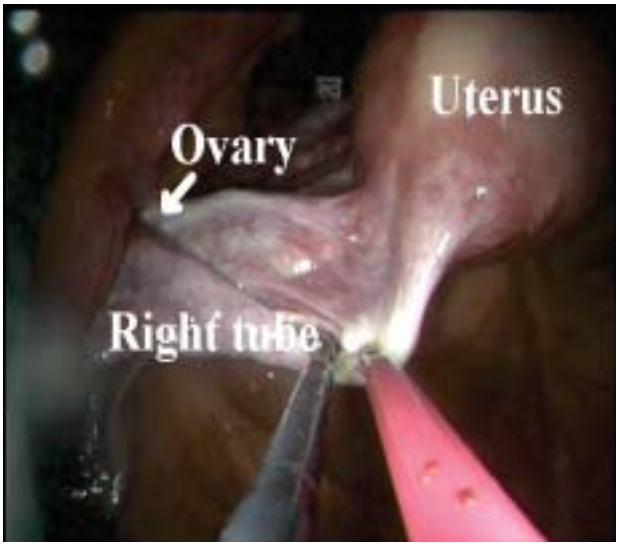


Figure 4 - *Right tube cauterization.*

nephrectomies in an experimental model at the University of Texas. Two years later, KALLOO e cols.[16] performed transgastric liver biopsies at Johns Hopkins University. After these initial reports, other investigators demonstrated the safety of transgastric ligation of fallopian tubes[17], cholecystectomy[18], cholecystogastric anastomosis[18], gastrojejunostomy[19], partial hysterectomy with oophorectomy[20], splenectomy[21], nephrectomy[22], gastric reduction[23], and pancreatectomy[24], all based on experimental studies in pigs. Since 2007, the transvaginal route has been used by some surgeons to perform cholecystectomy[8,25-28] and nephrectomy[9] in human beings.

Minimally invasive surgery has numerous advantages, and a logical extension from laparoscopic surgery is to eliminate skin incisions by performing natural orifices translumenal endoscopic surgery[17]. In fact, the vaginal access to the abdominal cavity is not new. It has been performed to visualize the pelvic and intra-abdominal organs since the early 1900s, when it was called culdoscopy. On April 19, 1901, the Russian surgeon, Dr Dmitri von Ott, first described ventroscopy through colpotomy in the Trendelenburg position to the Meeting of The Gynecology and Obstetrical Society of Saint Petersburg[29]. TeLinde[30], in 1940, was recognized as performing one of the first rigid culdoscopies in the United States. Palmer[31], in 1942, introduced transvaginal rigid culdoscopy in the dorsal decubitus position. In that same year, Albert Decker[32] invented what is known as the Decker culdoscope, a rigid instrument with a lamp adjacent to a lens at the distal end. CLYMAN[33], in 1963, introduced the rigid panculdoscope with which he performed various procedures, such as adhesiolysis, ovarian biopsies, and cyst aspiration. In 1999, WATRELOT e cols.[34] described the fertiloscopy, a minimally invasive technique for investigating female infertility. It uses a minimally invasive transvaginal approach to the pelvic organs and usually combines the following diagnostic procedures: hydrolaparoscopy (or hydropelviscopy), dye test, salpingoscopy, microsalpingoscopy and hysteroscopy.

Using the same concepts of culdoscopy and fertiloscopy, in this article we described the technique of totally transvaginal endoscopic tubal ligation. Endoscopic visualization of the pelvic anatomy is superb, and identification of the structures is remarkably simple.

Some of the difficulties reported previously by our team[8,9] can be faced in this procedure due to the flexibility of conventional endoscopes, which limits the control on instruments during the surgery. Once the instruments pass through the working channels of the endoscope, they reach the abdominal cavity in parallel and it also limits the surgeon's movements. Moreover, as the surgery is performed using U-turn, the image obtained is upside-down and sometimes lateral, but it does not make the surgery more arduous. Certainly all these difficulties can be overcome with the increasing experience in handling endoscopic devices.

Tubal ligation is a simple procedure and does not need advanced maneuvers to dissect and exposure tissues. It is not necessary to set up traction and counter-traction on the structures to perform the

surgery and that is why it seems to be the ideal procedure to start practicing surgical endoscopic skills.

Transvaginal endoscopic tubal ligation appears less invasive than a laparoscopy and a minilaparotomy, because it obviates any skin incision. The described technique is feasible and can be reproduced by any group with experience in laparoscopy and endoscopy, as such a group has the appropriate endoscopic equipment. In our opinion, transvaginal endoscopic surgery can provide patients the benefit of reduced pain, faster recovery time, and absence of scars compared to the traditional laparoscopic and open surgeries, remaining as an alternative approach to perform this kind of procedure. We know that the current experience on transvaginal endoscopic surgery is scarce and prospective studies comparing all these techniques must be done to confirm the safety, indications, and real advantages of this new surgical approach.

RESUMO

A esterilização tubária é uma das opções mais utilizadas para a contracepção feminina. Ela pode ser realizada durante o parto ou como um procedimento de intervalo, não relacionado à gestação. Este último é geralmente realizado por laparotomia, laparoscopia ou histeroscopia. Comparada à cirurgia aberta, a laparoscopia tem demonstrado alguns benefícios devido à sua mínima invasibilidade tais como melhor resultado cosmético, menor tempo de internamento, menor dor pós-operatória e retorno precoce ao trabalho e às atividades regulares. Os avanços recentes da cirurgia laparoscópica têm sido direcionados à tentativa de reduzir o tamanho e o número de portais, ou mesmo eliminar as incisões abdominais para se obter o objetivo de uma cirurgia mais minimamente invasiva. Neste artigo descrevemos a técnica de ligadura tubária endoscópica transvaginal, na tentativa de minimizar a morbidade cirúrgica e oferecer uma abordagem alternativa para a realização da esterilização tubária.

Palavras-chave: laparoscopia, esterilização tubária, cirurgia endoscópica transluminal por orifícios naturais, cirurgia transvaginal.

REFERENCES

1. Peterson HB. Sterilization. Obstet Gynecol. 2008; 111:189-203.
2. Pollack A; ACOG Committee on Practice Bulletins-Gynecology. ACOG practice bulletin. Clinical management guidelines for obstetrician-gynecologists. Number 46, September 2003. Obstet Gynecol. 2003; 102:647-58.
3. Beger HG, Schwarz A, Bergmann U. Progress in gastrointestinal tract surgery: the impact of gastrointestinal endoscopy. Surg Endosc. 2003; 17:342-50.
4. So JB, Chiong EC, Chiong E, et al. Laparoscopic appendectomy for perforated appendicitis. World J Surg. 2002; 26:1485-8.
5. Rassweiler J, Seemann O, Schulze M, et al. Laparoscopic versus open radical prostatectomy: a comparative study at a single institution. J Urol. 2003; 169:1689-93.
6. Sherman PA, Burigo JA. Comparison of laparoscopic Falope-Ring and minilaparotomy sterilization. Obstet Gynecol. 1984; 63:71-5.
7. MacKay AP, Kieke BA Jr, Koonin LM, et al. Tubal sterilization in the United States, 1994-1996. Fam Plann Perspect. 2001; 33:161-5.
8. Branco Filho AJ, Noda RW, Kondo W, et al. Initial experience with hybrid transvaginal cholecystectomy. Gastrointest Endosc. 2007; 66:1245-8.
9. Branco AW, Branco Filho AJ, Kondo W, et al. Hybrid transvaginal nephrectomy. Eur Urol. 2008; 53:1290-4.
10. Gettman MT, Blute ML. Transvesical peritoneoscopy: initial clinical evaluation of the bladder as a portal for natural orifice translumenal endoscopic surgery. Mayo Clin Proc. 2007; 82:843-5.
11. Rattner D, Kalloo A; ASGE/SAGES Working Group. ASGE/SAGES Working Group on Natural Orifice Translumenal Endoscopic Surgery. October 2005. Surg Endosc. 2006; 20:329-33.
12. Gettman MT, Box G, Averch T, et al. Consensus statement on natural orifice transluminal endoscopic surgery and single-incision laparoscopic surgery: heralding a new era in urology? Eur Urol. 2008; 53:1117-20.
13. Swain P. A justification for NOTES – natural orifice translumenal endosurgery. Gastrointest Endosc. 2007; 65:514-6.
14. de la Fuente SG, Demaria EJ, Reynolds JD, et al. New developments in surgery: Natural Orifice Transluminal Endoscopic Surgery (NOTES). Arch Surg. 2007; 142:295-7.
15. Gettman MT, Lotan Y, Napper CA, et al. Transvaginal laparoscopic nephrectomy: development and feasibility in the porcine model. Urology. 2002; 59:446-50.
16. Kalloo AN, Singh VK, Jagannath SB, et al. Flexible transgastric peritoneoscopy: a novel approach to diagnostic and therapeutic interventions in the peritoneal cavity. Gastrointest Endosc. 2004; 60:114-7.

17. Jagannath SB, Kantsevoy SV, Vaughn CA, et al. Peroral transgastric endoscopic ligation of fallopian tubes with long-term survival in a porcine model. Gastrointest Endosc. 2005; 61:449-53.
18. Park PO, Bergström M, Ikeda K, et al. Experimental studies of transgastric gallbladder surgery: cholecystectomy and cholecystogastric anastomosis (videos). Gastrointest Endosc. 2005; 61:601-6.
19. Kantsevoy SV, Jagannath SB, Niiyama H, et al. Endoscopic gastrojejunostomy with survival in a porcine model. Gastrointest Endosc. 2005; 62:287-92.
20. Wagh MS, Merrifield BF, Thompson CC. Endoscopic transgastric abdominal exploration and organ resection: initial experience in a porcine model. Clin Gastroenterol Hepatol. 2005; 3:892-6.
21. Kantsevoy SV, Hu B, Jagannath SB, et al. Transgastric endoscopic splenectomy: is it possible? Surg Endosc. 2006; 20:522-5.
22. Lima E, Rolanda C, Pêgo JM, et al. Third-generation nephrectomy by natural orifice transluminal endoscopic surgery. J Urol. 2007; 178:2648-54.
23. Kantsevoy SV, Hu B, Jagannath SB, et al. Technical feasibility of endoscopic gastric reduction: a pilot study in a porcine model. Gastrointest Endosc. 2007; 65:510-3.
24. Matthes K, Yusuf TE, Willingham FF, et al. Feasibility of endoscopic transgastric distal pancreatectomy in a porcine animal model. Gastrointest Endosc. 2007; 66:762-6.
25. Marescaux J, Dallemagne B, Perretta S, et al. Surgery without scars: report of transluminal cholecystectomy in a human being. Arch Surg. 2007; 142:823-6.
26. Zorron R, Maggioni LC, Pombo L, et al. NOTES transvaginal cholecystectomy: preliminary clinical application. Surg Endosc. 2008; 22:542-7.
27. Zornig C, Mofid H, Emmermann A, et al. Scarless cholecystectomy with combined transvaginal and transumbilical approach in a series of 20 patients. Surg Endosc. 2008; 22:1427-9.
28. Bessler M, Stevens PD, Milone L, et al. Transvaginal laparoscopically assisted endoscopic cholecystectomy: a hybrid approach to natural orifice surgery. Gastrointest Endosc. 2007; 66:1243-5.
29. Von Ott D. Die Beleuchtung der Bauchhohle (Ventroskopie) als Methode bei Vaginaler Coeliotomie. Abl Gynakol. 1902; 231:817-23.
30. Frenkel DA, Greene BA, Siegler SL. Technical improvements in culdoscopic examination. Am J Obstet Gynecol. 1952; 64:1303-9.
31. Brosens I, Campo R, Puttemans P, et al. Transvaginal laparoscopy. Clin Obstet Gynecol 2003;46:117–122.
32. Decker A. Culdoscopy. Am J Obstet Gynecol. 1952; 63:854-9.
33. Clyman MJ. A new panculdoscope – diagnostic, photographic, and operative aspects. Obstet Gynecol. 1963; 21:343-8.
34. Watrelot A, Dreyfus JM, Andine JP. Evaluation of the performance of fertiloscopy in 160 consecutive infertile patients with no obvious pathology. Hum Reprod. 1999; 14:707-11.

Correspondence Address:
WILLIAM KONDO
Address: Av. Getulio Vargas, 3163 ap 21
Zip Code: 80240-041
Curitiba – Paraná – Brazil
Phone number: (55) (41) 9222-1065
Fax number: (55) (41) 3362-3863
E-mail: williamkondo@yahoo.com

Brazilian Journal of Videoendoscopic Surgery

Minilaparoscopy: Here and Now

Minilaparoscopia: Aqui e Agora

MARCELO DE PAULA LOUREIRO[1]; EDUARDO AIMORÉ BONIN[2]

Jacques Perissat Institute Post-graduate program in Minimally Invasive Surgery. Positivo University. Curitiba, Paraná, Brazil.
[1.] D.Sc. from the University of São Paulo (USP). Specialist in Laparoscopic Surgery from the University of Bordeaux. Coordinator of the Post-graduate Program in Minimally Invasive Surgery, Jacques Perissat Institute;
[2.] Master in Principals of Surgery from the Federal University of Paraná (UFPR). Specialist in Videosurgery (CBC). Specialist in Digestive Endoscopy (SOBED). Research Fellow, Developmental Endoscopy Unit, Mayo Clinic, Rochester, MN, USA.

ABSTRACT

New technologies using different access routes have emerged in recent years as potential alternatives to conventional laparoscopy. The main proposals are to reduce the number of punctures made in the abdominal wall contributing to the absence or reduction of visible scars, less postoperative pain, and a faster postoperative recovery. Among the most promising techniques is transluminal surgery through natural orifices and single port surgery. Both, however, are still experimental and are more expensive. Minilaparoscopy is presented as a novel approach to reducing injury to the abdominal wall by using small caliber instruments. Technical adaptations in recent years have reduced costs with instrumentation and made the minilaparoscopy viable in various developing countries including Brazil. By preserving the original technique of laparoscopy, minilaparoscopy is currently re-emerging as a feasible option with the aim of reducing the harmful effects of surgical incisions.

Key words: Surgery, Laparoscopy, Technology, Minilaparoscopy, Natural Orifice Transluminal Endoscopic Surgery (NOTES), Single Port Surgery.

Bras. J. Video-Sur, 2011, v. 4, n. 1: 030-034

Accepted after revision: January, 16, 2011.

"Simplicity is the seal of truth"
Schopenhauer - German philosopher.

We are living in the midst of winds of change. Various new technologies appear eager to occupy the position of "great revolution in surgery", which so far still belongs to adult laparoscopic surgery. Today we have technologies that use contributions from various areas of applied science such as mechanical and electrical engineering. New endoscopic instruments and platforms have led to new surgical techniques – that a short time ago did not exist – with the potential to transform our daily lives and become rapidly globalized and unstoppable.

One of the main trends in surgery today is the development of techniques which permit performing the operations while reducing the number of ports, minimizing or even eliminating them. Among the benefits include the reduction or absence of visible scars, less pain, and faster post-operative recovery. Among the most promising techniques, those that stand out include Natural Orifice Translumenal Endoscopic Surgery (NOTES), surgery performed through a single port or incision (Single port or Single incision Surgery), and minilaparoscopy (Mini). These techniques differ in a number of aspects, such as type of access, complexity of instruments, and total cost of the procedure. Beyond these issues, the maintenance of the triangulation of the instruments determines the speed of skill acquisition and the popularization of the method. Finally, techniques with few clinical indications are commercially unattractive. All these issues will impact on the scalability and applicability of a particular technique, especially in the Brazilian setting. In this article we will briefly review each of the three techniques in relation to these issues, with special focus on minilaparoscopy. For this analysis we will use as reference conventional laparoscopy.

We start our analysis with NOTES, surgery via natural orifices, considered a major breakthrough. By using a novel route of surgical access, there finally is a surgical technique "without scars." The result of a huge effort and investment on the part of the surgical community and industry, in five years NOTES became feasible.[1] Technically feasible if performed within an almost unreal environment, with totally and truly sterilizable endoscopes (let us always remember the threat of Mycobacteriosis), with a minimum of two highly trained skilled surgeon-endoscopists working in the same operative field, and for motivated intrepid patients, who moreover do not pay anything extra for this. This "utopian" vision has already become a reality in a few centers around the world, including Brazil, but certainly thousands of surgeons who comprise the vast majority of the national contingent do not have access to it. Without a doubt, NOTES at least has encouraged the revival of philosophical concepts in new access once forgotten and also instigated the need to reinvent laparoscopy.

From natural orifices we move on to surgery performed in the natural scars. These surgeries are performed via single access through the umbilical scar.[2] Breaching our lone original scar has a strong appeal; not surprisingly it remains the preferred port of entry for laparoscopy itself. The issue is transforming this door into a "gateway," and inserting in this single (umbilical) incision a single trocar (Single Port) for multiple clamps, or multiple small trocars each next to each other (Single Incision). In this technique, the triangulation of the instruments is limited, hampering learning and the use of special tools and portals, and increasing the cost. The concept of a single portal or incision still needs to gain its space, principally in relation to its cost-effectiveness. In the meantime, there has been a parade of publications describing every sort of procedure, including some real hype about such procedures as appendectomies, hernioplasties, and even cholecystectomies. For the removal of larger surgical specimens, however, this new concept may prove itself truly useful, as in nephrectomies, splenectomies and colectomies.[34]

Finally, we examine of the Minilaparoscopy (Mini), also called "*needlescopic surgery*." This technique is presented as a simpler approach as it uses smaller caliber laparoscopic instruments. Adaptations of the technique may be referred to as mini-instrument or mini-assisted surgery, in which one dispenses the use of the minilaparoscope.[5] The first surgeries were performed by minilaparoscopy described in the mid-1990s by Peter Goh and Michael Gagner,[6,7] and did not become popular because of their complexity and because they used very thin, fragile and expensive video optics. In this technique, emphasis was placed on clipping the cystic artery and duct through the umbilical portal, which required changing the optic and its positioning.[8] Thus the "Mini" was stigmatized as complicated and expensive surgery, without major advantages.

Nevertheless, the "Mini" was not totally abandoned and continued to be improved and used in some centers around the world, [9,10,11,12] including in Brazil, in the city of Recife.[5] From Receife came probably the greatest contribution to the survival of the technique. Dr. Gustavo Carvalho, a professor at State University of Pernambuco, did what most Brazilian surgeons do best: he followed his intuition to adapt what has been classically described, adapting the original technique to make it viable in our conditions and reality. Using cholecystectomy as an example, since 2000 he used a standardized technique combining a 10 mm conventional laparoscope with a mini-instrument. A 10mm optic, the same that we all know and use, is placed in the usual umbilical port. To keep the technique accessible and reproducible, the cystic duct is ligated with suture and the cystic artery is cauterized. This adaptation was developed and tested carefully and gradually. Ten years of experience with more than 1000 patients operated, proves the safety of his daring innovation and reassures disbelievers who considered the cauterization of the cystic artery sacrilege.[5] Currently this technique – adapted from the "Mini" procedure – is considered a safe same-day surgery procedure with all the advantages of laparoscopy, that highly reproducible, and has great aesthetic appeal.

All these reasons led us three years ago to begin our contact with mini-instrument surgery. After a period of mentoring by Dr. Gustavo Carvalho, we began our clinical experience with "Mini" performing cholecystectomies, then totally extra-peritoneal inguinal hernioplasties (50 cases), fundoplications (14 cases), and finally Mini-assisted lumbar sympathectomy for the treatment of plantar hyperhidrosis (12 cases). In December 2009 we organized the first Brazilian workshop devoted to the "Mini" and since then the technique has been incorporated in the curriculum of the Postgraduate course in Minimally Invasive Surgery of the Positivo University in Curitiba, Parana. During

this experience what most struck us was the feeling that we were performing surgeries with more precise maneuvers, probably in less time, and obviously with superior aesthetics, when compared to conventional laparoscopy. Moreover, we note that "Mini" was easily learned and incorporated into our routine. In our experience (with cholecystectomies) we needed about five cases to feel comfortable with the technique.

Small instruments occupy less space. With videosurgery, our peripheral vision is restricted by the limited visual field of the optic. The less space our instruments occupy, the better the visual field. The Mini instruments combine with the concept of image amplification produced by the optics. The up-to-12 fold magnification provided by our videocameras teams us with conventional forceps unsuited to the task. 5 mm forceps when seen under maximum magnification in a restricted field of view occupy precious space; they appear oversized in the most demanding situations such as in a biliary anastomosis, resection of the sympathetic ganglion attached to the vena cava, or even the dissection of the vas deferens of the hernia sac. This is especially important in retroperitoneal surgery, where, of course, the space is exiguous and inadvertent movements can cause perforations in the peritoneum, diminishing this space even further. More delicate surgeries, perhaps, should be done by minilaparoscopy. Contrary to what occurs with other new methods, with the "Mini" one increases the dexterity, the delicacy and the precision.

The trend with current "Mini" trocars, unlike their predecessors in the 1990s, is to not have gaskets or rubber. For this reason they are characterized by minimal friction, thus requiring less force to move a forcep inside.[13] The resulting increase in the escape and consumption of CO_2, once a major source of criticism and without consequences in normal practice of the procedure, has been successfully circumvented by these new models of trocars.[13] Technical limitations of the "Mini" currently are limited to the pace in which industry can fabricate instruments that are finer, durable and that perform better. There is no doubt that Mini instruments are more delicate and require more maintenance when compared with conventional laparoscopy.

Using theoretical mathematical models to measure the injury volume and the tension of the parietal incision in comparisons between the "Mini" and Single Port, the "Mini" stands out because it employs multiple miniature access points. Consequently, the benefits of the "Mini" will be smaller total volume of parietal injury, smaller total area of tension in the incisions, and less somatic pain.[14,15] Mini instruments today are the probably the only ones considered as ubiquitous in current techniques of endoscopic surgery. They are used to enable various NOTES procedures and so-called Single Port *hybrids*, i.e., NOTES procedures assisted by instruments inserted through the abdominal wall. Some hybrid techniques are actually "Mini" techniques assisted by Single Port or NOTES.[16] We note that most NOTES procedures performed today in humans are also hybrids,[17] and many of them use Mini instruments.

Never has the Brazilian surgeon found himself with so many options for surgical access. But for this surgeon, forged in our harsh professional reality and concerned with improving the surgical quality on a daily basis, the first step in the natural evolution of laparoscopic surgery seems to be the refinement of the technique that he already uses. In this case, this means "simply" decreasing the thickness of your instruments, and thereby permitting smaller incisions and greater precision. Despite evidence indicating that the practice of "Mini" requires training and dexterity of the surgeon,[18] it is the simplest, most logical, least glamorous evolution, with the least commercial or marketing appeal, and thus much more compelling for our time. Based on a phrase credited to Leonardo da Vinci, could we dare to say that because of its simplicity, the "Mini" can be considered today the most sophisticated development in laparoscopic surgery?

We are facing another paradigm shift. Accept what seems obvious instead of venerating the unconventional. We value the simplicity of minilaparoscopy, a technique developed and adapted for our needs, with benefits not only in terms of costs, but also offering safety and preserving the results of laparoscopy. We value the work of a Brazilian, who now has been recognized internationally as the individual most responsible for the rescue of minilaparoscopy. Another sign for us to believe that Brazil is changing. Now it is we who need to believe in this change.

ACKNOWLEDGEMENTS

In particular to Prof. Dr. Gustavo Lopes de Carvalho for the mentoring in Minilaparoscopy, and

for providing complementary technical data used in the preparation of this article.

To our colleague Dr. Daniellson Dimbarre for providing data from his experience in performing a fundoplications by Minilaparoscopy.

To our colleagues Dr. Antonio Moris Cury Filho, Dr. Christiano Marlo Paggi Claus, Dr. Carolina Gomes Gonçalves, Dr. Roberto Gallardo (Guatemala), and to Flavia Squisatti for the active participation in the introduction of Minilaparoscopy in the Postgraduate Course in Minimally Invasive Surgery at the Positivo University, Curitiba, Parana, Brazil.

To Bhiosupply for providing instruments in order to facilitate the teaching of Minilaparoscopy.

The authors are members of the Jacques Perissat Institute, which maintains partnerships for the purpose of education in surgery with the following companies: Covidien, Karl Storz and Bhiosupply.

The authors declare they have no conflict of interest related to this article.

RESUMO

Novas tecnologias utilizando diferentes vias de acesso vêm se apresentando nos últimos anos como possíveis alternativas à laparoscopia convencional. As principais propostas consistem em reduzir-se o número de punções na parede abdominal contribuindo para ausência ou redução de cicatriz aparente, menor dor pós-operatória e recuperação pós-operatória mais precoce. Dentre as técnicas mais promissoras podemos citar a cirurgia translumenal por orifícios naturais e a cirurgia de portal único, porém ambas estão ainda em fase experimental e são de maior custo. A minilaparoscopia apresenta-se com uma proposta de se reduzir a injúria da parede abdominal por utilizar instrumentais de calibre reduzido. Adaptações técnicas nos últimos anos reduziram os custos com instrumental e tornaram a minilaparoscopia viável em diversos países em desenvolvimento incluindo-se o Brasil. Por preservar a técnica original da laparoscopia, a minilaparoscopia vem ressurgindo atualmente como uma opção praticável no intuito de reduzir os efeitos deletérios das incisões cirúrgicas.

Descritores: Cirurgia, Laparoscopia, Tecnologia, Minilaparoscopia, Cirurgia Transluminal por Orifícios Naturais, Cirurgia de Portal Único.

REFERENCES

1 Rattner DW, Hawes R, Schwaitzberg S, Kochman M, Swanstrom L. The Second SAGES/ASGE White Paper on natural orifice transluminal endoscopic surgery: 5 years of progress. Surg Endosc. 2011 Feb 27. [Epub ahead of print].

2 Rao PP, Rao PP, Bhagwat S. Single-incision laparoscopic surgery - current status and controversies.J Minim Access Surg. 2011 Jan;7(1):6-16.

3 Seo IY, Lee JW, Rim JS. Laparoendoscopic single-site radical nephrectomy: a comparison with conventional laparoscopy. J Endourol. 2011 Mar;25(3):465-9. Epub 2011 Feb 28.

4 Bucher P, Pugin F, Morel P. Single-port access laparoscopic radical left colectomy in humans. Dis Colon Rectum 2009;52:1797-801.

5 Carvalho GL, Silva FW, Silva JS, de Albuquerque PP, Coelho Rde M, Vilaça TG, Lacerda CM.Needlescopic clipless cholecystectomy as an efficient, safe, and cost-effective alternative with diminutive scars: the first 1000 cases. Surg Laparosc Endosc Percutan Tech. 2009 Oct;19(5):368-72.

6 Gagner M, Garcia-Ruiz A. Technical aspects of minimally invasive abdominal surgery performed with needlescopic instruments. Surg Laparosc Endosc. 1998 Jun;8(3):171-9.

7 Cheah WK, Goh P, Gagner M, So J. Needlescopic retrograde cholecystectomy. Surg Laparosc Endosc. 1998 Jun;8(3):237-8.

8 Lai EC, Fok M, Chan AS. Needlescopic cholecystectomy: prospective study of 150 patients. Hong Kong Med J. 2003 Aug;9(4):238-42.

9 Mostafa G, Matthews BD, Sing RF, Kercher KW, Heniford BT. Mini-laparoscopic versus laparoscopic approach to appendectomy. BMC Surg. 2001;1:4.

10 Mamazza J, Schlachta CM, Seshadri PA, Cadeddu MO, Poulin EC. Needlescopic surgery. A logical evolution from conventional laparoscopic surgery. Surg Endosc. 2001 Oct;15(10):1208-12.

11 Lee PC, Lai IR, Yu SC. Minilaparoscopic (needlescopic) cholecystectomy: a study of 1,011 cases. Surg Endosc. 2004 Oct;18(10):1480-4.

12 Franklin ME Jr, George J, Russek K. Needlescopic cholecystectomy. Surg Technol Int. 2010;20:109-13.

13 Carvalho GL, Lima DL, Sales AC, Silva JSN, Fernandes Junior FAM. A new very low friction trocar to increase surgical precision and improve aesthetics in minilaparoscopy. Trabalho submetido ao Congresso da Society of American Gastrointestinal and Endoscopic Surgeons (SAGES), 2011, Abstract 36229.

14 Blinman T. Incisions do not simply sum. Surg Endosc. 2010 Jul;24(7):1746-51. Epub 2010 Jan 7.

15 de Carvalho GL, Cavazzola LT. Can mathematic formulas help us with our patients?Surg Endosc. 2011 Jan;25(1):336-7.

16 Weibl P, Klingler HC, Klatte T, Remzi M. Current Limitations and Perspectives in Single Port Surgery: Pros and Cons Laparo-Endoscopic Single-Site Surgery (LESS) for Renal Surgery. Diagn Ther Endosc. 2010;2010:759431.

17 Teoh AY, Chiu PW, Ng EK Current developments in natural orifices transluminal endoscopic surgery: an evidence-based review. World J Gastroenterol. 2010 Oct 14;16(38):4792-9.

18 Thakur V, Schlachta CM, Jayaraman S. Systematic Review and Meta-analysis: Minilaparoscopic Versus Conventional Laparoscopic Cholecystectomy: A Systematic Review. Ann Surg. 2010 Dec 22.

Correspondence Address:
DR. MARCELO DE PAULA LOUREIRO
Ex-President, Sobracil – Paraná Chapter
Rua Angelo Bom, 315
Campo Comprido
Curitiba, PR 81210-340
E-mail: mloureiro@up.edu.br

Brazilian Journal of Videoendoscopic Surgery

Clinical Observation

Establishing an Artificial Pneumoperitoneum for Laparoscopic Procedures

Criação do Pneumoperitônio Artificial para a Realização de Procedimentos Videolaparoscópicos

JOÃO LUIZ MOREIRA COUTINHO DE AZEVEDO

Associate Titular Professor of the Department of Surgery of the Escola Paulista de Medicina *(EPM) of the Federal University of São Paulo (UNIFESP).*

ABSTRACT

The studies conducted by our study group in the field of video-assisted surgery have contributed to a deeper understanding of the creation of pneumoperitoneum for laparoscopic procedures. The occurrence of morbid, sometimes fatal, events while establishing a pneumoperitoneum by insertion of a Veres needle encouraged us to conduct a systematic review of the literature regarding this issue. This review revealed that Veres needle insertion into the abdominal cavity through a midline incision can result in injury to viscera and great retroperitoneal vessels, as well as a large number of deaths. This procedure is performed by most laparoscopic surgeons in Brazil and the USA. In an attempt to find safer alternatives, we conducted experimental and clinical studies in which the Veres needle was inserted into the left hypochondrium. There have been no reports of injury caused by Veres needle insertion into the left hypochondrium.

Key words: Artificial pneumoperitoneum; Laparoscopy, laparoscopic complications; Pneumoperitoneum; Veres needle Puncture.

Bras. J. Video-Sur, 2011, v. 4, n. 1: 035-041

Accepted after revision: December, 12, 2010.

INTRODUCTION

We initially investigated this technique in a study involving experimental animals (pigs), with the participation of an undergraduate student who was the recipient of a Young Investigator grant. With the aid of two doctoral students, we subsequently conducted clinical studies that resulted in academic dissertations. One of these involved a sample that was representative of a specific population, and other involved a sample that was representative of the general population. These studies demonstrated that the insertion of a Veres needle into the left hypochondrium to establish an artificial pneumoperitoneum is a viable, efficacious, and effective technique. Therefore, we began to recommend that laparoscopic surgeons adopt this technique, since it is theoretically safer than Veres needle insertion through a midline incision.

Next, we conducted studies that aimed to evaluate the accuracy of the five tests that are most commonly used to determine whether the tip of the Veres needle is indeed inside the peritoneal cavity before proceeding with CO_2 insufflation. In addition to determining the true diagnostic value of these tests, we attempted to establish at certain time points during insufflation a relationship between the following parameters: gas flow; intraperitoneal pressure; and the volume of gas injected into the peritoneal cavity. We found that pressure and volume was strongly correlated at certain time points during insufflation and that intraperitoneal pressure strongly correlated with volume. These findings allowed us to devise tables containing values of volume and pressure as a function of time, as well as expected values of pressure as a function of volume (and vice-versa), with the purpose of guiding surgeons during the process of intraperitoneal insufflation.

In addition, by applying the fuzzy set theory, we developed, in collaboration with other researchers from the *Universidade Federal de São Paulo* (UNIFESP, Federal University of São Paulo), São Paulo, Brazil, a computer program (for which we have filed a patent application) including a mathematical model, that can provide insufflators with a safety device

during the process of establishing a pneumoperitoneum using the closed technique.

Still regarding the safety of the process of creation of pneumoperitoneum, we studied the critical moment of insertion of the first trocar after creation of pneumoperitoneum through the closed technique (that is, without peritoneotomy), as well as measures to improve the safety of the procedure. With regard to the latter, we conducted a study that demonstrated that high intraperitoneal pressures (20 mmHg) for a short period of time (5 min) had no adverse effects on patients. This transitory increase in pressure was proposed by the authors with the purpose of increasing the distance between the anterior abdominal wall and the contents of the abdominal cavity, in order to avoid iatrogenic injury to important intra-abdominal structures when the first trocar is blindly inserted. We now consistently recommend the use of this measure. We are currently evaluating the effects of transitory, high intraperitoneal pressure on obese patients, who are known to be more prone to develop compartmental syndrome under these conditions. These studies aim to determine the highest intraperitoneal pressure level that has no negative effect on the patient, as well as the resulting volume of gas.

Finally, our goal has been to use modern and effective teaching methods, such as interactive computer programs and virtual reality, for teaching the safest, most effective way of establishing a pneumoperitoneum for laparoscopic procedures.

The line of research designated "Creation of artificial pneumoperitoneum for laparoscopic procedures" is within the field of video-assisted surgery.

The majority of complications associated with videolaparoscopy occur during the most critical step, which is the access to the peritoneal cavity,[1] because of the significant risk of vascular and visceral injuries.[2]

Addressing this particular issue, we conducted a recent systematic review,[3] selecting 38 articles that encompassed 696,502 laparoscopies. 1,575 (0.23%) lesions were reported, of which 126 (8%) involved blood vessels or hollow viscera (prevalence of 0.018% of the laparoscopies). Of the 98 vascular lesions, 8 (8.1%) were major retroperitoneal vessels of the midline. We concluded from this systematic review that puncture with a Veres needle in the midline of the abdomen, at the level of the umbilical scar, poses important risks for the life of the patients, and that there should be studies of alternative locations for this type of puncture.

Reports of litigation because of medical errors related to videolaparoscopy suggest that 18% of the complaints occurred due to accidents in the course of establishing the pneumoperitoneum, and close to half of all laparoscopic complications were attributed to technical problems that occurred in this step of the procedure.[4]

Vascular injuries represent the most common cause of death in laparoscopic procedures (15%). Injuries of the great retroperitoneal vessels can occur when the Veres needle is blindly inserted into the abdomen, before insufflation, as occurs in the closed technique.[2]

In general, there are two techniques to establish a pneumoperitoneum and access the peritoneal cavity. The first is called "closed" or "blind", and is performed using a Veres needle, followed by the insertion of the trocar, or, less often, by direct insertion of the trocar without pneumoperitoneum.[5] The second method is the open technique, in which a small laparotomy is performed under direct vision in the umbilical region, followed by introduction of the blunt trocar (Hasson's trocar).[6]

Although there is no consensus regarding the best method for accessing the peritoneal cavity in order to establish the pneumoperitoneum,[7] puncture with the Veres needle[8] is the most frequently used technique.[35-37] The study considered 155,987 laparoscopic procedures; in 81% a Veres needle was used.[8,9]

The Veres needle was developed in 1938 by the Hungarian physician János Veres for the purpose of establishing a pneumothorax to partially collapse the lung as a treatment for tuberculosis.[9] Today the Veres needle is used to create a path of entry into the abdominal cavity to establish a pneumoperitoneum for the purpose of making possible laparoscopic procedures.[10]

Commercially available Veres needles vary from 12 to 15 cm in length, with an external diameter of 2 mm. A bezel-shaped tip enables the needle to pierce the tissues of the abdominal wall. Upon entering the peritoneal cavity, the resistance generated from the abdominal wall is overcome, which permits the exposure of the interior needle with its blunt atraumatic mandril.[11] This system affords a degree of safety and efficacy, making the puncture of the peritoneal cavity with a Veres needle an easy, fast and effective technique. Once the peritoneal cavity is inflated by this technique, the first trocar can be inserted without

problems, minimizing intraoperative gas leakage and saving surgical time.

Nevertheless, despite this safety device, incorrect insufflations occur. Injuries to major vessels are the leading intraoperative cause of death associated with laparoscopic procedures.[12] There are case reports of injuries to major vessels that show all the drama of the situation.[13,14] The timely diagnosis of this complication is extremely difficult, mainly because of the position of the retroperitoneal vessels.[15]

The classic location of the Veres needle puncture is the midline of the abdomen near the umbilical scar.[16] Due to the short distance between the anterior abdominal wall and the retroperitoneal vascular structures in this region – less than two centimeters in thin people – puncture poses risks of injury to these large vessels.[17] The abdominal aorta, the inferior vena cava, as well as the common iliac vessels are especially vulnerable to lesions during puncture with the Veres needle in proximity of the umbilical scar.[15]

Injuries to these vessels are serious complications of laparoscopy that can occur in a blind moment of the laparoscopy, such as when puncturing to establish the pneumoperitoneum: "Certainly one of the most dramatic events that a surgical team can experience is a major vascular injury. Although the prevalence of these occurrences is very low (0.05%), the mortality associated with them ranges from 8% to 17%".[18]

Although effective, the midline puncture poses dangers. All injuries of large intra-abdominal retroperitoneal vessels by Veres needle, reported in the literature, were caused by midline punctures performed close to the umbilical scar. Due to the location of these large vessels, it is legitimate to assume that the risk of associated injuries is minimized when the punctures are done in a location away from the midline.[19,20]

Additionally, patients who have undergone previous abdominal surgery are at increased risk of visceral lesions associated with the Veres needle because of peritoneal adhesions, which typically are located at the level of the scar from the surgical incision of the anterior parietal peritoneum.[21] Autopsy studies found adhesions in 74% to 95% of patients with prior abdominal surgeries.[18] The midline incisions are those that pose the greatest risk of adhesion around the umbilical scar. Nevertheless, even abdominal incisions somewhat distant from the navel may still result in the formation of adhesions in the periumbilical region.[18]

In contrast, puncturing the left upper quadrant has been described as being safe, without risk of a major iatrogenic injury.[19,20] The specific point is the predominant anatomical structure in the left hypochondrium/upper quadrant[19,20] and the occasional injuries are generally minor.

The organs immediately behind the anterior abdominal wall at the puncture site of the left upper quadrant are the stomach and transverse colon.[21] In the event that the stomach is accidentally injured by the Veres needle, gastric contents would not necessarily escape, because the action of the triple layer of muscle of the stomach walls tends to occlude any puncture hole. In the event of accidental insufflation of the lumen of the gastric body, the gas escaping through the orogastric tube will be evident and will reveal the situation. In order to minimize the risk of injuries to the small intestine and the colon from punctures in the upper left quadrant with the Veres needle, patients should be placed in reverse Trendelenburg position of about 20 degrees, so that small bowel loops and segments of the transverse and descending colon can migrate to the temporarily elevated lower floor of the abdomen. Keep in mind that such lesions – both in the colon and in the stomach – are easy to diagnose upon initial inspection of the peritoneal cavity, and can be repaired laparoscopically by means of a suture stitch.

The rarity of adhesions in the abdominal wall of the left upper quadrant of the region should also be taken into consideration. As it is known that the respiratory movements of the diaphragm constantly mobilize structures in this region, and thus hinder their fixation to the anterior abdominal wall, the puncture of the left upper quadrant is the approach preferred by some surgeons for patients who have undergone prior laparotomy.[22]

There are also surgeons who perform bariatric surgeries and prefer the left upper quadrant for the installation of pneumoperitoneum in their patients.[21] This preference is due to the fact that in obese patients the open technique poses additional difficulties because of the excess weight, and puncture in the midline is dangerous due to the thickness of the adipose tissue and the high position of the navel in the abdomen. These characteristics make it difficult to puncture and facilitate injuries, most notably of the large retroperitoneal vessels.[22]

It is worth noting that the lesions, both vascular and visceral, produced by the blind introduction of Veres needle and trocars in the midline of the abdomen, are not prerogatives of inexperienced surgeons. Schafer et al. (2001)[23] found that among 26 such lesions, only four (15%) were produced by inexperienced surgeons (those who had performed fewer than 50 laparoscopies), while in 22 lesions (85%) the laparoscopies were performed by experienced observers (those who had performed between 51 and 100 laparoscopies) or very experienced (over 100 laparoscopies performed).

In terms of safety and efficacy, there are real advantages in the puncture of the left upper quadrant relative to the midline puncture. We proved this by research, first in experimental animals.[24]

In these animals (pigs) – whose abdominal anatomy is very similar to the human – we found that at the level of the arch formed by the costal cartilages (lower rib cage) the parietal peritoneum is closely adhered to the transverse fascia, and this ensemble is attached to with the costal cartilages. This configuration confers a certain some degree of fixity of the parietal peritoneum at this level, which is why we chose to standardize the location close to the edge of the lower rib cage as the puncture site we propose for the left upper left quadrant.

The idea is to minimize the possibility that the tip of Veres needle mistakenly remains in the space between the parietal peritoneum and transversalis fascia without entering the peritoneal cavity. Thus, we modified the location of the puncture as described by Palmer (a site two fingerbreadths below the rib cage) to a site close to the rib cage, in an experimental trial in humans.[25,26]

It is also imperative that during puncture one knows with the highest degree of precision possible the real location of the needle before initiating insufflation; proof of the needle's position is recommended in textbooks. There was a need to perform original research to assess the real value of these tests to confirm the needle's position, both in selected populations[27] and in the general population.[28]

Moreover, in order to inform the surgeon during the insufflation, it is interesting to consider that the levels of intraperitoneal pressure and the total volume injected at certain points of the insufflation are objective data, and their values can be correlated with the presence or absence of the tip of the Veres needle inside the peritoneal cavity at certain points of the insufflation process. This research was carried out by us.[29]

It is also useful to be able to directly correlate the intraperitoneal pressure with the volumes actually injected. We have conducted research studying these issues.[30,31]

All this research accumulated data that were used by us in developing a computer program using artificial intelligence (fuzzy logic). In conjunction with the Federal University of São Paulo (UNIFESP) a patent application has been submitted entitled:

"Diffuse system of decision support for positioning/placement of the Veres needle in the peritoneal cavity during the procedure for creating an artificial peritoneum, with input variables, volume and pressure, and variable output flow."

In addition, in the context of teaching the techniques for establishing an artificial pneumoperitoneum, we developed a computer program that was tested as part of doctoral dissertation,[32] with the results subsequently published in a journal.[33]

An automated demonstration of the operation of this interactive program is available on the Web at the URL: http://www.cirurgiaonline.med.br/cursos/simulador_demonstracao.

In another vein, still aimed at the prevention of such iatrogenic events, research by my group was done considering that the establishment of a regimen of very high pneumoperitoneum pressure, for just enough time to introduce the first trocar – done blindly using the closed method – could help to protect the intra-abdominal structure from injuries without, however, causing organic repercussions in the form of clinical complications.[34-37] In this particular regard, the results of other authors,[38] were confirmed by ours.

Measures aimed at promoting the safety of establishing a pneumoperitoneum were evaluated and have been routinely used by video-laparoscopicists. The measures include definitions regarding the type of gas to be used, the anatomic site and procedure for safe puncture with a Veres needle, injuries caused by the Veres needle, conducting tests to ensure proper placement of the needle, the diagnostic value of intraperitoneal pressure as it relates to injected volumes, precautions for the blind introduction of the first trocar, by direct view, according to Hasson, or with an optic trocar.

There is no study establishing a maximum volume of the intra-abdominal workspace or pressure

levels corresponding to normal pressure levels. Given that any pressure increase – even those that fall within safety margins – causes repercussions if the surgical interventions are prolonged, the ideal would be to establish for each patient their normal intraperitoneal pressure, even without curarization, and thereby establish the value for their pneumoperitoneum.

This is research that we are initiating *(Artificial pneumoperitoneum and systemic repercussions: correlation between intra-abdominal pressure and intraperitoneal space actually created.)* It proposes to study what is the lowest intraperitoneal pressure that provides the maximum immutable space, even with a subsequent increase in pressure, according to the anthropometric characteristics of each patient.

Laparoscopic surgery has presented the anesthesiologist with many questions about how pneumoperitoneum and the positioning of the patient affect the cardiorespiratory system. As they pertain to patients of normal weight, most changes in cardiorespiratory dynamics have been studied, but few clinical trials have been conducted in order to evaluate the effects of pneumoperitoneum on the morbidly obese.

Our group is conducting another research project: "*Organic implications of transient elevation of pneumoperitoneum pressure in laparoscopic metabolic and bariatric surgery to prevent iatrogenic injuries during the introduction of the first trocar in the morbidly obese.*"

The objective of this study is to evaluate the safety of laparoscopic bariatric surgery, as well as the clinical, hemodynamic, gasometrical, and metabolic implications of artificial pneumoperitoneum in the morbidly obese. The study also aims to define the best level of intra-abdominal pressure compatible with this technique in this patient population.

RESUMO

Com o auxílio das pesquisas do nosso grupo sobre o tema conseguimos agregar ao conhecimento da videocirurgia uma contribuição importante sobre a criação do pneumoperitônio artificial para procedimentos videolaparoscópicos. Alertados pela ocorrência de eventos mórbidos, às vezes fatais, durante o estabelecimento do pneumoperitônio mediante punção com agulha de Veres, realizamos análise sistemática da literatura em relação a este tema, quando constatamos que lesões viscerais e de grandes vasos retroperitoneais ocorrem por causa da punção abdominal na linha mediana, com muitos óbitos. Este tipo de punção é realizado no Brasil e nos Estados Unidos pela grande maioria dos cirurgiões laparoscopistas. Buscando alternativas mais seguras, realizamos estudos experimentais e clínicos com punção no hipocôndrio esquerdo, com a qual não há relatos de lesões.

Palavras-chave: Pneumoperitônio artificial; Laparoscopia; Complicações laparoscópicas; Pneumoperitônio; Punção com agulha de Veres.

REFERENCES

1. Anaise. D, editor. Vascular and bowel injuries during laparoscopy [monography of the Internet]. Available from: http://www.danaise.com/vascular_and_bowel_injuries_duri.htm
2. Neudecker J, Sauerland S, Neugebauer E, Bergamaschi R, Bonjer HJ, Cuschieri A, Fuchs K-H, Jacobi Ch, Jansen FW, Koivusalo A-M, Lacy A, McMahon MJ, Millat B, Schwenk W. The European Association for Endoscopic Surgery clinical practice guideline on the pneumoperitoneum for laparoscopic surgery. Surg Endosc. 2002;16:1121-43.
3. Azevedo JLMC, Azevedo O, Miyahira SA, Miguel GPS, Becker Júnior OM, Hypólito OHM, Machado ACCG, Cárdia W, Yamaguchi GA, Godinho L, Freire D, Almeida CES, Moreira CH. Injuries caused by Veres needle insertion for creation of pneumoperitoneum: a systematic literature review. Surg Endosc. 2009; 23:1428-32. DOI: 10.1007/s00464-009-0383-9
4. Hasan A, Banli O, Kavlakoglu B. Comparison between direct trocar and Veres needle insertion in laparoscopic cholecystectomy. J Laparoendosc & Adv Tech. 2007; 17:709-12.
5. Hasson HM. A modified instrument and method for laparoscopy. Amer J Obstet Gynec.1971; 110:887-7.
6. Molloy D, Kaloo PD, Cooper M, Nguyen TV. Laparoscopic entry: a literature review and analysis of techniques and complications of primary port entry. Aust N Z J Obstet Gynaecol. 2002; 42:246-53.
7. Bridgewater FH, Mouton WG. Rationale and intended use for the Veres needle: a translation of the original descriptive article. Surg Laparosc Endosc. 1999; 9:241-4.

8. Veres J. Neues Instument zur Ausfuhrung von Brust-oder Bauchpunktionen und Pneumothoraxbehandlung. Dtsch Med Wochenshr. 1938; 41:1480-1.
9. Santor J, Ballagi F, Nagy A, Rákóczi I. A needle-puncture that helped to change the world of surgery. Surg Endosc. 2000; 14:201-2.
10. Fitzgibbons RJ, Marsh RE. Métodos para a criação de um pneumoperitônio. In: Zucker KA, editors. Videocirurgia, 2nd ed. Rio de Janeiro: Revinter; 2006. p. 29-39.
11. Chandler JG, Corson SL, Way LW. Three spectra of laparoscopic entry access injuries. J Am Coll Surg. 2001; 192:478-91.
12. Peterson HB, Greenspan JR, Ory HW. Death following puncture of the aorta during laparoscopy sterilization. Obstet Gynecol. 1982; 59:133-4.
13. Hanney RM, Kathryn AM, Cregan PC. Major vascular injury and laparoscopy. Aust N Z J Surg. 1995; 65:533-5.
14. Pirró N, Ciampi D, Champsaur P et al. The anatomical relationship of the iliocava junction to the lumbosacral spine and the aortic bifurcation. Surg Radiol Anat. 2005; 27:137-41.
15. Guimarães P. Pneumoperitônio, punções e trocartes. In: Donadio N, Albuquerque Neto LC. Eds. Consenso Brasileiro em videoendoscopia ginecológica. São Paulo, Artes Médicas, 2001. p.27-32.
16. Hurd WW, Bude RO, DeLancey JOL, Pearl ML. The relationship of the umbilicus to the aortic bifurcation: implications for laparoscopic technique. Obstet Gynecol. 1992; 80:48-51.
17. Roviaro GC, Varoli F, Saguatti L, Vergani C, Maciocco M, Scarduelli A. Major vascular injuries in laparoscopic surgery. Surg Endosc. 2002;16:1192-6.
18. Palmer R. Safety in laparoscopy. J Reprod Med. 1974;13:1-5.
19. Rohatgi A, Widdison AL. Left Subcostal Closed (Veres Needle) Approach Is a Safe Method for Creating a Pneumoperitoneum. J Laparoendosc Adv Surg Tech. 2004; 14:278-80.
20. Catarci M, Carlini M, Gentileschi P, Santoro E. Major and minor injuries during the creation of pneumoperitoneum. Surg Endosc. 2001; 15:566-9.
21. Schwartz ML, Drew RL, Andersen JN. Induction of pneumoperitoneum in morbidly obese patients. Obes Surg. 2003;13:601-4.
22. Schafer M, Lauper M, Krahenbuhl. Trocar and Veres needle injuries during laparoscopy. Surg Endosc. 2001; 15:275-80.
23. Azevedo JLMC, Guindalini RSC, Sorbello AA, Silva CEP, Azevedo OC, Aguiar GS, Menezes FJC, Delorenzo A, Pasqualin RC, Kozu FO. Evaluation of the positioning of the tip of the Veres needle during the creation of the pneumoperitoneum by using the closed technique, in pigs. Acta Cir Bras, São Paulo. 2006; 21:26-30. DOI: 10.1590/S0102-86502006000100007
24. Azevedo OC. Punção no hipocôndrio esquerdo na criação do pneumoperitônio: valor diagnóstico das provas de posicionamento da agulha de Veres, das pressões intraperitoneais e dos volumes injetados durante a insuflação. Tese (Doutorado). Universidade Federal de São Paulo. Escola Paulista de Medicina. São Paulo, 2006. 52f.
25. Azevedo OC, Azevedo JLMC, Miguel GPS, Guindalini RSC. Veres needle insertion in the left hypocondrium in creation of the pneumoperitoneum. Acta Cir Bras, São Paulo. 2006; 21:296-303. DOI: 10.1590/S0102-86502006000500005
26. Azevedo OC, Azevedo JLMC, Sorbello AA, Miguel GPS, Wilson Junior JL, Godoy AC. Evaluation of tests performed to confirm the position of the Veres needle for creation of pneumoperitoneum in selected patients: a prospective clinical trial. Acta Cir Bras. São Paulo. 2006; 21:385-91. DOI:10.1590/S0102-86502006000600006
27. Becker JOM, Azevedo JLMC, Hypólito OHM, Miyahira SA, Miguel GPS, Machado ACCG, Azevedo O. Veres needle insertion into the left hypochondrium for creation of pneumoperitoneum: diagnostic value of tests to determine the position of the needle in a random population. Rev Col Bras Cir. 2010.
28. Azevedo JLMC, Azevedo OC, Sorbello AA, Becker OM, Hypólito O, Freire D, Miyahira S, Guedes A, Azevedo GC. Intraperitoneal pressure and volume of gas injected as effective parameters of the correct position of the Veres needle during creation of pneumoperitoneum. J Laparoendosc Adv Surg Tech. Part A, Online Ahead of Print: September 30, 2009. DOI: 10.1089/lap.2009.0080.
29. Becker JOM. Criação do pneumoperitônio no hipocôndrio esquerdo: sistema nebuloso (fuzzy) de suporte de decisão pela relação pressão/volume do posicionamento da ponta da agulha de Veres. Tese (Doutorado). Universidade Federal de São Paulo. Escola Paulista de Medicina. São Paulo, 2008. 89f.
30. Becker JOM, Araújo E, Azevedo JLMC. Laparoscopy pneumoperitoneum fuzzy modeling. IEEE Transactions on Biomedical Engineering (Print). 2010.
31. Oliveira EFB. Eficácia de um simulador multimídia no ensino de técnicas básicas de videocirurgia para alunos do curso de graduação. Tese (Doutorado). Universidade Vale do Rio Verde de Três Corações. Minas Gerais, 2005. 51f.
32. Oliveira EFB, Azevedo JLMC, Azevedo OC. Eficácia de um simulador multimídia no ensino de técnicas básicas de videocirurgia para alunos do curso de graduação em medicina. Rev Col Bras Cir. 2007; 34:251-6. DOI: 10.1590/S0100-69912007000400010
33. Hypólito OHM. Repercussões orgânicas da manobra de elevação para 20mmHg da pressão do pneumoperitônio artificial durante cinco minutos visando à prevenção de lesões iatrogênicas na introdução do primeiro trocarte: ensaio clínico e randômico. Tese (Doutorado). Universidade Federal de São Paulo. Escola Paulista de Medicina. São Paulo, 2008. 64f.
34. Hypólito OHM, Azevedo JLMC, Caldeira FMSLA, Azevedo OC, Miyahira SA, Miguel GPS, Becker Jr OM, Guedes

ACC. Creation of pneumoperitoneum: noninvasive monitoring of clinical effects of elevated intraperitoneal pressure for the insertion of the first trocar. Surgical Endoscopy. 2010; 24:1663. DOI:10.1007/s00464-009-0827-2.

35. Hipólito OHM, Azevedo JLMC, Gama FAB, Azevedo OC, Becker Júnior OM, Machado ACCG, Miyahira SA, Azevedo GC. Invasive monitoring of the clinical effects of high intra-abdominal pressure for insertion of the first trocar in laparoscopy. J Chir. 2010.
36. Hipólito OHM, Azevedo JLMC, Gama FAB, Azevedo OC, Becker Júnior OM, Machado ACCG, Miyahira SA, Azevedo GC. Relação do CO_2 arterial e expirado na pressão do pneumoperitônio artificial elevada para a introdução do primeiro trocarte. 2010.
37. Reich H, Ribeiro SC, Rasmussen C, Rosenberg J, Vidali A. High-pressure trocar insertion technique. J Soc Laparoendosc Surg. 1999; 3:45-8.
38. Reich H, Rasmussen C, Vidali A. Peritoneal hypertension for trocar insertion. Gynaecol Endosc. 1999; 8:375-7.
39. Tsaltas J, Pearce S, Lawrence A, Meads A, Mazzatesta J, Nicolson S. Safer laparoscopic trocar entry: its all about pressure. Aust N Z J Obstet Gynaecol. 2004; 44:349-50.

Correspondence Address:
JOÃO LUIZ MOREIRA COUTINHO DE AZEVEDO
R. Joaquim Távora 550 – Apto 101-A
V. Mariana – CEP 04015-011
São Paulo, SP

Brazilian Journal of Videoendoscopic Surgery

Review Article

Current Indications for Videothoracoscopy

Indicações Atuais da Videotoracoscopia

RUI HADDAD[1]; LUIS CARLOS LOSSO[2]

[1.] Full Member of the Surgical Section of the National Academy of Medicine. Professor of the Post-Graduate School of Medicine of the Catholic University of Rio de Janeiro; Associate Professor, Department of Surgery of School of Medicine, and Adjunct Coordinator of the Post-Graduate Program in Thoracic Surgery of the Federal University, Rio de Janeiro (UFRJ); [2.] Assistent Professor of the Discipline of Thoracic Surgery of the School of Medicine of the ABC Foundation. Prof. Assistente, Disciplina de Cirurgia Torácica, Faculdade de Medicina da Fundação do ABC President of the South American chapter of the International Minimally Invasive Thoracic Surgery Society. Director of the Thoracic Surgery Service of the Prof. Edmundo Vasconcelos Hospital, São Paulo.

ABSTRACT

Videosurgery was without a doubt, the highpoint with which the surgery closed the millennium. Although nothing more than a new approach to surgical access, there is no doubt that it significantly changed surgical practice. Nor is there any doubt as to the potential that the future of videosurgery holds such as the use of three-dimensional images, the development of more compact and efficient tools and equipment, andthe integration with other technologies of the digital age for medical education and treatment. Concomitant with the technical development there has always been, in the course of the history of Medicine, a concern with minimizing human suffering and the prevention of complications associated with the new therapeutic options. The constant pursuit of more effective and more efficient diagnostic and therapeutic modalities, with fewer side effects, transformed minimally invasive videosurgery approaches, into the substantive hope of performing surgical procedures with minimal discomfort for patients when compared to those employing traditional access. Sixteen years after of its introduction, there are now several well-established indications for videothoracoscopy, and others still controversial, that remain investigational.

Key words: Videothoracoscopy. Indications. Complications.

Bras. J. Video-Sur, 2011, v. 4, n. 1: 035-042

Accepted after revision: November, 6, 2010.

THORACIC VIDEOSURGERY ESTABLISHED INDICATIONS (TABLE 1)

Pleural mass and effusion of unknown origin

An excellent diagnostic option which offers direct visualization of the lesion, guides the biopsy of the parietal and visceral pleura, and enables the collection of large samples of tissue, videothoracoscopy should be indicated early as a means of diagnosis when previous investigation failed to achieve results.

Malignant and/or recurrent pleural effusion

In addition to diagnostic videothoracoscopy, therapeutic videothoracoscopy enables both pleurodesis by talc insufflation and by parietal pleurectomy, which enables the obliteration of the pleural space, before a lung incarceration due to progression or extension of the tumor. In cases of hepatic hydrothorax, videothoracoscopic findings of diaphragmatic defects can be repaired with small surgical intervention.

Parapneumonic or loculated inflammatory pleural effusion and pleural empyema

Early intervention is recommended in cases of loculated parapneumonic pleural effusion, as well as in the fibrinopurulent phase of pleural empyema, with debridement of pleural adhesions and multiloculated collections. These measures seek to remove fibrinous membranes that cover the visceral and parietal pleural surfaces and necrotic debris in order to clean and unify the pleural cavity

Table 1 - *Videothoracoscopy: the established indications.*

Pleural mass and effusion of unknown origin
Malignant and/or recurrent pleural effusion
Parapneumonic or loculated inflammatory pleural effusion and pleural empyema
Post-operative and post-traumatic intrapleural clot
Evaluation of diffuse pulmonary infiltrates and pulmonary mass
Spontaneous pneumothorax and bullous emphysema
Severe Pulmonary Emphysema
Evaluation of Pulmonary Nodule
Mediastinal masses and cysts
Thymic hyperplasia in Myasthenia Gravis
Pre-resection intrathoracic cancer staging
Pericardial effusion
Hyperhidrosis, vascular disease, long QT syndrome and reflex sympathetic dystrophy
Diseases of the thoracic spinal cord
Diseases of the esophagus
Thoracic trauma
Children

allowing complete re-expansion of the lung. Even for organizing empyemas evolving for 60 to 90 days with incarcerated lung, videothoracoscopy is still useful.

Postoperative intrapleural clot

Videothoracoscopy enables the surgeon to suction and wash the pleural cavity, to locate bleeding, and to treat hemothorax occurring postoperatively or secondary to intrathoracic diseases. Clot trapped in the pleural cavity points to the occurrence of prolonged hemorrhagic effusions, especially when there is a high concentration of fibrinolytic factors. These effusions can even become infected. The association of videothoracoscopy with intrapleural streptokinase facilitates the hygiene of the pleural cavity.

Chylothorax

The invasive control of postoperative chylothorax following thoracic interventions for trauma or secondary to intrathoracic diseases is achieved by videothoracoscopy through the direct identification of the thoracic duct and its ligation.

Pulmonary infiltrates and pulmonary mass of unknown origin

Videothoracoscopic diagnostic access is of value in cases of pulmonary infiltrates by permitting that several fragments of different areas of the lung be obtained under direct vision and guided by computed tomography, with minimal tissue manipulation. Fragments of the middle lobe and lingula are considered representative specimens for the different analyses. Patients undergoing lung transplantation or immunosuppressed with increased risk of infections or malignancies may benefit from minimally invasive diagnostic access. For localized masses, like those in the posterior segments of upper lobes and superior segments of lower lobes, videothoracoscopic access permits biopsy of the lesion.

Spontaneous pneumothorax and bullous emphysema

Minimally invasive access allows treatment of lung disease (resection of pulmonary blebs and bullae) and the prevention of recurrence by abrasive chemical pleurodesis or apical parietal pleurectomy. Videothoracoscopy is also useful to identify and treat complications such as prolonged air leak, incomplete lung re-expansion, and hydro-, pio- or hemo-thorax. The procedure can be performed bilaterally in one operative time. The indication for the procedure should be early, within three to four days of an unfavorable course after closed pleural drainage. There is, however, no consensus regarding when one treats first-time uncomplicated primary spontaneous pneumothorax. Individuals with bilateral lesions,

divers, aviators, and those in the military, or those with secondary or bilateral synchronous pneumothorax should be treated with the first episode. The rate of long-term complications and recurrence with videothoracoscopy is equivalent to more invasive procedures such as axilotomia and limited thoracotomy.

Severe pulmonary emphysema

The National Emphysema Treatment Trial demonstrated that for the surgical treatment of severe pulmonary emphysema videothoracoscopy offers a quicker functional recovery with costs 17% lower than thoracotomy. When ideal clinical indications – emphysema concentrated in the upper lobes with poor exercise capacity and emphysema concentrated in the upper lobes with high exercise capacity – are respected, the functional results obtained, the intra- and post-operative morbidity, and mortality are similar in the two modes of surgical access.

Pulmonary nodule of unknown etiology

Videothoracoscopy has changed the diagnostic approach of peripheral pulmonary nodules. Clinical criteria such as age, smoking, professional activity, personal history; and radiographic criteria for risk of malignancy such as size larger than three centimeters in diameter, the time of growth between 21 and 400 days; bosselated, spiculated, lobulated, ill-defined borders; density less than 185 UH, presence of irregular calcification, presence or absence of a cavity, are not superior to histopathological study of a lesion to define the diagnosis of solitary nodule or multiple lung nodules. Videothoracoscopy allows the resection of pulmonary nodules of up to three centimeters in diameter, located on the periphery of the lungs, for diagnosis and possible therapy.

Mediastinal masses and cysts

For mediastinal masses, videothoracoscopy is used as a diagnostic method in patients in whom less invasive access such as CT-guided percutaneous puncture, transtracheal puncture, transesophageal puncture guided by ultrasound or access via the cervical were contraindicated or inconclusive. It has therapeutic value in benign diseases, of small size and exhibiting non-infiltrating and non-invasive behavior. On the other hand, with malignant disease surgical access is only useful for diagnosis and should not be used to treat, because the diseases are usually infiltrative, locally invasive, and require complete resection by a wide surgical approach.

Pre-resection intrathoracic cancer staging

The finding of unsuspected ipsilateral pleural metastases without associated pleural effusion is not a rare occurrence in patients with lung cancer (even early stage disease) with indication for curative surgical treatment, as one might suppose. Videothoracoscopy is useful in diagnosing patients with hilar or mediastinal involvement unable to undergo biopsy cervical or anterior mediastinoscopy. Its use does not imply an increase in cost or of surgical morbidity, avoids unnecessary thoracotomies, and confirms resectability in patients previously considered inoperable. Nevertheless, in most situations it is inappropriate to characterize non-resectability, because even during thoracotomies, only after extensive dissection can one make conclusions regarding the resectability (or not) of a centrally located tumor. The evaluation of clinical treatments using induction chemotherapy requires invasive preoperative staging. Videothoracoscopy and complementary videomediastinoscopy determine accurately the presence or absence of N2 and N3 and identify T3, T4 and M1.

Thymic hyperplasia in myasthenia gravis

Videothoracoscopic thymectomy in Myasthenia Gravis has been shown to be reliable, fast, and safe in the resection of thymic tissue and mediastinal fat, without deterioration of myasthenic state and with long-term results equivalent to those obtained by sternotomy in terms of control and remission of the disease. The operative access selected is the surgeon's choice.

Pericardial effusion

A pericardial window can be made quickly and safely by videothoracoscopy, with complete visualization of the phrenic nerves and with the placement of a window of any size.

Hyperhidrosis, vascular diseases, long QT syndrome, and reflex sympathetic dystrophy

Videothoracoscopy is now the standard of care for operations on the thoracic sympathetic trunk, is indicated for resection or neurolysis of the stellate

ganglion and/or part of the thoracic sympathetic chain in patients with causalgia, hyperhidrosis and/or ischemic vascular phenomena of the upper limb. It is simple procedure, not infrequently performed bilaterally, and with a very acceptable cosmetic result.

Diseases of the thoracic spine

Videothoracoscopic anterior access to the thoracic spine, while minimizing the iatrogenic injury to the integrity of the chest, permits the execution of procedures such as drainage of vertebral abscesses, spinal discectomy, rib resection, intervertebral fusion, correction of scoliosis (<70 degrees), placement of implants, among others, with decreased morbidity.

Diseases of the Esophagus

The excision of benign tumors of the esophagus of small size, and the performance of minimally invasive esophagectomy can be safely performed in selected cases with functional benefits.

Thoracic trauma

In hemodynamically stable patients, when used early, videothoracoscopy allows you to empty the hemothorax, diagnose and treat slow and continuous bleeding originating from the chest wall and lung parenchyma, treat lung lacerations with air leaks, evaluate mediastinal lesions, diagnose and treat limited diaphragmatic injuries avoiding unnecessary operations in many patients. Pericardial exploration, identification of cardiac lesions and placing a window in the pericardium to control cardiac tamponade are procedures performed safely in stable patients. Currently, videothoracoscopy appears as a new diagnostic and therapeutic access for many situations of thoracic trauma with results comparable to open operations when performed by experienced surgeons.

Children

Indicated for children six months and older with pleural diseases, in children between two and eight years for the pleural and mediastinal disorders. For children over eight years, the indications are practically the same as for adults.

CONTROVERSIAL INDICATIONS (TABLE 2)

Controversial indications

At the same time, the functional concept of minimal discomfort and low morbidity of videosurgery spread so that, to many, it seemed possible to consider that there wouldn't be great risks of accidents or of developing intra- and post-operative complications.

Unfortunately, the advantages gained do not include zero surgical risk. Physiological changes occur in the postoperative period and there are remain a considerable number of controversies about surgical access.

Pectus excavatum

The videothoracoscopic correction of pectus excavatum by the Nuss technique (and its variants), safe in children, is limited in adolescents and adults due to the higher incidence of complications. There is a risk of cardiac and the internal thoracic arteries lesions, perforation of thoracic viscera, breaking or mobilization of the support bar, pleural effusion, pneumothorax, and pericarditis. The aesthetic results are dependent on the selection of the ideal candidate for the surgery by videothoracoscopy.

Table 2 - *Videothoracoscopy: the controversial indications.*

Pectus escavatum
Cancer
Lobectomy
Sparing or limited resection of lung tissue
Extended pulmonary segmentectomy
Metastasectomy
Systematic lymph node dissection
Intra-operative mapping and sentinel lymph node biopsy
Re-staging
Thymomas
Robotics

Cancer Surgeries

Controversies in the use of videothoracoscopy in oncology are: optimal patient selection, the definition of the initial cancer stage, the ability to ensure results, inadequate identification of the intrathoracic extent of disease and the tumor margins, the risk of incomplete resection of the lesion, the great variety of techniques used that have not been standardized, the potential risk of local implant site or systemic dissemination of tumor cells related to extensive manipulation of the tumor because of limited access, the possibility of tumor recurrence, the undefined degree of immunosuppression and surgical invasion, the non-existence of extensive series of prospective randomized trials and the lack of knowledge about long-term survival rates. There are, therefore, doubts with regard to guarantees about complete resection.

Lobectomy/Pulmonary lobectomy

Pulmonary lobectomy is still considered an investigational procedure due to questions not fully answered, to technical difficulties and the risk of complications. Nevertheless, videothoracoscopy is routinely used for lung resections, such as lobectomy or pneumonectomy, at centers of excellence worldwide, in selected patients with lung cancer in stage Ia and Ib or in individuals with benign diseases, with morbidity and mortality rates similar to those achieved with conventional approaches and oncological outcomes comparable to those obtained with conventional surgical access. There is, however, the possibility of an unfavorable anatomy, adhesions, or pleural thickening, absence of fissures, thick hilar areolar tissue, hilar lymph node enlargement, inadequate exposure of blood vessels and bronchi, and hemorrhagic accidents, instrument failure which contraindicate this minimally invasive route. Technical variations have been described such as simultaneous stapling of hilar elements. With this type of surgical procedure there is a risk of air leakage, bleeding, bronchopleural, arteriovenous, or bronchovascular fistula, and instrument failure. The experience with videothoracoscopy is limited to a few thoracic surgery centers around the world.

Sparing or limited resection of lung tissue

Lung cancer patients without functional reserve or high-risk patients with recommendations for limited pulmonary and lung tissue-sparing resections find in videothoracoscopy an excellent means of access, because they attain favorable functional outcome more quickly in the post-operative period.

Extended pulmonary segmentectomy

This is a surgical technique that poses difficulties for the videothoracoscopic procedure, specifically in the individualized treatment of elements of the hilum of the lung segment and in the identification of the anatomical limits of the segment, for its resection. Initial experience has been presented about selected cases of stage I lung cancer in the apex of the left upper lobe. Trisegmentectomy of the left upper lobe in selected cases of early lung cancer has been described with promising results. The experience is limited to just a few thoracic surgery centers around the world.

Metastasectomy

When contemplating videothoracoscopy as a path of therapeutic access, individuals with multiple pulmonary nodules constitute a special group of patients. In theory, modern helical CT scanners – which can identify lesions as small as two millimeters in diameter – should be able to identify virtually all existing metastases. Nevertheless, concerns about not identifying all lung metastases intraoperatively, leading to the risk of an incomplete tumor resection, makes metastasectomy via videothoracoscopy controversial.

Systematic lymph node dissection

Serious controversy surrounds the systematic lymph node dissection of the mediastinum in lung cancer resections with curative aim. The quality of radical dissection cannot be guaranteed because there are no real anatomical limits in the different mediastinal regions, except the right upper mediastinum. Incomplete resection is not oncologically correct, and at the moment should not be recommended. There is a trend toward the use of sentinel lymph node sampling instead of systematic dissection in cases of non-small lung cancer in initial stages. Long-term prospective randomized trials are needed to define the best surgical conduct.

Intraoperative mapping and sentinel node biopsy

Mediastinal lymph node mapping poses technical challenges and limitations in the injection of the marker into the tumor, in the mapping and

identification of the sentinel lymph node level, and with the excision of sentinel lymph nodes when using videothoracoscopic access. The experience to date is preliminary.

Re-staging

Although a major contribution has been achieved by immediate pre-operative staging videothoracoscopy, there is controversy regarding the quality of the re-staging in patients who have undergone induction chemotherapy or chemoradiotherapy.

Thymomas

Surgical resection has been the gold standard treatment of thymomas and those with early stage disease have high cure rates. There is still no consensus on the applicability of videothoracoscopy because of the risk of thymus gland remnants, perithymic adipose tissue, and ectopic thymus, rupture of the capsule in thymomas larger than two centimeters, the risk of vascular and mediastinal nerve lesions, the lack of long-term confirmation of satisfactory results and the need for re-thymectomy. However, it is an alternative in situations in which sternotomy is not recommended. The recommended approach is bilateral videothoracoscopy, combined with a small neck incision, when you want to get an extended resection, as achieved with total sternotomy and a neck incision.

Robotics

Instruments in development, inadequate for thoracic operations because of loss of tactile sensation. Limited initial experience.

COMPLICATIONS (TABLE 3)

The incidence of intraoperative accidents and complications is low when performed by thoracic surgeons and when established principles for thoracic surgery are followed. Major complications, those that may endanger the life of the patient include bleeding and prolonged air loss. Minor complications occur with small incidence and most of them have no clinical significance.

Bleeding

Bleeding is the most serious of the postoperative complications. Minor bleeding may result from the instrument penetrating the extrapleural plane, injury to the intercostal or mammary neurovascular bundle, section of pleural adhesions, and lesions of the lung tissue. Major bleeding may occur after lobectomy, pneumonectomy, and mediastinal interventions because of vascular accidents or malfunction of endoscopic instrument.

Prolonged air loss

Air loss commonly occurs in the postoperative period of pulmonary interventions, through the suture of the bronchial stump, the suture of the lung parenchyma or even through the surgical dissection of segmental surfaces. Technical advances such as the use of bovine pericardium to reinforce the suture line mechanics, argon gas, biological glues, absorbable mesh applied over the area of air loss, parietal pleurectomy, pleurodesis and the pleural mantle are alternatives that have contributed as complementary measures in the control of prolonged air loss.

Tumoral implants and dissemination

The tumoral implant in chest incisions has been described in the literature. The mandatory preventive measure is the placement of malignant, infected or suspicious specimens inside of plastic bags prior to removing them from the pleural cavity.

Intercostal injury

Intercostal neuralgia is a common problem resulting from the manipulation of surgical instruments through holes in the intercostal spaces. Choosing the

Table 3 - *Videopleuroscopy: complications.*

Bleeding
Prolonged Air Loss
Tumoral implant of the incision and dissemination
Injury of intercostal nerve
Infection

most appropriate intercostal spaces, the use of small diameter tools, and great care in handling them is absolutely fundamental to minimizing postoperative chest pain.

Infection

Wall abscesses occur occasionally. Pleural empyema is a rare complication whose resolution is difficult and time-consuming.

RESUMO

A videocirurgia foi sem sombra de dúvidas, a chave-de-ouro com a qual a Cirurgia encerrou o milênio. Embora ela nada mais seja do que um novo acesso para abordagem operatória, não há dúvidas de que ela modificou, de forma significativa, a prática cirúrgica. Tampouco há dúvidas quando às potencialidades que o futuro da videocirurgia nos reserva como o uso de imagens tridimensionais, o desenvolvimento de instrumentos e equipamentos mais compactos e mais eficientes e, ainda, a integração com outros métodos da era digital para a educação e tratamentos médicos. Concomitante ao desenvolvimento técnico sempre houve, no transcorrer da história da Medicina, a preocupação com a minimização do sofrimento humano e a prevenção de complicações inerentes às novas alternativas terapêuticas. A busca constante de modalidades de diagnóstico e tratamento mais eficientes, mais eficazes, com menos efeitos colaterais, transformou as abordagens minimamente invasivas por videocirurgia, na esperança concreta de realizar procedimentos cirúrgicos com o mínimo de desconforto para os doentes quando comparadas aos acessos tradicionais. Passados 16 anos de sua introdução, há atualmente algumas indicações bem estabelecidas para a videotoracoscopia e outras ainda controversas, em caráter investigacional.

Descritores: Videotoracoscopia. Indicações. Complicações.

REFERENCES

1- Ambrogi MC, Lucchi M, Dini P, Mussi A, Angeletti CA. Videothoracoscopy for evaluation and treatment of hemothorax. J Cardiovasc Surg 2002; 43:109-12.
2- Burdine J, Joyce LD, Plunkett MB e cols. Feasibility and value of video-assisted thoracoscopic surgery wedge resection of small pulmonary nodules in patients with malignancy. Chest 2002; 122:1467.
3- Cardillo G, Facciolo F, Carbone L, Regal M, Corzani F, Ricci A, Di Martino M, Martelli M. Long-term follow-up of video-assisted talc pleurodesis in malignant recurrent pleural effusions. Eur J Cardiothorac Surg 2002; 21:302-5.
4- Divisi D, Battaglia C, De Berardis B, Vacareli M, Di Francescantonio W. Salvemini S, Crisci R. Acta Biomed Ateneo Parmense. 2004; 75:158-63.
5- de Hoyos A, Litle VR, Luketich JD. Minimally Invasive esophagectomy. Surg Clin North Am 2005;85:631-47.
6- Dumont P, Denoyer A, Robin P. Long-term results of thoracoscopic sympathectomy for hyperhidrosis. Ann Thorac Surg 2004; 78:1801-7.
7- Freixinet JL, Canalis E, Julia G, Rodrigues P, Santana N, Rodrigues de Castro F. Axillary thoracotomy versus videothoracoscopy for the treatment of primary spontaneous pneumothorax. Ann Thorac Surg 2004; 78:417-20.
8- Hoffmann H. Invasive staging of lung cancer by mediastinoscopy and video-assisted thoracoscopy. Lung Cancer 2001; 34:S3-5.
9- Houck WV, Fuller CB, McKenna RJ Jr. Video-assisted thoracic surgery upper lobe trisegmentectomy for early-stage left apical lung cancer. Ann Thorac Surg 2004; 78:1858-60.
10- Huang PM, Chang YL, Yang CY, Lee YC. J thorac Cardiovasc Surg. 2005; 130:41-5.
11- Landreneau RJ, Mack MJ, Hazelrigg SR, et al. Video-assisted thoracic surgery: basic technical concepts and intercostals approach strategies. Ann Thorac Surg 1992;54:800-7.
12- Lang-Lazdunski L, Chapuis O, Bonnet PM, Pons F, Jancovici R. Videothoracoscopic bleb excision and pleural abrasion for the treatment of primary spontaneous pneumothorax: long-term results. Ann Thorac Surg 2003; 75:960-5.
13- Leaver HA, Craig SR, Yap PL, Walker WS. Acute phase responses following minimal access and conventional thoracic surgery. Eur J 2001; 20:455-63.
14- Loscertales J, Jimenez-Merchan R, Congregado-Loscertales M, Arenas-Linares C, Giron-Arjona JC, Tristan AA, Ayarra J. Usefulness of videothoracoscopic intrapericardial examination of pulmonary vessels to identify resectable clinical T4 lung cancer. Ann Thorac Surg 2002; 73:1563-6.
15- Losso LC, Ghefter MC, Imaeda CJ. Complicações da cirurgia torácica vídeo-assistida. J. Pneumol 1995; 21:159-64.
16- Mantegazza R, Baggi F, Bernasconi P. Video-assisted thoracoscopic extended thymectomy and extended transsternal thymectomy (T-3b) in non-thymomatous myasthenia gravis patients: remission after 6 years of follow-up. J Neurol Sci 2003; 212(1-2):31-6.
17- McKenna RJ Jr, Benditt JO, DeCamp M, Deschamps C, Kaiser L, Lee SM, Mohsenifar Z, Piantadosi S, Ramsey S,

Reilly J, Utz J; National Emphysema Treatment Trial Research Group. Safety and efficacy of median sternotomy versus video-assisted thoracic surgery for lung volume reduction surgery. J Thorac Cardiovasc Surg 2004; 127:1350-60.

18- Newton PO. The use of video-assisted thoracoscopic surgery in the treatment of adolescent idiopathic scoliosis. Instr Course Lect 2005; 54:551-8.

19- Oguzkaya F, Akcali Y, Bilgin M. Videothoracoscopy versus intrapleural streptokinase for management of post traumatic retained haemothorax: a retrospective study of 65 cases. Injury 2005; 36:526-9.

20- Pons L, Lang-Lazdunski L, de Kerangai X e cols. The role of videothoracoscopy in management of precordial thoracic penetrating injuries. Eur J Cardiothorac Surg 2002; 22:7-12.

21- Pun YW, Balsalobre RM, Vicente JP e Fau LF. Experiência multicéntrica de cirugía videotoracoscópica em el tratamiento de quistes y tumores del mediastino. Arch Broncopneumol 2002; 38:410.

22- Roviaro GC, Varoli F, Vergani C e Maciocco M. State of the art in thoracoscopic surgery: a personal experience of 2000 videothoracoccopic procedures and a overview of the literature. Surg Endosc 2002; 16:881-92.

23- Roviaro GC, Varolli F, Francese M, Caminiti R, Vergani C, Maciocco M. Thoracoscopy and transplantation: a new attractive toll. Transplantation 2002; 73:1013-8.

24- Schaarschmidt K, Kolberg-Schwerdt A, Lempe M, Schlesinger F, Bunke K, Strauss J. Extrapleural, submuscular bars placed by bilateral thoracoscopy—a new improvement in modified Nuss funnel chest repair. J Pediatr Surg. 2005 Sep; 40(9):1407-10

25- Seldomridge JA, Phillips FM. Minimally invasive spine surgery. Am J Orthop 2005; 34:224-32.

26- Solaini L, Prusciano F, Bagioni P e cols. Vídeo-assisted surgery major pulmonary resections. Present experience. Eur J Cardiothorac Surg 2001; 20:437.

27- Thomas P, Doddoli C, Yena S, Thirion X, Sebag F, Fuentes P, Giudicelli. VATS is an adequate oncological operation for stage I non-small cell lung cancer. Eur J Cardiothorac Surg 2002; 21:1094-99.

28- Toker A, Eroglu O, Ziyade S, Tanju S, Senturk M, Dilege S, Kalayci G. Comparison of early postoperative results of thymectomy: partial sternotomy vs. videothoracoscopy. Thorac Cradiovasc Surg 2005; 53:110-3.

29- Yim APC. VATS Major pulmonary resection revised – controversies, techniques and results. Ann Thoracic Surg 2002; 74:615-23.

30- Yoshino I, Ushijima C, Tomiyasu M, Suemitsu R, Ichinose Y, Sugimachi K. Unique minithoracotomy assisted by videothoracoscopy facilitates a maximal view even with a minimal wound for resection of primary lung cancer. Surg Endosc 2002; 16:148-50.

Correspondence Address:
RUI HADDAD
Av. Aquarela do Brasil, 333 / bl. 1 / apto. 2401
São Conrado, Rio de Janeiro, RJ
22610-010
E-mail: rhaddad@globo.com

INFORMATION FOR AUTHORS

1. Objectives

BRAZILIAN JOURNAL OF VIDEOENDOSCOPIC SURGERY (BJV) is the official journal of the Brazilian Society of Videosurgery that publishes scientific articles in order to register results of videosurgery researches and related subjects, encourages study and progress in this area as well as publications to deepen medical knowledge.

2. Analysis, Selection and Exclusiveness of Manuscripts

Manuscripts submitted will be analyzed by a Reviewers Committee, the manuscripts should be original and should not be published elsewhere. A copy of the manuscript is anonymously forwarded by the Editor to 2 or 3 reviewers to be analyzed within 30 days.

Peer review includes suggestions to the Editor, reject or accept the manuscript with or without changes. Manuscripts that are rejected will be returned to the author. Afterwards, peer review suggestions are forwarded to the main author for approval who will decide if she/he will resubmit it. Scientific articles describing experiments on human subjects or animals must include approval of the appropriate ethics committee of the institution where the study was performed, in accordance with the Declaration of Helsinki (1964 and 1975,1983 and 1989 amendments), the Animal Protection International Rules and the National Health Council Resolution nº 196/96. Republishing a national or an international journal article is only accepted in special cases and must be accompanied by written permission for its use from the copyright owner and the author. In this case a copy of the first manuscript version should be provided. Manuscripts must have up to 6 authors in order to be published.

3. Periodicity & Scientific Matters to be published

Brazilian Journal of Videoendoscopic Surgery is published quarterly. It is a communication channel of scientific matters such as:

- Original Article: original clinical(or experimental) research;
- Preliminary Communications: partial results on new researches, techniques and methods in study;
- Case Report(or Clinical Meeting): with critical analysis and discussion;
- Clinical Observation: should have critical analysis and discussion;
- Epidemiologic Statistics: with critical analysis and discussion;
- Description and Evaluation: of methods or procedures, with revision, critical analysis and discussion;
- Opinion and Analysis: of philosophical, ethical and social aspects regarding the area of study;
- Letters to the Editor: including criticisms and suggestions about publications, as well as questions and/or comments about manuscripts that have already been published.

4. Requirements for preparation and submission of manuscripts

Authors should send the manuscript in microsoft word format by email to: revista@sobracil.org.br). Security Copy: A copy of all materials submitted to the journal will be sent to the author with the approval by the Editorial Board for future copyrights warranties. IMPORTANT! Keep a copy of all the material submitted to the publication of your manuscript.

Cover letter: A cover letter signed by the main author should be enclosed. If the author have interest in pay for colored illustrations this should be specified in the cover letter.

Permission for reproduction and copyright transfer statement: Manuscripts must be accompanied by written permission for use of copyrighted material or photographs of identifiable persons. Copyright transfer statement must be sent.

Protection sending the manuscript: Manuscripts should be sent in a suitable package, in order to avoid bending photographs and illustrations.

5. Standard Format and Print out

- Manuscripts should be typed double-spaced with up to 25 lines per page.
- Pages should be numbered consecutively (numbers should be in the upper or lower right corner). The first page should be the Title Page.
- Each section should start on a new page.
- Manuscripts should be printable on one side of a 216x279mm or A4(212x297mm) white sulphite paper with margins of 25mm.
- Manuscripts should include, in sequence and on separate pages:

- Identification Page (Title page – see details bellow);
- Abstract/Key words;
- Text pages and Acknowledgments;
- References;
- Tables (one in each page, separately);
- Illustrations;
- Legends;
- Abbreviations.

6. Manuscripts Preparation

6.1. Identification Page (Title Page)

All manuscripts will be subject to a process of anonymous editorial review, therefore the name and address of authors should only be in the Title Page with identification as it is not going to be sent to the reviewers. The authors should verify if there is any identification on the text to avoid identification.

Title Page "without identification"

- Complete Manuscript Title(concise and informative)
- Short title (up to 8 words)

Title Page "with identification"

- Name(s) of author(s) and Institutional Scientific Affiliation: provide detailed information about the department and the institute where the work was conducted. Affiliation and/or Academic degrees of the authors: include name, highest academic degree and institutional affiliation and position of each author.
- Footnotes:

Address, telephone, fax and e-mail of the main author should be given for journal editor contact.

Address to request copies and to contact author (include full address information and e-mail of the author who submitted the material to be published).

- Source of Funding: it should be declared any source of funding such as grants, equipments and others.

6.2. Abstract

The abstract is mandatory. It should be up to 250 words. Every abstract should be written in an informative style. Depending on the abstract it should contain the following headings:

Original Articles: Objectives/Materials(Patients) and Methods/Results/Discussion/Conclusion(s).

Reviews, Actualization, Opinion: Objectives/History(Scientific Summary)/Discussion

Case report or Clinical Meetings: Objectives/Meetings Summary/Discussion

Technical Notes or Preliminary Communication: Objectives/Technical Report/ Research Report/ Preliminary Results/Discussion

6.3. Descriptors (Key Words)

Identify the manuscript with 3 to 10 key words or short phrases bellow the abstract using DeCS or MESH terminology which will assist indexers in cross-indexing the article in the data base.

For DeCS terms access: **http://decs.bvs.br** and for MESH (Medical Subject Index) terms access: **http://www.nlm.nih.gov/mesh/meshhome.html** . If suitable MeSH terms are not yet available, well known terms or expressions are accepted.

6.4. Text

The textual material of clinical or experimental observation manuscripts should be organized whenever possible in a standard form as follows: Introduction, Patients and Methods, Results, Discussion, Conclusion, Acknowledgment, References. Other types of manuscripts such as case report, editorials and reviews may follow a different format, according to the Editorial Board. Long manuscripts in order to provide a better understanding of its contents may include subheadings in some sections such as Results and Discussion.

Citations and References: Authors citations must appear in the text as superscript numbers placed to the right of a word, sentence or paragraph. Citations of names should be typed in Upper Case. Name of author(s) citation should follow the format bellow:

- One author: KOCK[1]
- Two authors: KOCK e PENROSE[1]
- Three or more authors: KOCK and cols. [1]

Note: In the body of the text the form "…and cols" is suggested and in the references "… et al".

Introduction – It should briefly describe the reason to accomplish the article and the objective. Do not include data or conclusions and mention only relevant references.

Materials (or Patients) and Methods – should describe in detail the recruitment of individuals (human subjects and laboratory animals as well as group control) included in the research. Identify the age, sex and other relevant characteristics of the subject. Authors should be careful when specify race or ethnic group as their definition and relevance are ambiguous. Methods, apparatus (with manufacturer's name and address in parentheses) and procedures used should be identified in adequate detail so that other researches can reproduce the experiment. The methods published in other research should be mention and unknown methods briefly described. Statistical methods and protocols used should also be described, as well as the computers software used. Authors that submitted reviews should include a section to describe the methods used for locating, selecting, extracting and synthesizing data. These methods should be summarized in the abstract. When the paper reports experiments on human subjects it must indicate whether the procedures followed ethical standards of the responsible committee on human experimentation. Do not use name, initials or hospital identification of the patients, especially in illustrative material. When the paper reports experiments on animals, it must indicate that protocols were reviewed by the appropriate institutional committee with respect to the care and use of laboratory animals used in this study.

Results – Provide results in a logical sequence in the text, tables and figures. Do not repeat all tables and figures data in the text; consider the relevant ones.

Discussion – Emphasize important and new aspects of the study as well as the conclusions originated from them. Avoid detailed repetition of the data provided in the Introduction or Results. Include findings implications and limitations in the Discussion Section, mentioning implications for future research. Compare what was observed to other relevant studies.

Conclusions – The conclusions should be based on the study objectives, in order to avoid unqualified statements and conclusions that are not based on the findings. Author(s) should not state the economic benefits and costs unless their manuscript includes economic analysis and data. Studies that have not been completed should not be mentioned. New hypothesis should only be considered if justified. Include recommendations when appropriate.

Acknowledgement: Acknowledgements to people and institutions may be included at the end of the manuscript, stating any type of contribution and/or participation towards the development of the research. Technical support should be acknowledged in a paragraph separate from other types of contributions.

6.5. References

The references that are stated in the text should be consecutively in alphabetical order or as they are cited in the text. References, tables and legends must be identified in the text by superscript Arabic numerals. Citation of manuscripts accepted but not yet published: mention the journal and add "In press" in the reference list (authors should have written permission to mention these articles, as well as to verify if manuscripts were accepted to publication).

Avoid personal communications citation, unless it provides essential information and it is not possible to be obtained in printed sources (in such case they should be cited in parentheses in the text with name of the person and date of the communication). The Brazilian Journal of Videoendoscopic Surgery is in accordance with "Vancouver Style" (uniform requirements for manuscripts submitted to biomedical journals), electronic version is available on **http://acponline.org/journals/annals/01jan97/unifreqr.htm**, also published in N Engl J Med 1997; 336(4): 309-315 and commended by the International Committee of Medical Journal Editors.

The Uniform Requirements (Vancouver Style) are based on the American National Standards Institute (ANSI) adapted by the NLM (National Library of Medicine). Complete information about format of references may be verified in: Uniform Requirements for Manuscripts, Journal of Public Health 1999; 33(1), also available in electronic version: http:// www.fsp.usp.br/~rsp: http:// www.fsp.usp.br/~rsp.

Examples of references format:

- **Periodical article**

Include only the first 6 authors and add "et al". Do not use Upper Case or bold or underlined or italics. Journal names are abbreviated according to the Index Medicus – in the List of Journals Indexed in Index Medicus available at **http://www.nlm.nih.gov/tsd/serials/lji.html**, and the Latin American Journals available at: **http://www.bireme.br/abd/P/lista_geral.htm**.

Ex: Parkin DM, Clayton D, Black RJ, Masuyer E, Friedl HP, Ivanov E, et al. Childhood leukemia in Europe after Chernobyl: 5 years follow-up. Br J Cancer 1996; 73: 1006-12.

- **Book**

Ex: Rigsven MK, Bond D. Gerontology and leadship skills for nurses. 2nd ed. Albany (NY): Delmar Publishers; 1996.

- **Chapter in Book**

Ex: Philips SJ, Whiosnant JP. Hypertension and stroke. In: Laragh JH, Brenner BM, editors. Hypertension: pathophysiology, diagnosis and management. 2nd ed. New York; Raven Press; 1995. p.465-78.

- **Conference Paper**

Ex: Bergtson S, Solhein BG. Enforcement of data protection, privacy and security in medical informatics. In: Lun KC, Degoulet P, Piemme TE, Rienhoff O, editor. MEDINFO 92. Proceedings of the 7th World Congress on Medical Informatics; 1992 Sep 6-10; Geneva, Switzerland, Amsterdam: North Holland; 1992. p.1561-5.

- **Dissertation**

Ex: Carvalho ACP. A contribuição da tomografia computadorizada ao diagnóstico de aneurisma dissecante da aorta [dissertação - mestrado]. Rio de Janeiro: Faculdade de Medicina, Universidade Federal do Rio de Janeiro; 1993.

Kaplan SJ. Post-hospital home health care: the elderly's access and utilization [dissertation]. St. Louis (Ø): Washington Univ.; 1995

- **Journal article in electronic format**

Ex: Morse SS. Factors in the emergence of infectious diseases. Emerg Infect Dis [periodical online] 1995; 1(1). Available from: URL: http://www.cdc.gov/ncidod/EID/eid.htm [consulted on 11/12/2002].

- **Opinion or technical articles online**

Ex: Carvalho ACP, Marchiori E. Manual de orientação para a elaboração de monografias, dissertações e teses. Avaialabre from: URL http://www.radiologia.ufrj.br/manual.htm [consulted on 08/12/2002].

6.6 Tables

Print out each Table on a separate sheet of paper. Number tables with Arabic numerals consecutively in the order of their first citation in the text and supply a brief title for each table. Data that are shown in the table should not be repeated in the graphics. Follow the "Guidelines for Tabular Presentations" established by the National Statistical Council (Rev Bras Est 1963, 24:42-60). Explanatory matter in the footnotes of the tables should be limited and the following symbols should be used in this sequence */+/§/**/§§ etc. Identify the statistical analysis of dispersion such as standard deviation and standard error of the mean.

6.7. Illustrations (figures, drawings, graphics etc.)

Illustrations should be numbered with Arabic numerals consecutively according to the order in which they have been first cited in the text, they should be mentioned as "Figure". All photographic documentation should have on its back (in pencil) the number of the legend and page in the text indicating the correct position(portrait or landscape) of the figure, that may be glued on a separate sheet of paper. Illustrations (drawings or photographs without mounting) should not be larger than 203x254mm. Legends should be in a separate sheet of paper. The illustrations should allow a perfect reproduction of the original. Drawings and graphics should be done with nankim ink in white paper or drawing paper, and normographe fonts should be used for lettering, freehand and typewritten lettering is unacceptable. High resolution digital photographs printed in high quality photographic paper will be accepted. Copies of the digital photographs should be submitted on BMP, JPEG or TIFF format in CD or diskette. Colored photographs will not be accepted for publication in black and white. Illustrations in color require in real color for reproduction whenever possible.

Legends for Illustrations

Print out legends for illustrations using double spacing, on a separate page, with Arabic numerals corresponding to the illustrations. When symbols, arrows, numbers, or letters are used to identify parts of the illustrations, identify and explain each one clearly in the legend. Explain the internal scale and identify the method of staining in microphotographs.

6.8 Abbreviations

Use only standard abbreviations, avoiding abbreviations in the title and abstract. The first time an abbreviation appears it should be preceded by the full term for which an abbreviation stands in the text, unless it is a standard unit of measurement.

7. Protection of Patients' Rights to Privacy - Information that may identify a patient as a subject of a study (descriptions, photographs, and genealogy) should not be published without patient's informed consent. Photographs with inadequate protection of anonymity may be rejected by the publisher, if patients' rights to privacy were infringed. In these cases, the journal publisher's may require patient's informed consent.

8. Approval of Local Ethics Committee – Authors should send a letter with approval of the appropriate local ethics committee signed by all of them or the main author when the study involves human beings.

9. The Brazilian Journal of Videoendoscopic Surgery has all rights as well as translations reserved under both International and Pan American Copyright Conventions.

10. For the total or partial publication of text of manuscripts published in the Journal in other periodic written authorization of the editors of these periodic is necessary. It is also required citation of the journal.

11. It is forbidden translation or total or partial reproduction of the manuscripts for commercial purpose.

12. Brazilian Journal of Videoendoscopic Surgery editorial committee neither accept advertising nor pay authors of manuscripts published in its pages.

13. Brazilian Journal of Videoendoscopic Surgery reserves the right to reject manuscripts that do not comply with the requirements (presentation, typewrite, number of copies, copy in diskette, requested items …) in addition to suggest changes to manuscripts under the Editorial Board and Editorial Consultants analysis.

14. The Editorial Board when necessary will automatically adjust all approved manuscripts to the proposed requirements.

15. Conflict of interest disclosure statement: All authors must disclose any commercial interest, financial interest, and/or other relationship with manufacturers of pharmaceuticals, laboratory supplies, and/or medical devices and with commercial providers of medically related services. All relationships must be disclosed. Off label uses of products must be clearly identified.

16. Randomized controlled trial and clinical trials must be registered before submitted to publication. Instructions for registration can be found in **http://www.icmje.or/clin_trialup.htm** and the registration can be done in the National Library of Medicine clinical trial database (http://clinicaltrials.gov/ct/gui).

Manuscripts submission address:
Editors of the Brazilian Journal of Videoendoscopic Surgery
SOBRACIL – Av. das Américas, 4.801 room 308
Centro Médico Richet, Barra da Tijuca
22631-004 – Rio de Janeiro – Brazil
e-mail: revista@sobracil.org.br

MANUSCRIPT CHECKLIST

The authors should observe the following checklist before submitting a manuscript:

☑ Send three paper copies of the article (including figures, tables and graphics with legends).

☑ Include one copy in a CD in Microsoft Word software, with figures, tables and graphics with legends or send the files by email to: Revista@sobracil.org.br

☑ Write: a) Manucript cover letter; b) Permission for reproduction (including authorization for reproducing and copyright transfer statement; c) Letter of Clinical Research Approval of the Institution Ethics Committee where the study was conducted.

☑ Include: Identification Page (Title Page "with identification"), with a complete title of the manuscript; name(s) of author(s) and affiliation (or title(s)): institution where the work was conducted. Address, telephone and e-mail of the main author. b)Title Page "without identification" with Complete Manuscript Title and Short title to be sent to the Editorial Board.

☑ Verify standards formats and print out (pages numbered consecutively, double-spaced, one side of the paper print out, etc…).

☑ Verify sequence of the headings of the sections (depending on the type of manuscript).

☑ In the Abstract include: Objectives, Material (or Patients) and Methods, Results and Conclusion(s). Check the key words. The Abstract should have 200-250 words.

☑ Check if the references are according to the journal requirements: numbered consecutively, in alphabetical order or following the sequence that they are mentioned in the text.

☑ Verify the Legend of the Figures, Graphics and Illustrations that should be on a separate page.

☑ Photographs and Illustrations should be sent in a high quality resolution for possible reproduction (colored photographs will not be accepted for publication in black and white). Identify the photography on its back (in pencil) the number of the legend and page).

Brazilian Journal of Videoendoscopic Surgery reserves the right to reject manuscripts that do not comply with the requirements (presentation, typewrite, number of copies, copy in diskette, requested items …) in addition to suggest changes to manuscripts under the Editorial Board and Editorial Consultants analysis.

Events

**6th Biennial Meeting of Asia Pacif Society
for the of Aging Male (APSSAM)**
Busan, South Korea
September 1 – 4, 2011
E-mail: secretariat@apssam2011.org
Website: www.apssam2011.org/

9th European Urology Residents Education Programme (EUREP)
Prague, Czech Republic
September 2 – 7, 2011
E-mail: J.mcgrath@congressconsultants.com
Wesite:www:eurep.uroweb.org

41st National Congresso f the Poilish Association of Urology
Gdansk, Poland
Septermber 8 – 10, 2011
E-mai: kongresptu@ptu.net.pl
Website: www:pturol.org.pl/

**ESU organised course at the time of the national congresso
of the Polish Association of Urology**
Gdansk. Poland
September 9, 2011
E-mail: seu@uroweb.og
Website: www.uroweb.org

SBH
Sociedade Brasileira de Hérnia e Parede Abdominal

20a22 setembro 2012

São Paulo

Instituto Sírio Libanês de Ensino e Pesquisa

II Congresso Brasileiro de Hérnia

www.cbhernia.com.br

PRINCIPAIS TEMAS

- Cirurgia de hérnia e medicina baseada em evidências
- Minilaparoscopia
- Single port / single site hernia surgery
- Fisiopatologia da doença herniária – doenças do metabolismo e colágeno
- Novas tecnologias em telas e mecanismos de fixação
- Dor crônica e qualidade de vida
- Técnica se adapta ao paciente X Paciente se adapta à técnica
- Entendendo a recidiva
- O impacto do reparo prévio de hérnia com tela sobre a prostatectomia radical
- O impacto da prostatectomia radical prévia sobre o reparo da hérnia com tela
- Vídeos com padrões de técnicas: open repair, TAPP, TEP (com e sem trocater balão), LVIHR
- Sessão interativa com votação de consensos
- Debate sobre hérnias inguinais e ventrais

E muito mais ...

REALIZAÇÃO SBH Sociedade Brasileira de Hérnia e Parede Abdominal

AHS American Hernia Society

APOIO

AMH

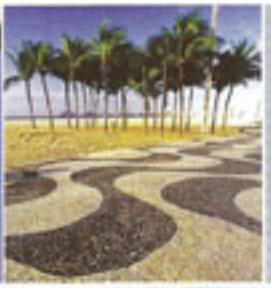
AGÊNCIA DE TURISMO GAP

SECRETARIA EXECUTIVA GAP

O mundo escolheu o Rio para as Olimpíadas e a Copa do Mundo e nós o escolhemos para o ...

SOBRACIL 2012
11º Congresso Brasileiro de Videocirurgia



18a21 julho
Rio de Janeiro
Windsor Barra Hotel

www.sobracil.org.br/congresso

Palestrantes internacionais já confirmados

Aurora D. Pryor
MD, F.A.C.S. (USA)
Departamento de Cirurgia Metabólica e de Perda de Peso - Universidade de Duke

Bernard Dallemagne
MD (França)
IRCAD / EITS
Departamento de Cirurgia Digestiva e Endocrinologia
Hospital Universitário de Strasbourg

Giovanni Dapri
MD (Bélgica)
Departamento de Cirurgia Gastrointestinal
Escola Européia de Cirurgia Laparoscópica
Hospital Universitário Saint-Pierre

Nathaniel J. Soper
MD (USA)
Professor e Chefe do Departamento de Cirurgia da Northwestern University
Escola de Medicina Feinberg

Leopoldo Videla
MD (Argentina)
Professor de Ginecologia - Universidade de Buenos Aires.
Chefe do serviço de Ginecologia do Instituto Cirúrgico de Callao, Buenos Aires.

Arnaud Wattiez
MD, PhD (França)
Depto. Cir. Ginecológica IRCAD França
Professor da Universidade de Strasbourg
Chairman da EAGS

Jacques Marescaux
MD, Hon. FRCS, Hon. FJSES, FACS (França)
Hospital Universitário de Strasbourg
Editor Chefe da WebSurg
Chefe do Departamento de Cirurgia Geral e Digestiva - Universidade Louis Pasteur

Joël Leroy
MD, FRCS (França)
IRCAD / EITS
Departamento de Cirurgia Digestiva
Hospital Universitário de Strasbourg

Michael Edward Bailey
MB BS LRCP FRCS FRCS Ed (Hon) (Reino Unido)
Hospital Guildford Nuffield
Universidade de Surrey

Raja M. Flores
MD (USA)
Chefe do Departamento de Cirurgia Torácica
Mount Sinai Hospital - NY

Luca Minelli
MD (Itália)
Chefe do Depto. de G&O do "Ospedale Sacro Cuore" - Verona
Professor Honorário das Universidades de Pádua e Nápole

Ted Lee
MD (USA)
Diretor de Cirurgia Ginecológica Minimamente Invasiva
Pittsburgh