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Brazilian Journal of Videoendoscopic Surgery

A Time of Changes

Dear Readers,

With this first issue of the 2012 volume we introduce a new cover design.

The improvements, however, go well beyond the cover.

The journal has undergone important changes. An international editorial board was established and a standardized model for reviewers has been implemented. The lag in publication is narrowing, as we publish issue No. 1 of the 2012 volume in the same calendar year. We intend to publish issues No. 2 and No. 3 in 2012, and No. 4 in early 2013, maintaining the continuity of the journal and getting it out on time.

Over the course of the past year and a half we published a six-part series of scientific methodology articles emphasizing study design and basic statistical concepts. The series received praise from several readers, we hope it stimulates more submissions from our readers.

Access to the journal through the SOBRACIL website has been modernized and readers can now find issues from 2010 and 2011. Full versions of articles from these years can be downloaded, for free.

In light of the contributions being made by our new international editorial board, the national editorial board has been streamlined to focus on Brazilian scholars whose CVs are available on the LATTES platform. The vast majority have advanced post-graduate degrees. All these measures allow us to request indexation by Lilacs and Scielo, the first step towards the recognition of the journal by the National Counsel of Technological and Scientific Development (CNPq). Not an easy task, given the many requirement.

Following the global trend, we are in the final stages of adding tools to the SOBRACIL site that will permit on-line submission of manuscripts. Indeed, soon, the only way to submit manuscripts will be electronically. On-line forms will automatically detect some errors. We expect all this will expedite the review process, and get our authors contributions published faster.

Improving this journal strengthens the Brazilian Society of Videosurgery, We need everyone's support!

Give us your feedback. Critiques. Engage.

Let's keep working together.

Marco Aurelio Pinho de Oliveira
Editor-in-Chief
Brazilian Journal of Videoendoscopic Surgery

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Tempo de Mudanças

Caros leitores,

Neste primeiro volume de 2012 estamos apresentando um novo desenho de capa. Mas as melhorias não devem ficar só na capa.

A revista passou por algumas modificações, incluindo a criação de um conselho editorial internacional e a criação de um modelo padronizado para os revisores. A defasagem na publicação está diminuindo, pois publicamos o primeiro número de 2012 dentro do mesmo ano. A intenção é publicar o 2o e 3o números ainda em 2012 e o 4o no início de 2013, mantendo a continuidade da revista e entregá-la em dia.

Nas últimas edições foram publicados seis editoriais sobre os diversos desenhos de estudos, incluindo conceitos básicos de estatística. Por conta desta série sobre metodologia científica recebemos elogios de vários leitores, e esperamos que a mesma ajude a aumentar o número de submissões dos nossos leitores.

No site da SOBRACIL o acesso para a revista foi modernizado e já é possível encontrar todos os números publicados em 2010 e 2011. Todos os artigos destes anos podem ser baixados na íntegra, gratuitamente.

Para valorizar as contribuições que vem sendo feitas pelos nossos novos membros internacionais, o conselho editorial nacional está sendo composto preferencialmente por membros com currículo Lattes. Além disso, a grande maioria possui título de doutorado e/ou mestrado.Todas estas medidas permitem que a partir de agora possamos pleitear inicialmente uma indexação no Lilacs e Scielo, primeiro passo para o reconhecimento da revista junto ao Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq). Não é uma tarefa fácil, pois as exigências são muitas.

Seguindo a tendência mundial, estamos na fase final da construção de um site dedicado para receber os artigos dos autores. Em breve, a única forma de envio será o eletrônico. Desta forma esperamos agilizar todo o processo de avaliação e fazer com que as contribuições dos autores possam ser publicadas mais rapidamente.

Valorizar a revista é fortalecer a SOBRACIL. Precisamos do apoio de todos!

Opinem. Critiquem. Enfim, participem.

Vamos trabalhar em conjunto.

Marco Aurelio Pinho de Oliveira
Editor-Chefe do Brazilian Journal of Videoendoscopic Surgery

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Brazilian Journal of Videoendoscopic Surgery

Original Article

Comparison Between Single Trocar Access (SITRACC) Cholecystectomy and Conventional Laparoscopic Cholecystectomy - One year follow-up

Comparação entre Colecistectomia laparoscópica Single Trocar Access (SITRACC) e Colecistectomia laparoscópica Convencional - Seguimento após um ano

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Study was conducted at the Red Cross Hospital, Curitiba, PR.

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ABSTRACT

Objective: To describe the data obtained after one year follow-up of patients who underwent Single Trocar Access (SITRACC®) cholecystectomy, compared to conventional endoscopic cholecystectomy. **Patients and Method:** Twenty patients who underwent SITRACC cholecystectomies and twenty patients who underwent conventional videocholecystectomy were questioned using the SF-36 instrument one year after the procedure to evaluate quality of life. The incidence of hernias in the trocar site was also studied. **Results:** There was no statistically significant difference between the groups with regard to quality of life and the trocar hernia rate. There were no major complications in either group**. Discussion:** The SITRACC device is a new platform for a novel surgical approach. The literature is limited regarding several important comparative questions, particularly whether this kind of approach truly offers benefits to patients. Studies which compare the SITRACC approach to the conventional laparoscopic approach in term of clinical outcomes (quality of life) and complications (the trocar hernia rate) are needed. **Conclusions:** One year after surgery the SITRACC cholecystectomy group had the same outcomes – in terms of quality of life as measured by the SF-36 – as the conventional laparoscopic cholecystectomy group, at least. There was no increase of trocar hernia cases in the SITRACC group. New studies are necessary, using larger series, to compare this new approach to the conventional endoscopic surgery procedures, especially concerning operative trauma and the metabolic response.

Key words: Videosurgery. Cholecystectomy. Surgery by Single Portal, SITRACC.

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INTRODUCTION

Since the 1987 introduction of videosurgery and the concept of minimally invasive surgery into the surgical field, it has been amply demonstrated that this approach offers patients less suffering, milder metabolic changes, faster recovery, and superior aesthetic results, and these advances have disseminating to operating rooms around the world quickly and enthusiastically.

With constant improvements in the optics and the instruments available for the performing videosurgeries, new and more complex procedures are being carried out successfully using the minimal invasion approach.

Simultaneously, new technologies and Minimum Access Surgery approaches have emerged, such as Natural Orifice Transluminal Endoscopic Surgery (NOTES), Needlescopy, and Surgery by Single Access, whose common goal is the search for minimal operative trauma and faster postoperative recovery, with the fewest complications.

Several platforms for performing Single Access Surgery have emerged in recent years[1]. One

of them is the Single Trocar Access – abbreviated SITRACC[2,3] – from the EDLO Company, Brazil, (Figures 1 and 2), that is a disposable single trocar which uses specially designed instruments (Figures 3, 4 and 5).

The literature lacks studies comparing classic videosurgery techniques with these new approaches. This paper reports the first comparative data, measured one year after the procedures, comparing SITRACC cholecystectomies and those done by conventional videosurgery.

METHODS

The Surgeries were performed at the Red Cross-Positivo University Hospital, in Curitiba, Brazil, between November 22, 2008 and October 30, 2010, after the study protocol was approved by the Ethics in Research Committee of the institution.

Twenty patients who had undergone SITRACC cholecystectomies and 20 patients who had undergone Standard Laparoscopic (SL) cholecystectomies were enrolled. All were at least one year out from their cholecystectomies.

All patients had had symptomatic cholelithiasis as the indication for surgery. The patients ranged in age from 18 to 65 at the time of surgery. Approximately three-quarters of each group – 15 in the SITRACC group and 14 in the SL group – were women.

Transumbilical access was established using the four channel Single Trocar Access (SITRACC®) platform (EDLO, Brazil). 5 mm trocars were used in three channels; the fourth channel typically had a 10 mm trocar, which could be converted to 5 mm with the use of a reducer. Flexible or articulated instruments, appropriate for the method, as well as a 5 mm 30

Figure 1 – *SITRACC® – Single Trocar Access Platform, EDLO, Brazil.*

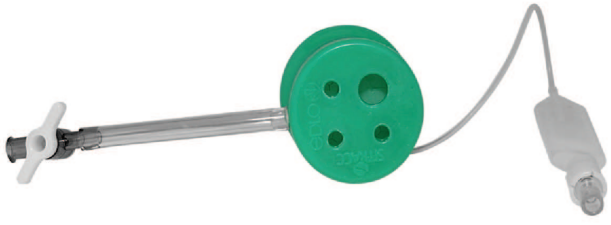


Figure 2 – *SITRACC – Note the three 5 mm and one 10 mm openings.*

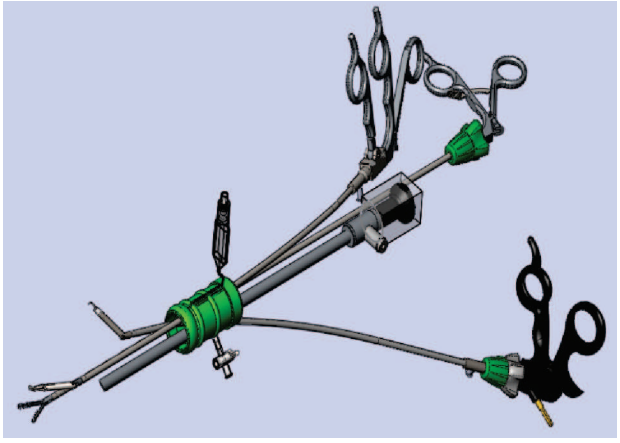
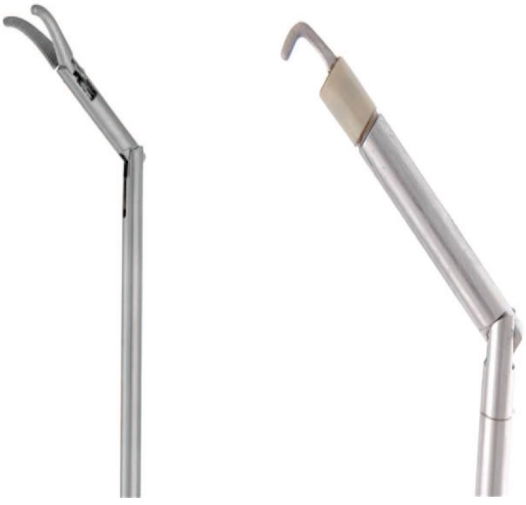


Figure 3 - *SITRACC platform, with the articulated instruments.*



Figures 4 and 5 - *SITRACC dissection forceps, with the articulated distal extremity and articulated hook, manufactured by EDLO, Brazil.*

degree optic were used. The "Standard Laparoscopic" cholecystectomies were performed following the classic steps.

Quality of life was measured using the Short Form (36) Health Survey (abbreviated SF-36) which was administered by an interviewer by telephone contact. The occurrence of incisional hernia at the trocar insertion site was also evaluated.

The SF-36 questionnaire measures health status. It consists of eight scaled scores (ranging from 0 to 100), which are calculated as the weighted sums of answers to the questions in each of eight domains:

1. Functional Capacity
2. Physical Aspects
3. Pain
4. General Health
5. Vitality
6. Social Aspects
7. Emotional Aspects
8. Mental Health

The results were tabulated and the group scores were compared by Mann-Whitney Non-Parametric Test; p values below 0.05 were considered statistically significant.

RESULTS

No incisional hernia was reported in either the SITRACC or SL group.

Analysis of the data shown in table 1 and figure 6 demonstrated that there was no statistically significant difference between the two groups on the SF-36 measures.

DISCUSSION

Since the groundbreaking publications of KALLOO[4,5] that initiated the study of the new

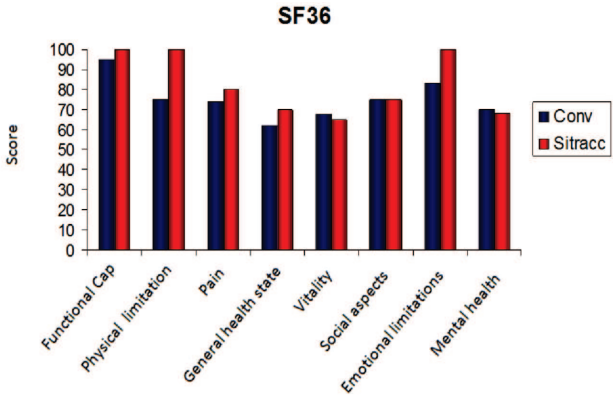


Figure 6 *- Mean scores obtained for the eight domains of the SF-36 health survey.*

Table 1 – *Results of the data collected by the application of the SF-36.*

SF-36 Domain	Technique	n	Average	Median	Minimum	Maximum	Standard Deviation	P Value
Functional Capacity	Conv	20	76.8	95.0	5.0	100.0	35.1	
	Sitracc	20	92.4	100.0	35.0	100.0	16.2	0.109
Limitations by Physical Aspects	Conv	20	62.5	75.0	0.0	100.0	42.5	
	Sitracc	20	92.6	100.0	25.0	100.0	19.3	0.071
Pain	Conv	20	62.1	74.0	20.0	100.0	25.0	
	Sitracc	20	76.8	80.0	30.0	100.0	20.2	0.138
General Health	Conv	20	58.4	62.0	10.0	80.0	17.8	
	Sitracc	20	64.9	70.0	20.0	80.0	14.5	0.215
Vitality	Conv	20	67.9	67.5	35.0	90.0	16.4	
	Sitracc	20	65.4	65.0	40.0	90.0	14.4	0.739
Social Aspects	Conv	20	68.2	75.0	5.0	100.0	30.5	
	Sitracc	20	76.5	75.0	25.0	100.0	19.2	0.570
Limitation by Emotional Aspects	Conv	20	71.4	83.3	0.0	100.0	36.7	
	Sitracc	20	92.1	100.0	66.6	100.0	14.6	0.138
Mental Health	Conv	20	66.6	70.0	24.0	92.0	20.0	
	Sitracc	20	68.7	68.0	40.4	96.0	12.8	0.860

approach now known as NOTES, several researches around the world have been conducting studies of the new equipment and instruments for this and even newer approaches, to determine their viability and practical application.

The training and demand for new workstations, access to the abdominal cavity, closure of the stomach and other hollow viscera, the potential for infection, the development of new and necessary equipment, and the orientation difficulty because of the use of regular endoscopes have emerged as the principal challenges for the development of transluminal surgery. They need to be overcome to transform NOTES into a common option in clinical and surgical practice.

The transumbilical approach now presents itself as the most viable technology, because the visualization is similar to conventional videosurgery, and because the development and use of flexible and articulated instruments allows a degree of triangulation, facilitating surgical maneuvers.

WHEELEES is credited with being the first to use the principles of single-access surgery, in 1969, to perform tubal ligation.[6]

In 1997 NAVARRA[7] et al.[7] described cholecystectomy performed through two 10 mm trocars introduced via the umbilicus.

Single Access Surgery entered in a period of latency, resurfacing in 2007, when ZHU published his first experience using the umbilicus as a single access path into the peritoneal cavity, a technique he named *Transumbilical Endoscopic Surgery* (TUES).[8]

In 2008, ZHU et al.[9] published a study describing new cases of TUES: two cases of hepatic cyst fenestration, six cholecystectomies, and nine appendectomies, using a trocar with three working channels.

Also in 2008, Indian authors PALANIVELU et al.[10] published a study describing eight transumbilical appendectomies in which a standard flexible endoscope was used. The authors considered the technique as a preparatory step for NOTES.

Since then Single Access Surgery techniques have been developed for various procedures such a nephrectomy and pyeloplasty,[11,12,13] adrenalectomy,[14] right colectomy,[15] sleeve gastrectomy,[16,17] adjustable gastric band,[18] Roux-en-Y gastric bypass,[19] gastrostomy,[20] intracorporeal gastrojejunostomy,[21] and splenectomy,[22] among others.

Procedures in several surgical subspecialties have been successfully performed using single surgical access techniques. Data to date indicate that transumbilical surgery is feasible and safe,[23] but the literature is quite limited in terms of medium to long term follow-up and in terms of studies comparing single access surgery and so-called conventional videosurgery.

The SF- 36 quality of life health survey was developed in the USA in the 1980s, and have be widely used and validated by several studies. The SF-36 is a multi-purpose, short-form health survey with 36 questions. It yields an 8-scale profile of functional health and well-being scores as well as psychometrically-based physical and mental health summary measures and a preference-based health utility index. It is a generic measure, as opposed to one that targets a specific age, disease, or treatment group. Accordingly, the SF-36 has proven useful in surveys of general and specific populations, comparing the relative burden of diseases, and in differentiating the health benefits produced by a wide range of different treatments. The experience to date with the SF-36 has been documented in nearly 4,000 publications, including surgical studies.[24,25,26,27,28]

The benefits of Single Access Surgery as compared to NOTES vary, but include from the principles of *Scarless Surgery* – operations that leave little or no scar – to the improved vision provided (which surgeons already use in regular laparoscopic procedures), and the low risk of infection.

We still need large double blind series, that compare similar procedures performed using single access surgery techniques with those performed by regular videosurgical methods. Data collected in this study begins to demonstrate that single access surgery has, in the medium and long term, outcomes that are at least comparable to outcomes obtained with the current "gold standard" approach for performing cholecystectomy, the videocholecystectomy.

Single access surgery procedures need to be viewed as part of an operative arsenal that extends from open surgery to videosurgery and NOTES. Each patient is unique, as is his or her illness. It is up to the experienced surgeon to determine the best approach that offers security and better surgical outcomes and aesthetic results.

RESUMO

Objetivos: Descrever os dados obtidos pelo menos um ano após a realização de colecistectomias pela abordagem Single Trocar Access (SITRACC®), comparadas àquelas realizadas pela abordagem laparoscópica convencional. **Pacientes e Método:** Foram estudados vinte pacientes SITRACC e vinte pacientes submetidos à colecistectomia laparoscópica convencional, todos eles pelo menos um ano após o procedimento, tendo sido submetidos ao questionário SF-36, classicamente utilizado como medida de aferição da qualidade de vida, bem como também foi avaliada a incidência de hérnia em sítio de trocater. **Resultados:** Não houve diferença estatística significativa entre ambos os grupos estudados, tanto com relação à qualidade de vida quanto sobre o montante de incidência da hérnia em local de trocater. Igualmente entre ambos os grupos não foram relatadas complicações maiores. **Discussão:** A plataforma SITRACC é um novo equipamento para uma nova abordagem, que necessita de estudos comparativos com a abordagem convencional mais aprofundados, bem como sobre a incidência de hérnia incisional. A literatura disponível é escassa na resposta de diversas questões comparativas, especialmente se este tipo de abordagem realmente representa benefício real para os pacientes. **Conclusões:** O grupo submetido a colecistectomia SITRACC apresentou o mesmo nível de satisfação, com relação a qualidade de vida, quando comparado ao grupo convencional, um ano após os procedimentos. Não houve aumento de incidência de hérnia incisional no grupo Single Trocar Access. Novos estudos são necessários, utilizando-se séries maiores, para comparar esta nova abordagem aos procedimentos videocirúrgicos convencionais, especialmente no que diz respeito ao trauma cirúrgico e à resposta metabólica.

Palavras chave: Videocirurgia. Colecistetomia. Cirurgia por Portal Único, SITRAC.

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Brazilian Journal of Videoendoscopic Surgery

Original Article

Pelvic Endometriosis – A Survey of Knowledge and Practice Among Gynecologists

Endometriose Pélvica – Enquete com Médicos Ginecologistas

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The Word took place in Sugisawa Hospital and Medical Center.
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ABSTRACT

Purpose: Endometriosis affects a large number of reproductive age women. Clinical manifestations of the disease are cyclic pelvic pain and infertility. Women with endometriosis usually seek medical advice from a gynecologist for their symptoms. The role of the gynecologist is therefore crucial in identifying, treating, and, when appropriatey, referring these patients promptly to specialised centers. Methods: A brief questionnaire was completed anonymously by 40 Brazilian gynecologists. Results: 67.5% of the respondents perform surgery for endometriosis. Approximately half (55%) of the respondents stated that the physical examination can diagnose cases of deeply infiltrating endometriosis; 92.5% do not exclude the possibility of deep endometriosis when serum CA-125 levels are normal. Magnetic resonance imaging, transvaginal ultrasound and colonoscopy are important in the preoperative assessment of the patient for 72.5%, 70%, and 62.5% of the respondents. For 62.5% of the respondents, GnRH analogues are the best medical management for endometriosis. Only 17.5% of the gynecologists think that all hormone-based treatments have similar outcomes. Although 80% of gynecologists responded that complete resection of the disease is the best treatment for deep lesions, 44% of the gynecologists that perform surgery for endometriosis recommend only diagnostic laparoscopy in these cases. Only 7.4% of the respondents are able to treat deep endometriosis with bowel involvement without the aid of a general surgeon or a colorectal surgeon. Conclusions: More education is required among gynecologists on the subject of endometriosis, in order to identify and treat patients with this disease. Referral to a center with the necessary expertise to offer all available treatments in a multi-disciplinary context is important to improve the surgical outcomes of deep infiltrating endometriosis.

Key words: Endometriosis. Diagnosis. Treatment. Deep endometriosis. Laparoscopy.

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INTRODUCTION

Endometriosis is a benign gynecological disease defined as the presence of endometrial tissue – consisting of gland and/or stroma – outside of the uterine cavity.[1] This condition is predominantly found in women of reproductive age and affects approximately seven to ten percent of all women, 71% to 87% of women with chronic pelvic pain, and 38% of women with infertility.[2]

The deep infiltrating disease has been defined as endometriosis that penetrates more than 5mm below the peritoneal surface and is strongly associated with severe chronic pelvic pain, dyspareunia and dysmenorrhea. In this situation the endometriotic implants may involve the uterosacral ligaments, pouch of Douglas (retrocervical endometriosis), rectovaginal septum and even the rectum, bladder and ureters.[3]

The diagnosis includes deep history, physical examination and complementary imaging tests to stage the disease and plan a possible surgical treatment.[4,5]

Treatment should be individualized for each patient. Hormonal treatments are effective for controlling pain related to endometriosis, but are not an option in women wishing to get pregnant.[6,7] Surgical treatment is indicated for the histopathologic diagnosis

of the disease and is necessary in symptomatic patients to complete medical treatment. In general, the evidence suggests that complete excision of endometriosis offers prolonged symptom relief, particularly in women with severe or debilitating symptoms. To ensure complete removal of disease and for the best results in terms of quality of life, several procedures may be required, including surgical manipulation of the bladder, ureters, rectum, and vagina.

The complication rate for laparoscopic surgery for deep endometriosis is estimated to be 3.4%, and may reach 10% to 22% when intestinal resection is necessary.[3] Postoperative intestinal fistula have a deleterious impact on women's fertility and quality of life and is the most worrisome complication of this type of surgery.

In this article, we report our assessment of the knowledge of a group of Brazilian gynecologists with regard to clinical evaluation and treatment of endometriosis using hypothetical cases.

METHODS

From June to December 2010 we surveyed gynecologists about endometriosis. A questionnaire (available in the Appendix of this article) was sent electronically to 400 members of the Society of Obstetricians and Gynecologists of Paraná (SOGIPA), chosen randomly, and was hand-delivered to 40 physicians taking laparoscopy courses (Gynelaser) held in Brasilia.

Data analysis was conducted using version 8.0 of the STATISTICA statistical software package.

Os dados foram inseridos no programa STATISTICA 8.0 e avaliados.

RESULTS

Only the questionnaires hand-delivered in the laparoscopy courses were completed (n = 40), accounting for only 9.1% of the 440 questionnaires distributed. No gynecologist answered the survey electronically.

Gynecologists who answered the survey had been in a practice an average of 15.2 ± 10 years (range 1-40 years). Thirty percent of gynecologists reported having specific training in the treatment of endometriosis; 45% responded that they perform laparoscopic surgeries. Forty-five percent reported performing open surgery for the treatment of deep endometriosis, and 30% said they perform laparoscopic surgery for deep endometriosis. As three of the 40 gynecologists (7.5%) reported performing both open and laparoscopic surgery for endometriosis, the total percentage of gynecologists among survey respondents that treat deep endometriosis was 67.5%. Fifty percent of gynecologists have already participated in or accompanied surgeries of deep endometriosis involving the retrocervical region, the rectovaginal septum, or the intestine.

Regarding the diagnosis of endometriosis, 55% stated that the diagnosis of endometriosis can be suspected or established by the gynecological examination. For 65% of the gynecologists the value of serum CA-125 levels is important for the diagnosis of endometriosis, but 92.5% do not rule out the diagnosis of endometriosis when the CA-125 level is normal.

Table 1 shows the imaging studies gynecologists consider important in the preoperative investigation of deep endometriosis.

Table 1 - *Responses to the question: "Which tests do you consider important for the preoperative diagnosis and investigation of deep endometriosis?"*

Imaging Test	Yes	No
Transvaginal Ultrasound	28 (70%)	12 (30%)
Transvaginal Ultrasound after bowel prep	22 (55%)	18 (45%)
Ultrasound of the urinary tract	16 (40%)	24 (60%)
CT of the Pelvis	12 (30%)	28 (70%)
Magnetic Resonance Imaging of the pelvis	29 (72.5%)	11 (27.5%)
Colonoscopy	25 (62.5%)	15 (37.5%)
Transrectal Ultrasound	16 (40%)	24 (60%)

In the setting of a clinical suspicion of endometriosis, but without abnormal findings on physical examination, or in imaging studies or laboratory tests, 57.5% of gynecologists recommend a diagnostic laparoscopy and 42.5% said they try a therapeutic trial with an oral contraceptive.

In patients with endometriosis lesions larger than 1 cm in diameter in the uterosacral ligament, 35% of gynecologists believe that colonoscopy is the most important test to include in the preoperative investigation. For 30% of gynecologists computed tomography of the pelvis is the most important test and for 22.5% ultrasonography of the urinary tract should be ordered as part of the pre-operative evaluation (Figure 1).

For deep endometriosis, 80% of the gynecologists surveyed considered complete resection of the lesion the ideal surgical treatment and 15% favor bipolar coagulation of lesions. Five percent of the gynecologists responded "I don't know." Of the 27 gynecologists who reported performing surgery for deep endometriosis, 81.5% responded that they do complete resection of the lesions (Table 2).

For 52.5% of gynecologists, the deep lesions of endometriosis in uterosacral ligament exceeding 1 cm in diameter should be treated by means of complete resection of the lesion associated with ureterolysis (Figure 2).

Thirty-five percent of the gynecologists think that laparoscopic uterosacral nerve ablation (LUNA) is the most important procedure to prevent recurrence of endometriosis in patients with endometriotic nodules in the rectovaginal septum involving the vagina. Thirty percent responded that they "don't know" and only 20% considered that resection of the posterior fornix of the vagina is the procedure that helps reduce the risk of recurrence (Figure 3).

In the opinion of 62.5% of gynecologists, the GnRH analogue Zoladex is the most effective medication for the medical management of endometriosis. Only 17.5% believe that all medical treatments have a similar effect (Figure 4).

Regarding the surgical techniques for resection of an endometriosis lesion involving the intestine, 25% know only segmental resection with anastomosis, 35% stated they "don't know", and 40% know the three techniques mentioned in question (segmental resection with anastomosis, discoid resection, and rectal shaving).

For cases of deep endometriosis involving the intestine or the rectovaginal septum, 57.5% of gynecologists state they perform complete resections

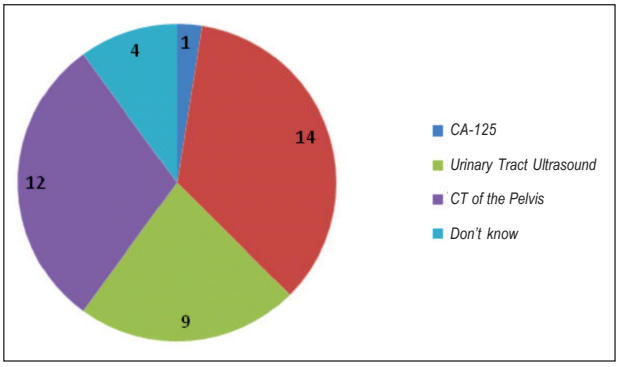

Figure 1 *- Responses to the question: "In a patient with a deep endometriosis lesion larger than 1 cm in the uterosacral ligament, which do you consider important as part of the preoperative evaluation?"*

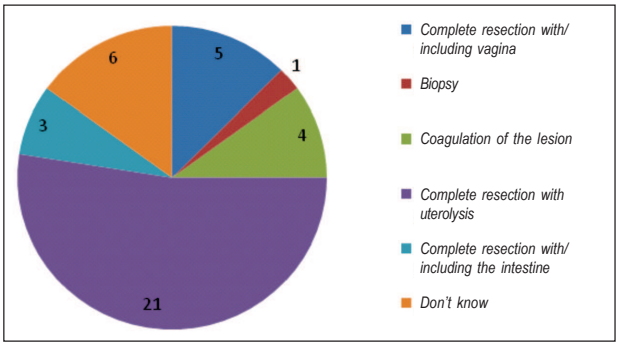

Figure 2 *- Responses to the question: "In a patient with deep endometriosis of the uterosacral ligament >1cm (lateral lesion), what procedure should be performed in most cases?"*

Table 2 *- Surgical treatment of deep lesions of endometriosis.*

Surgical Treatment	Does not perform endometriosis surgery	Performs endometriosis surgery
Bipolar coagulation of the lesion	2 (15.4%)	4 (14.8%)
Complete Resection of the lesion	10 (76.9%)	22 (81.5%)
Don't know	1 (7.7%)	1 (3.7%)

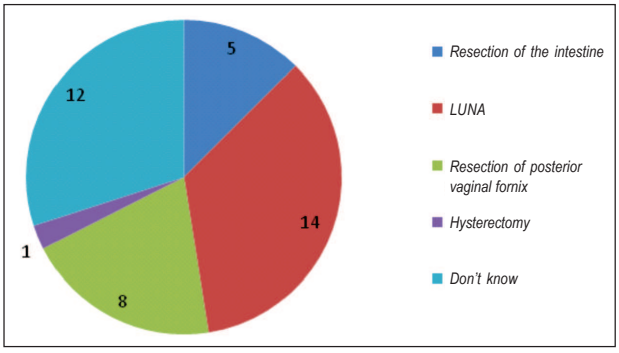

Figure 3 *- Responses to the question: "For a patient with an endometriosis nodule in the rectovaginal septum on imaging and a palpable vaginal lesion during the gynecological exam what procedure should be performed to reduce the risk of recurrence?"*

LUNA = laparoscopic uterine nerve ablation

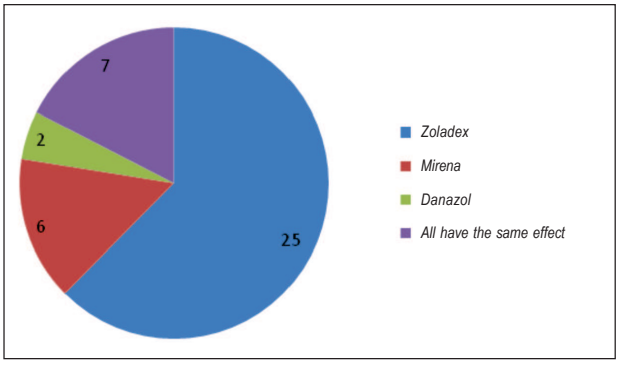

Figure 4 *- Responses to the question: "What is the best medication for the medical management of endometriosis?"*

of the lesions, 55% state they operate with the help of a general surgeon or coloproctologist, and 2.5% operate without resorting to the assistance of another professional. Considering only those gynecologists who said they operate on endometriosis, 44.4% responded that they recommend diagnostic laparoscopy rather than complete resection of the lesion (Table 3).

In the case of severe (stage IV) endometriosis with obliteration of the posterior fornix and the possibility of intestinal involvement, only 7.4% of gynecologists who perform surgery for endometriosis reported having the training to perform the procedure without the assistance of a general surgeon or a coloproctologist (Table 4).

For 72.5% of gynecologists the presence of an endometrioma is a risk factor for presence of deep disease (Table 5).

When asked which treatment option would maximize the chance of pregnancy for a woman with a clinical suspicion of endometriosis, infertility for 1 year, an increased CA-125, and deep lesions of endometriosis involving the rectovaginal septum, 40% responded that it is complete resection of the lesion followed by *in vitro* fertilization, 25% said it is complete resection associated with Zoladex, and 17.5% chose *in vitro* fertilization (without surgery) (Figure 5).

Table 6 shows the procedures that gynecologists who responded to the questionnaire are trained to perform.

DISCUSSION

In this paper we describe preliminary results of a survey conducted with gynecologists about pelvic endometriosis, demonstrating that there are still some pitfalls in the diagnosis and treatment of patients with endometriosis.

The preoperative diagnosis of Deep endometriosis is very important for surgical planning and in order to be able to discuss with patients the risks and potential complications of surgery. Deep endometriosis

Table 3 *- Responses to the question: "In a case of a patient with suspected endometriosis involving the intestinal or the rectovaginal septum, you recommend".*

Surgical Treatment	Does not perform endometriosis surgery	Performs endometriosis surgery
Diagnostic Laparoscopy with biopsy	3 (23.1%)	7 (25.9%)
Referral to surgeon or coloproctologist	0	1 (3.7%)
Diagnostic Laparoscopy and Zoladex	1 (7.7%)	5 (18.5%)
Complete surgery with the presence of a surgeon or coloproctologist	9 (69.2%)	13 (48.2%)
Complete surgery without the presence of a surgeon or coloproctologist	0	1 (3.7%)

Table 4 - *Responses to the question: "When during surgery you encounter with AFS stage IV-R endometriosis, with total obliteration of the posterior fornix and the possibility of intestinal involvement, what is your approach?"*

Surgical Treatment	Does not perform endometriosis surgery	Performs endometriosis surgery
Interrupt the surgery and use Zoladex	1 (7.7%)	6 (22.2%)
Interrupt the surgery and refer to surgeon or coloproctologist	1 (7.7%)	5 (18.2%)
Summon a surgeon or coloproctologist to assist and continue the surgery	6 (46.1%)	14 (51.8%)
Continue the surgery alone	5 (38.5%)	2 (7.4%)

Table 5 - *Responses to the question: "In the case of a patient with an endometrioma of 4 cm in diameter, what is important to keep in mind when you recommend surgery?"*

Response	Number (%)
Oophorectomy	7 (17.5%)
Endometrioma is a marker of deep disease	29 (72.5%)
Surgery not indicated	2 (5%)
Don't know	2 (5%)

involving the uterosacral ligaments, retrocervical region, pouch of Douglas, and posterior vaginal fornix can usually be palpated on digital vaginal examination when they exceed 5 to 10mm in diameter. The physical examination is important because guides the selection of laboratory and imaging tests to be ordered. The clinical/physical examination should include: (1) inspection of the retrocervical area as well as the upper portion of the posterior vaginal wall in search of typical bluish lesions, and (2) vaginal examination in search of nodules in the uterosacral ligaments and pain upon extension of the uterosacral ligaments. By re-examining the patient during the menstrual period we can increase the performance of the exam.[9] In our study, only 55% of gynecologists responded that deep endometriosis nodules can be felt on physical examination, this probably has a direct impact on clinical diagnosis. Gynecologists who think that the disease cannot be felt on physical examination probably do not search for retrocervical nodules or nodules in the posterior vaginal fornix during the vaginal digital examination, which may be one of the reasons for failure to diagnose this disease and for delay in diagnosis. This is consistent with the findings of Arruda et al[10] who showed that the time between symptom onset and diagnosis of endometriosis in Brazilian women is about seven years.

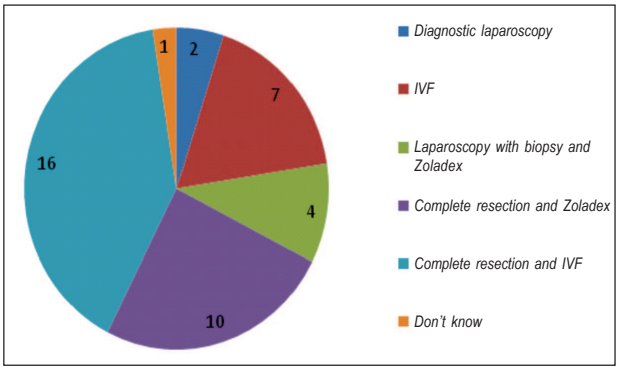

Figure 5 - *Responses to the question: "For a woman with clinical suspicion of endometriosis, with infertility for one year, with an elevated CA-125, and deep lesion of endometriosis involving the rectovaginal septum, which would be the treatment of choice (that gives the best results for pregnancy) if the her main goal at that moment is to get pregnant?"*

The presence of a high CA-125 level in a young patient with symptoms of endometriosis increases the suspicion of endometriosis, but a normal value does not exclude the possibility. Normally no biologic test is necessary for the diagnosis of endometriosis. The increase in the CA-125 is related to the volume of deep endometriosis lesions.[9]

One report suggests[11] that the use of a panel of six serum markers (interleukin 6, interleukin 8, tu-

Table 6 - *Surgical procedures that the gynecologists reported having the technical knowledge to perform.*

Procedure	Yes	No
Bladder resection	17 (42.5%)	23 (57.5%)
Ureterolysis	13 (32.5%)	27 (67.5%)
Segmental intestinal resection and anastomosis	10 (25%)	30 (75%)
Rectal shaving	6 (15%)	34 (85%)
Double J catheter placement	8 (20%)	32 (80%)
Ureteral anastomosis	13 (32.5%)	27 (67.5%)
Ureteral reimplantation	6 (15%)	34 (85%)

mor necrosis factor alpha, high-sensitivity protein C, CA-125 and CA-19-9) to test specimens obtained during the secretory phase or during menstruation allow the diagnosis of both minimal and mild and moderate to severe endometriosis, with high sensitivity and clinically acceptable specificity.

Kafali et al[12] showed that it may be possible to make a clinical diagnosis of endometriosis by evaluating differences in CA-125 levels during the menses with the rest of the menstrual cycle. In their study of 28 women, there was a 22% increase in serum CA-125 levels during the menstrual period (12.2 U / ml) compared with the rest of the menstrual cycle (10 U/ml) in the control group. This increase was also observed in women with endometriosis, but the levels varied 198.3%. The mean CA-125 levels in these patients was 35.8 U/ml during menses compared with 12 U/ml during the rest of the menstrual cycle. In our survey, 65% of gynecologists said that CA-125 is important for the diagnosis of endometriosis, but 92.5% would not rule out the possibility of deep endometriosis when the CA-125 value is normal.

Several imaging studies have been used to map the lesions of deep endometriosis. The most commonly reported in the literature are transvaginal pelvic ultrasound (with or without a bowel preparation), magnetic resonance imaging, and transrectal ultrasonography. Abrao et al[4] evaluated the ability of the clinical examination, transvaginal ultrasonography, and magnetic resonance imaging to diagnosis endometriosis with retrocervical or recto-sigmoid involvement.

One hundred and four women with a clinical suspicion of endometriosis were evaluated using these three diagnostic methods which were later correlated with the surgical specimen histopathologic findings. Endometriosis was confirmed histologically in 94.2% of patients. Regarding recto-sigmoid or retrocervical region involvement, respectively, the digital examination had a sensitivity of 72% and 68%, a specificity of 54% and 46%, positive predictive value of 63% and 45%, negative predictive value of 64% and 69%, and an accuracy of 63% and 55%. For transvaginal ultrasound, the sensitivity was 98% and 95%, the specificity was 100% and 98%, positive predictive value was 100% and 98%, negative predictive value was 98% and 97% and the accuracy was 99% and 97%. MRI had a sensitivity of 83% and 76%, a specificity of 98% and 68%, positive predictive value of 98% and 61%, negative predictive value of 85% and 81% and an accuracy of 90% and 71%.

In a similar fashion, Bazot et al[5] compared the value of the physical examination, transvaginal ultrasound, transrectal ultrasound, and magnetic resonance imaging in the evaluation of different locations of deep infiltrating endometriosis. Ninety-two patients with clinical evidence of pelvic endometriosis were evaluated retrospectively. The sensitivity and positive and negative likelihood ratios for physical examination, transvaginal ultrasound, transrectal ultrasound, and magnetic resonance imaging were respectively 73.5%, 3.3, and 0.34; 78.3%, 2.34, and 0.32; 48.2%, 0.86 and 1.16; and 84.4%, 7.59, and 0.18 for endometriosis in uterosacral ligaments; 50%, 3.88 and 0.57; 46.7%, 9.64 and 0.56; 6.7%, –, 0.93; and 80%, 5.51, and 0.23 for vaginal endometriosis; and 46%, 1.67, and 0.75; 93.6%, – , and 0.06, 88.9%, 12.89 and 0.12; and 87.3%, 12.66 and 0.14 for intestinal endometriosis. The authors concluded that MRI has results comparable to transvaginal ultrasound and transrectal ultrasound for the diagnosis of intestinal endometriosis, but has a greater sensitivity and higher likelihood ratios for the diagnosis of endometriosis in the uterosacral ligaments and in the vagina.

Several authors[13] have shown that injection of ultrasound gel inside the vagina and rectum to perform magnetic resonance imaging can identify rectovaginal endometriosis with a sensitivity of 90.9% and a specificity of 77.8%. For the presence of a deep lesion, the sensitivity can reach 94.1% and specificity 100%. These findings were confirmed by Chassang et al[14] who also showed that the opacification of the vagina and rectum with ultrasound gel significantly improved the sensitivity of MRI for the detection of deep endometriosis, allowing better delineation of the pelvic organs. This was especially apparent for lesions in the vagina and rectovaginal septum.

Ultrasonography of the urinary tract is important in cases of lateral lesions infiltrating the uterosacral ligaments and large volume midline lesions in order to assess ureteral involvement. Donnez et al[15] prospectively evaluated 405 women with severe dysmenorrhea or deep dyspareunia due to recto-vaginal endometriosis nodules using intravenous pyelography. Ureteral stenosis with hydronephrosis was observed in 18 patients (4.4%). A significantly higher prevalence (11.2%) was observed in nodules equal to or exceeding 3 cm in diameter. Five women had complete ureteral stenosis. Renal scintigraphy revealed damage to renal parenchymal function ranging from 18 to 42%.

Computed tomography is another potential option as an imaging modality for the evaluation of deep endometriosis,[16] but most groups with experience in deep endometriosis prefer MRI. Given that the endometriosis deposits have a predilection for the outer layers of the wall intestinal,[17] colonoscopy has a limited role in identifying lesions of intestinal deep endometriosis since it is better suited for evaluating the bowel mucosa.

In the opinion of gynecologists who responded to the study, transvaginal ultrasonography and pelvic MRIs are the studies most frequently ordered for the investigation of deep endometriosis (70% and 72.5%, respectively), which is consistent with the recent literature. Nevertheless, 62.5% still feel that colonoscopy is a study to be used in the investigation of deep endometriosis. Only 22.5% of gynecologists remembered the importance of urinary tract ultrasonography in the evaluation of women with posterolateral lesions of deep endometriosis (in the uterosacral ligaments).

Treatment of endometriosis must be customized for each patient and can be divided into medical and surgical, or a combination of both. The therapeutic approach varies depending on the wishes of the patient: the treatment for infertility is different than the treatment of painful symptoms.

The clinical treatment has a role in the strategy of the management of endometriosis when administered for a prolonged period of time. It has been shown that progestins can prevent the implantation and growth of regurgitated endometrial inhibiting the expression of matrix metalloproteinases and angiogenesis, as well as having various anti-inflammatory effects *in vitro* and *in vivo* that may reduce the inflammatory state generated by metabolic activity of the ectopic endometrium. Oral contraceptives increase the abnormally low apoptotic activity of the endometrium of women with endometriosis. Furthermore, anovulation, decidualization, amenorrhea, and establishing an estrogen-progestin balance contribute to the quiescence of the disease.[18]

Empirical treatment for painful symptoms whose probable cause is endometriosis, but without definitive pathological diagnosis includes counseling, analgesia, nutritional therapy, and the progestins or combined oral contraceptives. It is unclear whether the latter should be administered in a conventional manner, continuously or in a tricyclic regime.[19] Among the gynecologists who answered the survey, 42.5% said they prescribe a therapeutic trial of an oral contraceptive when they have a clinical suspicion of endometriosis; the remaining 57.5% recommend laparoscopy.

Similar efficacy has been observed with several medical treatments for women with endometriosis confirmed by histopathology following surgery. Thus, the combined oral contraceptives and progestins, based on their favorable safety profile, good tolerability and low cost, should be considered first-line agents, both as an alternative to surgery and for postoperative adjuvant use. In situations where the progestin and oral contraceptives are ineffective, poorly tolerated or contraindicated, GnRH analogs, Danazol or gestrinone can be used. As the reproductive prognosis is not improved by medical therapy, is not indicated for women who want to get pregnant.[7]

In a Cochrane review including 4935 women,[20] the GnRH analogues seem to be more effective in relieving pain associated with endometriosis than a placebo or no treatment. There was no evidence of a difference in pain relief between

GnRH analogues and Danazol, although more side effects have been reported in the groups that used analogues. There was no evidence of a difference in pain relief between the GnRH analogues and levonorgestrel. The literature also suggests that there is no evidence of a difference in the results of treatment of painful symptoms associated with endometriosis using oral contraceptives and GnRH analogues.[21]

For patients with a clinical diagnosis of adenomyosis, the levonorgestrel IUD appears to be effective in reducing uterine volume, with improvement of vascularization and relief of symptoms. Sheng et al[22] treated severe dysmenorrhea due to adenomyosis using the levonorgestrel IUD and followed the patients for three years. There were declines in pain scores measured using a visual analogue scale, a reduction in uterine volumes, and a reduction in CA-125 levels. The most common side effect was weight gain (28.7%), followed by formation of simple ovarian cysts (22.3%), and pelvic pain (12.8%). In 36 months, the overall satisfaction rate was 72.5%.

Even in women with rectovaginal endometriosis, the effect of clinical treatment in terms of improvement in pain appears to be substantial, with pain relief, reduction in lesion size during treatment, and improved quality of life.

Progestins and combined oral contraceptives have repeatedly been shown to be safe, well tolerated, and effective in the long-term treatment of women with symptomatic endometriosis, as have danazol and GnRH analogues.

The best candidates for long-term medical management are those women who do not wish to get pregnant and those who have undergone surgery without success. The patients who have not responded or adhered to treatment or who do not want to use medical treatment for a long period of time – even if well tolerated – should considered surgery. It is important to remember that hormonal treatments should not be offered in the presence of obstructive uropathy, symptomatic intestinal stenosis, or the presence of a suspicious adnexal mass.[6]

Only 17.5% of gynecologists in this survey responded that the medical treatments for endometriosis have a comparable clinical response profile. The great majority of them (62.5%) still think the best medical treatment for endometriosis is a GnRH analog.

Surgical treatment of endometriosis is a complex procedure. While superficial endometriosis can be treated safely and effectively by most gynecologists, the deep infiltrative disease must be treated in specialized endometriosis centers. For women to be treated appropriately, it is necessary to try to identify pre-operatively whether or not they have deep endometriosis.[23] Normally the surgery entails a combination of several procedures, including release of adhesions, oophoroplasty or oophorectomy, ureteral procedures (double-J catheter placement, ureterolysis, uretero-ureteral anastomosis or ureteral reimplantation), bladder procedures (partial cystectomy), vaginal procedures (resection of the posterior vaginal fornix) or intestinal procedures (shaving, discoid resection, or resection with anastomosis). The professional who performs surgery for deep endometriosis must be qualified to perform all these procedures or should work in a multidisciplinary team that is able to perform these surgical procedures.

The presence of an ovarian endometrioma should make the gynecologist pay attention to the fact that there may be other concomitant lesions of deep endometriosis. Among the gynecologists who answered the survey, 72.5% agreed with this statement. In 1999, Redwine[24] noted that superficial or deep ovarian endometriosis is a marker for the presence of extensive intestinal and pelvic disease. The surgeons who diagnose and treat endometriomas may be underdiagnosing and undertreating their patients. Banerjee et al[23] prospectively evaluated 295 women with histologically confirmed endometriosis - 61 (21%) had ovarian endometriomas. A higher proportion of women with endometrioma had endometriotic disease involving the intestine compared with women without endometrioma (77% vs. 21%, P <0.001).

A strong relationship was observed between the presence of endometrioma and obliteration of the posterior fornix, disease involving the recto-sigmoid, and involvement of the sero-muscular layer of the intestine. The presence of endometrioma significantly increased the probability of having the disease in the sigmoid-rectum, with a positive likelihood ratio of 6.96 (95% CI: 4.04 to 12). With a negative likelihood ratio of 0.55 (95% CI: 0.45 to 0.67) the absence of endometrioma, however, did not rule out the presence of disease in the sigmoid-rectum.

A study by Chapron et al[25] included 500 women with deeply infiltrating endometriosis. Among

women with associated ovarian endometrioma, the number of isolated lesions of deep endometriosis was lower (41.9% vs. 61.1%). The average number of lesions of deep endometriosis was statistically higher in women with associated ovarian endometrioma (2.51 ± 1.72. vs. 1.64 ± 1). For women with associated ovarian endometrioma, deep endometriosis lesions were more severe, with higher rates of lesions in the vagina, intestine, and ureter.

ESHRE guidelines recommend laparoscopic ovarian cystectomy in cases of endometrioma equal to or exceeding 4 cm in diameter to confirm the diagnosis histologically, reduce the risk of infection, improve access to follicles and possibly improve ovarian response. Coagulation or laser vaporization without the excision of the pseudocapsule is associated with an increased risk of cyst recurrence.[19]

Several surgical techniques have been described to address endometriotic lesions involving the intestine, including rectal shaving, discoid resection, and bowel resection with colorectal anastomosis. In 2005, Mohr et al[26] described 187 women treated laparoscopically for intestinal endometriosis. Complete pain relief in the immediate postoperative period was significantly higher with partial bowel resection compared to shaving alone (92% vs. 80%, respectively, $p < 0.04$). The shaving, a less invasive procedure, was associated with a lower complication rate: 6% compared with 23% for discoid resection ($p < 0.007$) and 38% for bowel resection ($p < 0.001$), and higher pregnancy rates. In the experience of the gynecologic service of Clermont-Ferrand[3], the rate of major postoperative complications in women undergoing treatment for severe endometriosis requiring some bowel procedure was 9.3%.

Post-operative complications occurred in 6.7% of women who underwent rectal shaving and 24% of women who underwent segmental bowel resection. In a prospective analysis of 500 cases of deep endometriosis nodules treated by rectal shaving,[27] major complications included seven cases of rectal perforation (1.4%), four cases of ureteral injury (0.8%), bleeding exceeding 300 ml in one case (0.2%), and urinary retention in four cases (0.8%). Of the 388 women who wanted to become pregnant, 221 (57%) conceived spontaneously and 107 (27.6%) through in vitro fertilization. Ultimately, 328 (84.5%) conceived. The recurrence rate was 8% and was significantly lower ($p < 0.05$) in women who became pregnant (3.6%) than in women who did not became pregnant (15%). Among the women who did not want to become pregnant or failed to become pregnant, severe pelvic pain recurred in 16% to 20%.

In those patients with a lesion that is palpable on digital vaginal examination, it seems that the surgery is only complete when the resection of the posterior vaginal fornix is performed. Matsuzaki et al[28] assessed 61 women with recto-vaginal endometriosis nodules larger than 2 cm in diameter and found that the distance between the vaginal mucosal epithelium and the endometriotic glands was <1 mm in 30 patients (49.2%) and <5mm in 60 patients (98.4%), which provides histological evidence that the excision of the posterior vaginal fornix is necessary to completely remove voluminous rectovaginal endometriotic nodules. Complete surgical excision of deep endometriosis with excision of tissue adjacent to the posterior vaginal fornix improves quality of life with long-term persistence of results in patients who don't respond to medical management.[29]

Patients with endometriosis and moderate to severe ureteral dilatation may require concomitant procedures for excision of endometriosis, including ureterolysis, uretero-ureterostomy, nephrectomy or uretero-cystoneostomy.[30,31] Ureteral involvement is a serious and silent complication that should be considered in all cases of deeply infiltrative endometriosis. Isolation and laparoscopic retroperitoneal inspection of both ureters helps diagnose silent ureteral involvement. Conservative laparoscopic surgery provides a safe and feasible modality for the management of ureteral endometriosis.[32] In a study by Seracchioli et al[32] which included 30 women with laparoscopic diagnosis of endometriosis with ureteral involvement, confirmed histologically, the diagnosis was presumed preoperatively in only 40% of patients. Ureteral involvement occurred on the left side in 46.7%, on the right side in 26.7%, and bilaterally in 26.7%. It was associated with endometriosis in the ipsilateral uterosacral ligament in 100% of the cases, in the bladder in 50%, in the rectovaginal septum in 80%, in the ovaries in 53.3%, and in the bowel in 36.7%.

Concerning the role of laparoscopic uterine nerve ablation (LUNA) in the management of the pelvic pain associated with endometriosis, a Cochrane review published in 2005,[33] assessed the effectiveness of surgical interruption of pelvic nerve for the treatment of primary and secondary dysmenorrhea. For the management of secondary dysmenorrhea, treatment

with LUNA combined with surgical treatment of endometrial implants versus surgical treatment of endometriosis alone showed that the addition of LUNA did not help in relieving pain. For presacral neurectomy combined with the treatment of endometriosis versus treatment of endometriosis alone, there was a overall difference in the pain control, although the data suggest that this may be specific for laparoscopy and only for midline abdominal pain. Adverse effects were most common for pre-sacral neurectomy; however, most were complications such as constipation, which can improve spontaneously.

With regard to gynecologists' practice when faced with deep endometriosis lesions, 80% said that the ideal surgical treatment is complete resection of the lesion. However, when we put a scenario of a patient with deep endometriosis with intestinal or rectovaginal septum involvement, 44.4% of the gynecologists who responded said they do endometriosis operations responded that they recommend a diagnostic laparoscopy and not a complete resection, which contradicts the answer to the previous question.

Only one of the gynecologists (7.4%) reported that they performed this type of surgery without the assistance of a surgeon general or a coloproctologist. Only 20% of gynecologists remembered the need for resection of the posterior fornix of the vagina for deep lesions palpable on digital vaginal examination, and 35% still believe that LUNA has an important role in preventing the recurrence of symptoms and of the lesions.

The relationship between endometriosis and infertility is still controversal.[1] Several factors can affect spontaneous fertility in women with deep endometriosis including the woman's age[34] (especially above age 35), the presence of uterine adenomyosis,[35] the presence of associated male infertility, and couples' attitudes about natural conception and infertility treatments. Treatment with intrauterine insemination appears to improve the fertility in cases of minimal or mild endometriosis. *In vitro* fertilization (IVF) treatment is the appropriate treatment when tubal function is compromised, when there is male infertility or when other treatments have failed, but pregnancy rates with IVF are still lower in patients with endometriosis than those with infertility due to tubal factors.[19]

We conclude that more education is necessary among gynecologists with respect to endometriosis in order to identify and treat patients with this disease. Referral to specialized centers that offer all available treatments in a multidisciplinary context is important to improve the surgical results of deep infiltrative endometriosis.

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We thank the 40 doctors who answered the questionnaires anonymously and collaborated with the study.

RESUMO

Objetivo: A endometriose afeta um grande número de mulheres em idade reprodutiva. As manifestações clínicas da doença são dor pélvica cíclica e infertilidade. As mulheres com endometriose geralmente procuram atendimento médico devido à sua sintomatologia. O papel do ginecologista é, portanto crucial na identificação, no tratamento e, quando necessário, no encaminhamento das pacientes para centros especializados. Métodos: Um questionário anônimo foi completado por 40 ginecologistas brasileiros. Resultados: 67.5% dos avaliados realizam cirurgia para endometriose. Aproximadamente metade (55%) dos avaliados declararam que o exame físico pode diagnosticar casos de endometriose profunda e 92,5% não excluem a possibilidade de doença profunda quando os níveis de CA-125 séricos são normais. Ressonância nuclear magnetica, ultra-som transvaginal e colonoscopia são importantes na avaliação pré-operatória das pacientes para 72,5, 70 e 62,5% dos avaliados. Para 62,5% dos avaliados, os análogos de GnRH são o melhor tratamento clínico para endometriose. Apenas 17,5% dos ginecologistas acham que todos os tratamentos clínicos hormonais têm resultados semelhantes. Embora 80% dos ginecologistas responderam que a ressecção completa da doença é o melhor tratamento para a doença profunda, 44% dos ginecologistas que realizam cirurgia para endometriose indicam apenas laparoscopia diagnóstica nesses casos. Apenas 7,4% dos avaliados são capazes de tratar endometriose profunda com comprometimento intestinal sem o auxílio de um cirurgião geral ou um cirurgião colo-retal. Conclusões: Mais educação é necessária entre os ginecologistas com relação à endometriose, a fim de identificar e tratar pacientes com esta doença. O encaminhamento para centros especializados que ofereçam todos os tratamentos disponíveis em um contexto multi-disciplinar é importante para melhorar os resultados cirúrgicos da endometriose profunda infiltrativa.

Palavras chave: Endometriose. Diagnóstico. Tratamento. Endometriose profunda. Laparoscopia.

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APPENDIX

SURVEY ON SURGICAL TREATMENT OF DEEP ENDOMETRIOSIS

Dear colleague,

Thank you for your willingness to participate in this survey regarding the surgical treatment of endometriosis. As we know, there is a high prevalence of endometriosis in women of reproductive age and it is up to us, gynecologists, to advise the best treatment, whether medical, surgical, or a combination of the two.

After you respond to the questionnaire, we will be sending you several articles on the subject.

Number of years practicing gynecology: _____ years

Have you had some specific training in the management of endometriosis? (Please circle only one option)
YES NO

Do you perform laparoscopic procedures?
YES NO

Do you perform open surgeries to treat deep endometriosis?
YES NO

Do you perform laparoscopic surgeries to treat deep endometriosis?
YES NO

Have you had the opportunity to accompany or participate in a surgery for deep endometriosis involving the retrocervical region, rectovaginal septum, or intestine?
YES NO

Can the diagnosis of endometriosis be established by the physical examination?
YES NO I don't know

Do you believe that the CA-125 level is important for the diagnosis of endometriosis?
YES NO I don't know

When the CA-125 is normal, do you dismisses the diagnosis of deep endometriosis?
YES NO I don't know

What tests do you consider important for the diagnosis and preoperative investigation of deep endometriosis? (Please circle the tests that you normally order. If a test is not indicated, please note "NI")

Transvaginal pelvic ultrasound _____
Transvaginal pelvic ultrasound with bowel preparation _____
Ultrasound of the urinary tract _____
Computed tomography of the pelvis _____
Magnetic resonance imaging of the pelvis _____
colonoscopy _____
Transrectal ultrasound _____
I don't know

In the setting of a clinical suspicion of endometriosis, but no physical examination findings, laboratory or imaging, you would:

Try a therapeutic trial with contraceptive
Dismiss endometriosis
Indicates a laparoscopy
I don't know

In a patient with deep endometriosis lesions > 1cm in the uterosacral ligament, which test do you considers important as part of the pre-operative work-up:

CA-125
colonoscopy
Ultrasound of the urinary tract
Computed tomography of the pelvis
I don't know

What is the best form of surgical treatment of deep lesions of endometriosis?

Biopsy of the lesion
Coagulation of injury with bipolar cautery
Complete resection of the lesion
I don't know

In a patient with deep endometriosis of the uterosacral ligament >1cm (lateral lesion), what procedure should be performed in most cases?

Complete resection of the lesion with a portion of the vaginal vault
Biopsy of the lesion
Coagulation of the lesion
Complete resection of the lesion with ureterolysis (release of the ureter)
Curative resection with bowel resection
I don't know

A patient has an endometriosis nodule in rectovaginal septum found on imaging and a vaginal lesion palpable to the touch. What procedure should be performed to reduce the risk of recurrence?

Bowel resection
Laparoscopic Uterine Nerve Ablation (LUNA)
Resection of the posterior fornix of the vagina
Hysterectomy
I don't know

What is the best medication for the medical management of endometriosis?

Zoladex
Oral contraceptive
Progestin (oral or intramuscular)
Mirena
Danazol
All have the same effect
I don't know

What are the surgical techniques for resection of a lesion of endometriosis involving the intestine?

Intestinal resection and anastomosis
Discoid resection of the rectum
Shaving
All of the above
I don't know

In the case of a patient with suspected endometriosis involving the intestine or the rectovaginal septum, you would:

Recommend a diagnostic laparoscopy with biopsy
Refer to a digestivesurgeon or coloproctologist
Recommend a diagnostic laparoscopy and adjuvant treatment with Zoladex
Recommend a complete surgery including bowel resection or rectal shaving, if necessary, along with a digestive surgeon or coloproctologista
Recommend a complete surgery including bowel resection or rectal shaving, if necessary, without resorting to a colleague from another specialty

When you encounter intra-operatively AFS-R stage IV endometriosis with total obliteration of the posterior fornix and the possibility of intestinal involvement, what is your approach?

Halt the operation and postoperatively execute medical management with Zoladex
Halt the operation and refer to a digestive surgeon or digestive coloproctologista
Summon a digestive surgeon or coloproctologist during the procedure and continue to surgery
Continue the surgery; as you have experienced in the surgical manipulation of the urinary and gastrointestinal tracts, address involvement of the ureter or rectosigmoid as necessary.

In the case of a patient with an endometrioma of 4 cm in diameter, which is important to keep in mind when they recommend surgery?

One should remove the entire ovary to prevent recurrence, since the recurrence rate of endometrioma is high.
Endometrioma is a marker of deep endometriosis and there is a possibility of other associated lesions (retrocervical, rectovaginal septum, intestine, ureter)
There is no indication for surgery for an endometrioma of this size
I don't know

For a woman clinically suspected of having endometriosis, who has been infertile for one year, with an elevated CA-125, and a deep lesion of endometriosis involving the rectovaginal septum, which would be the treatment of choice (with the best success for pregnancy) if the main objective at that time is to get pregnant?

Recommend laparoscopy to confirm the diagnosis of endometriosis
Refer for *in vitro* fertilization (IVF)
Recommend laparoscopy with biopsy and take Zoladex post-operatively
Recommend complete resection of the lesion and then treat with Zoladex
Recommend complete resection of the lesion and then *in vitro* fertilization
I don't know

What surgical procedures would you have no difficulty performing, if necessary, during an operation?

Resection of bladder
Ureterolysis
Segmental bowel resection and anastomosis
Rectal shaving
Double-J catheter
Ureteral anastomosis
Ureteral reimplantation

THANK YOU FOR YOUR TIME!
ALL INFORMATION CONTAINED IN THIS QUESTIONNAIRE IS CONFIDENTIAL

I DECLARE THAT I ACCEPTED TO PARTICIPATE IN THIS SURVEY VOLUNTARILY

_____
signature

THE INITIALS OF YOUR NAME:
_____

DATE: _____ / _____/2010

Brazilian Journal of Videoendoscopic Surgery

Original Article

Laparoscopic Transmediastinal Drainage: A Simple and Effective Procedure for Reverting an Accidental Pneumothorax During Laparoscopic Antireflux Surgery

Drenagem transmediastinal laparoscópica: Um procedimento simples e eficaz para reverter um pneumotórax acidental durante uma cirurgia laparoscópica antirefluxo

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ABSTRACT

Introduction: Pneumothorax (PTX) secondary to pleural injury is an uncommon accident in laparoscopic antireflux surgery (LARS). Its frequency is approximately 2–6%. The current therapy for transoperative PTX is thoracic intercostal drainage. **AIM:** To evaluate the treatment of accidental transoperative PTX using a new procedure: laparoscopic transmediastinal drainage (LTD). **Materials and Methods:** From January 2000 to September 2010, 400 patients underwent LARS and 18 patients presented accidental pleural injuries. All 18 were treated using LTD. LTD was performed by the insertion of an 8 to 12 French silicone drain between the diaphragmatic pillars, leaving all the holes of the drain in the pleural cavity. The drain's exit was made through a 3 to 5 mm trocar hole inserted below the 5 mm work-trocar. The patients were kept on high-pressure mechanical ventilation (PEEP) by the anesthesiologist. The drains were removed 15 min on average after the end of the surgery and a chest radiograph was performed to confirm the absence of PTX. **Results:** No significant complication was observed when this technique was used for the treatment of PTX. Radiographic confirmation of the absence of PTX was obtained in all the patients. **Conclusions:** The treatment of PTX by LTD is a safe, simple, and effective method and should be considered the procedure of choice for this complication during LARS. By avoiding traditional intercostal drainage LTD maintains a minimally invasive surgery and preserves the desired esthetic outcomes.

Key words: Pneumothorax. Intraoperative complications. Laparoscopy. Laparoscopy transmediastinal drainage. Antireflux procedure. Gastroesophageal reflux disease.

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1. INTRODUCTION

Laparoscopic antireflux surgery (LARS) is an effective alternative to lifelong antireflux medical therapy and has become the standard approach to hiatal hernia repair and surgical treatment of gastroesophageal reflux disease (GERD).[1-3] Numerous studies have shown that LARS is a safe and effective treatment with excellent intermediate and long term functional outcomes, which results in high patient satisfaction, and significantly improves patients' long term quality of life.[4,5]

Although laparoscopic fundoplication surgery is a safe and effective procedure, it is not free of

complications. One complication of laparoscopic surgery is accidental pneumothorax (PTX). It occurs more often during laparoscopic reoperations for antireflux procedures which failed to resolve symptoms. In published studies, Nissen fundoplication surgery has a 2% to 6% rate of accidental PTX.[6]

The association of Nissen fundoplication with PTX is usually the result of the complexity of the surgical procedure, leading to a pleural injury, an otherwise uncommon accident in LARS. This occurrence is higher at a reoperation procedure. The current therapy for transoperative PTX is thoracic intercostal drainage. Such an intervention would be viewed as parting from what was a minimal access surgery.

This study reports and evaluates the treatment of accidental PTX – occurring as a result of antireflux surgical therapy – employing a novel, simpler, safer, and effective procedure, the laparoscopic transmediastinal drainage (LTD).

2. PATIENTS AND METHODS

From January 2000 to September 2010, 400 patients underwent LARS; 18 patients presented pleural injuries (Figure 1). There were 5 left-sided pleural injuries among 351 primary antireflux procedures and 13 pleural injuries (10 left-sided and 3 right-sided pleural injuries) among 49 redo procedures (Table 1). All 18 pneumothorax were successfully treated using LTD.

2.1. Surgical Technique

LTD was performed by the insertion of an 8F silicone drain between the diaphragmatic pillars, if the patient did not present a simultaneous hemothorax, with all of the holes of the drain within the pleural cavity (Figure 2A). In more complex cases, such as reoperations with bleeding, the insertion of a larger diameter (12F) drain, better drains a simultaneous hemothorax. The drain's exit was made through a 3 mm (8F) or 5 mm (12F) trocar hole inserted below the 5 mm work-trocar (Figure 2B).

All patients underwent Nissen laparoscopic fundoplication; no conversion to open surgery was required. The positioning of the surgical team, patient, and trocars is summarized in figure 3.

The patients were maintained on Positive End-Expiratory Pressure (PEEP) at 5 to 10 cm H_2O by the anesthesiologist during the surgery. The drains

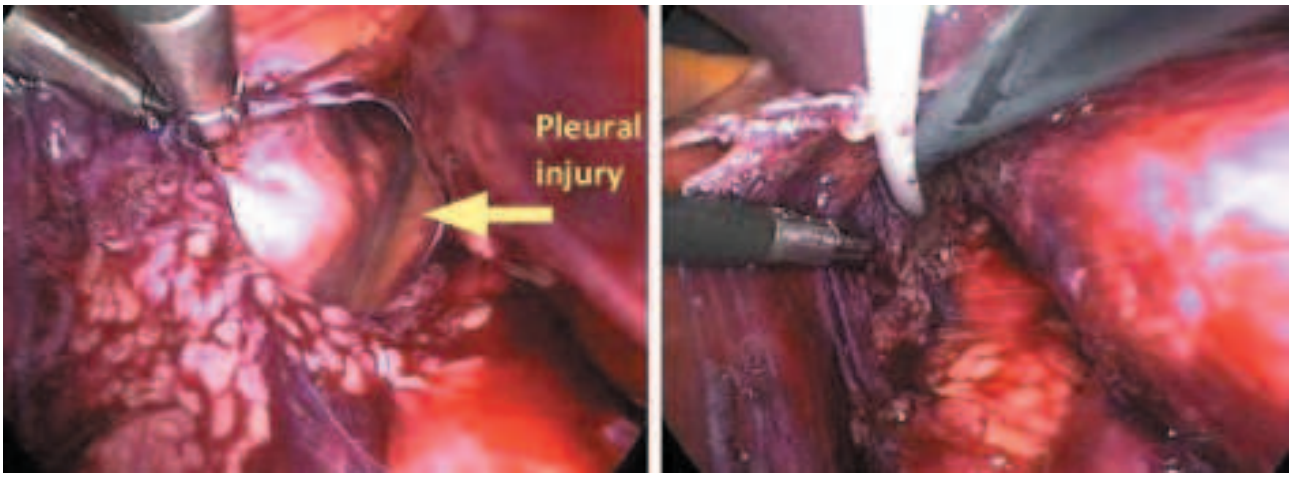

Figure 1 *- Right pleural injury and drain positioning.*

Table 1 *- Frequency of pleural lesions by primary operations and reoperations.*

	Primary Operations (n = 351)	**Reoperations (n = 49)**	**Total (N = 372)**
Left pleural lesions	5 (1.4)	10 (20.4)	15 (4.0)
Right pleural lesions	0	3 (6.1)	3 (0.8)

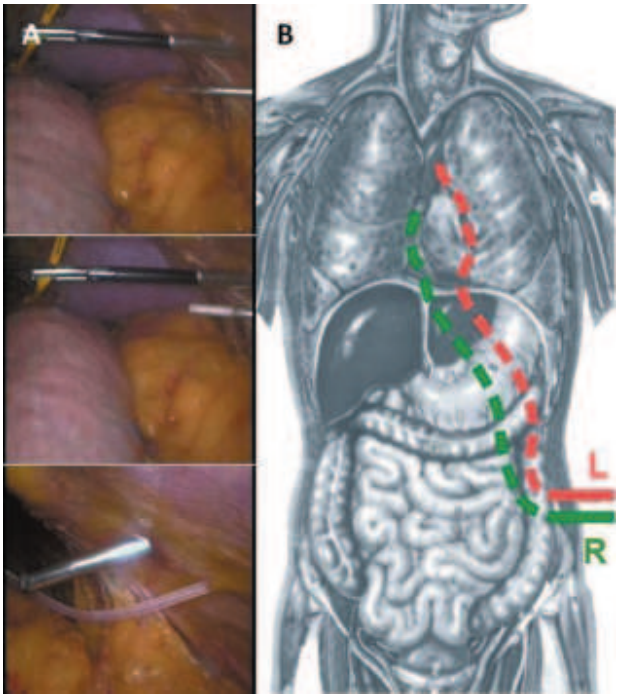

Figure 2 *- A - Sequence of drain insertion into the peritoneal cavity. B - Path and exit of drain below the left 5 mm trocar.*

were removed, on average, 15 minutes after the end of the surgery and a chest radiograph was obtained to confirm the absence of PTX.

3. RESULTS

No significant complication was observed in this technique used for the treatment of PTX. Radiography confirmed the absence of PTX in all the patients.

The patients were asked about their satisfaction with the outcome after surgery. In a subjective evaluation of the patient satisfaction, all were satisfied with the outcome of the surgery.

4. DISCUSSION

PTX does not normally constitute a problem in open surgery because the intrapleural pressure is equal to the operating room pressure (atmospheric or zero pressure) and application of a minimal PEEP will force the lungs to inflate fully. In contrast, the intrapleural pressure of a PTX (or, to be precise, a capnothorax) created during laparoscopy may equalize the positive intraperitoneal insufflation pressure and thereby prevent full inflation of the lung during inspiration. Such an event may impair gas exchange.[7] Moreover, the PTX may reduce the operative space.

If the PTX is recognized during the beginning or in the middle of surgery, the prevailing treatment

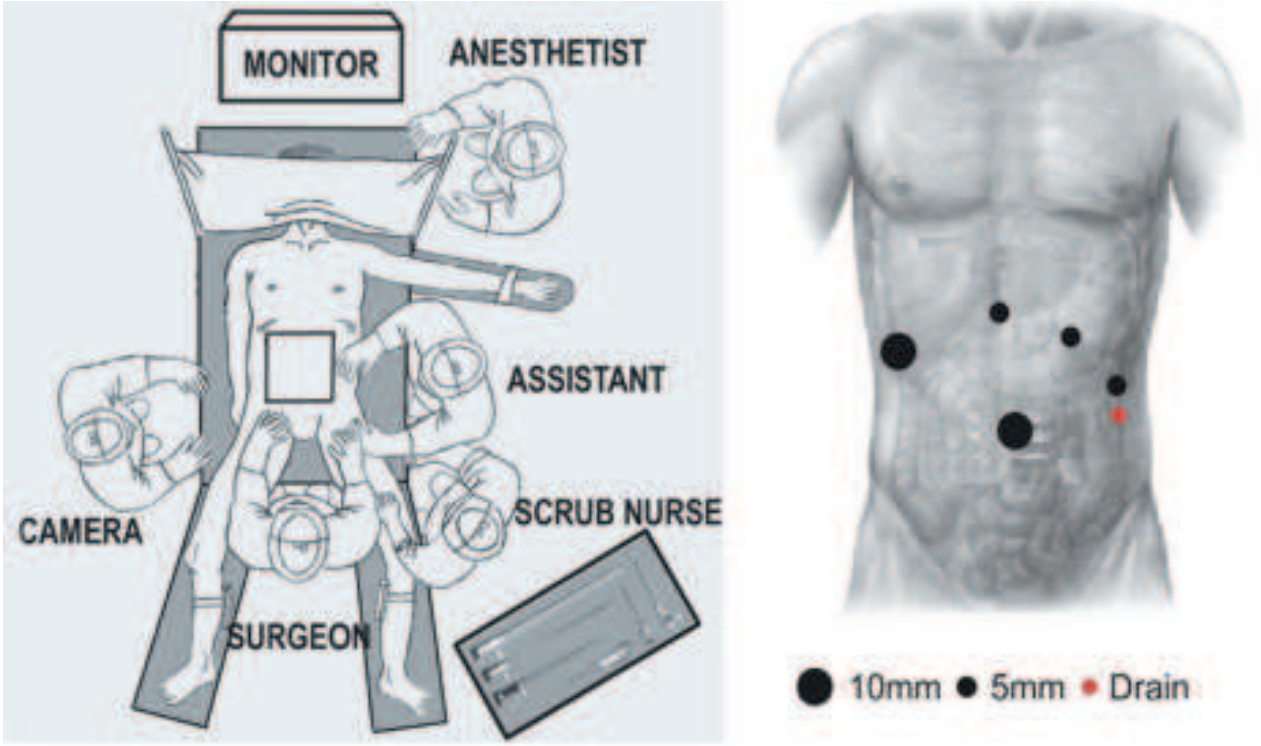

Figure 3 *- Positioning of the patient and surgical team: patient in the middle at a cephalus upward angle of 30° with the legs bent.*

consists of deflating the abdomen, performing a thoracic intercostal drainage, and then proceeding with the surgery if the patient remains hemodynamically stable.[8] LTD, not only avoids thoracostomy, but the intended esthetic results are maintained; only a minimal additional incision, usually 3 mm trocar hole in the abdomen, for 8F drainage, is required.

The psychological benefits for the patient are relevant. Thoracostomy may be viewed as an unexpected complication of the surgery, while an additional small abdominal incision probably won't. Transmediastinal pneumothorax drainage preserves the main goal of laparoscopic procedure: minimal postoperative morbidity.

Since 2000 the LTD technique described in this report has been the remedy of choice in our institution to treat all patients who experience an accidental PTX during antireflux surgical therapy.

5. CONCLUSIONS

Treatment of PTX by LTD is a safe, simple, and effective method and it should be considered the procedure of choice for this complication during LARS. LTD maintains the minimally invasive nature of the surgery, and preserves the desired esthetic outcomes.

This technique merits wide dissemination among surgeons, so that it benefits more patients.

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RESUMO

Introdução: Pneumotórax secundário a lesão pleural é um acidente incomum em cirurgia laparoscópica antirrefluxo. Sua frequência é aproximadamente 2-6%. A terapia atual para o pneumotórax transoperatório é a drenagem torácica intercostal. **Objetivo:** Avaliar o tratamento de um pneumotórax acidental transoperatório usando um novo procedimento, a drenagem laparoscópica transmediastinal. **Materiais e Métodos:** De janeiro de 2000 a setembro de 2010, 400 pacientes foram submetidos à cirurgia laparoscópica antirrefluxo dos quais 18 apresentaram lesões pleurais acidentais. Todos foram tratados usando a drenagem laparoscópica transmediastinal. Ela é realizada pela inserção de um dreno de silicone 8F-12F entre as bordas do pilar diafragmático, deixando todos os orifícios do dreno na cavidade pleural. A saída do dreno foi criada através de uma incisão feita por um trocar de 3-5 mm inserido abaixo do trocar de 5 mm. Os pacientes foram mantidos em ventilação mecânica de alta pressão pelo anestesista. Os drenos foram removidos em uma media de 15 minutos após o final da cirurgia e uma radiografia de tórax foi realizada para confirmar a ausência de pneumotórax. **Resultados:** Nenhuma complicação foi observada por essa técnica usada para o tratamento do pneumotórax. Radiofragia confirmou a ausência de pneumotórax em todos os pacientes. **Conclusões:** O tratamento por Drenagem Laparoscópica transmediastinal é um método seguro, simples e efetivo e deve ser considerado um procedimento de escolha para essa complicação durante a cirurgia laparoscópica antirrefluxo e cirurgia minimamente invasive, além de manter o resultado estético, evitando a drenagem intercostal tradicional.

Descritores: Pneumotórax. Complicações intraoperatórias. Laparoscopia. Drenagem transmediastinal laparoscópica. Procedimento antirrefluxo. Doença do refluxo gastroesofageal.

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Original Article

Laparoscopic Partial Nephrectomy for Renal Tumors Larger Than 4cm

Nefrectomia parcial laparoscópica para tumores renais maiores que 4 cm

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ABSTRACT

Background: Minimally invasive laparoscopic partial nephrectomy (LPN) is commonly performed for renal tumors d" 4 cm in size. LPN for tumors > 4 cm has not been assessed. **Objective**: To evaluate the safety and feasibility of LPN for tumors > 4 cm by compariang them to a group of patients undergoing LPN for tumors d" 4 cm. **Materials and Methods:** We reviewed data for 171 consecutive patients who underwent transperitoneal LPN between May 2002 and May 2012 performed by a single surgeon. Patients were stratified into two groups: 32 with tumors > 4 cm on preoperative imaging (group 1) and 139 patients with tumors d" 4 cm (group 2). Preoperative, perioperative, pathologic, and functional outcomes data were analyzed and compered between groups. We used X^2 and student t tests for categorical and continuous variables, respectively. A *p* value *<0.05* was considered statistically significant. **Results:** Mean radiographic tumor size was 5.9 cm (4.1 – 9.2) for group 1 and 2.3 cm (0.9 – 4.0) for group 2. No significant differences were found between groups for estimated blood loss, total operative time, length of hospital stay, complication rates, and change in estimated glomerular filtration rate. Patients with larger tumors had longer median warm ischemia times (22 vs 17 min; p= 0.011). **Conclusions:** In our experience, LPN for tumors > 4 cm is safe and feasible, showing comparable outcomes to LPN for smaller tumors. More studies are necessary to determine the viability of LPN for large tumors as an effective form of treatment.

Key words: Laparoscopy. Nephrectomy. Partial nephrectomy. Renal cell carcinoma.

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1. INTRODUCTION

Nephron-sparing surgery has become an established approach for small renal tumors, demonstrating oncologic efficacy equivalent to that of radical nephrectomy (RN)[1-3] with the advantage of preservation of renal function and possibly improved survival. Laparoscopic partial nephrectomy (LPN) has demonstrated comparable oncologic and functional outcomes to open partial nephrectomy (OPN)[4]; however, partial nephrectomy (PN) for larger tumors may pose additional technical challenges during surgery. OPN has been described for patients with tumors > 4 cm in size with satisfactory results.[3] LPN has also been described for patients with tumors > 4 cm,[5,6] but technical challenges may be even more pronounced with a laparoscopic approach than with an open approach. We evaluate early surgical, functional, and oncologic outcomes of LPN for renal tumors > 4 cm on preoperative imaging and compare these results to outcomes for tumors d" 4 cm.

2. PATIENTS AND METHODS

Data for 171 consecutive patients who underwent transperitoneal LPN at our institution

between May 2002 and May 2012 by a single surgeon (MBM) were reviewed from a prospectively maintained, institutional review board-approved database. Tumor size was assessed preoperatively with either computed tomography or magnetic resonance imaging. Patients were stratified into two groups based on clinical tumor size: 32 with tumors > 4 cm on preoperative imaging (group 1) and 139 patients with tumors ≤ 4 cm (group 2).

Pre-operative demographic factors analyzed included age, gender, surgical side, body mass index, history of previous abdominal surgery and American Society of Anesthesiologists classification. The tumor's location, endophytic nature, and proximity to the collecting system were assessed using preoperative imaging. The number of procedures performed for incidentally discovered masses and imperative indications (solitary kidney, bilateral renal masses, stage 3 or worse chronic kidney disease) was also assessed.

Our LPN technique reproduces the open procedure step-by-step. Briefly, patients are placed in flank position, and ports are placed as demonstrated in figure 1 for the right side and figure 2 for the left side.

Bowel mobilization and kidney exposure are performed. The renal hilum is dissected – and the perinephric fat is reflected to expose the kidney capsule – and then stretched for dissection of the renal vessels. Finally the kidney positioned for optimal tumor resection. The renal capsule is scored to demarcate the margins of the resection. Hilar occlusion is performed in all cases using either a laparoscopic bulldog clamp (Storz®) or a laparoscopic Satinsky clamp (Taimin®).

For large, endophytic, or central tumors, we generally clamp both the artery and the vein. For small, peripheral, cortical tumors, we sometimes clamp onlythe artery; when possible we clamp the terminal artery. Tumor excision is performed sharply with laparoscopic scissors, ensuring adequate surgical margins. In our series, the renal capsule was reapproximated using 0 polyglactin sutures anchored with Hem-o-lok clips (Telefex Medical, Research Triangle Park, NC, USA) using the sliding clip renorrhaphy technique. The opposite side is secured by a Hem-o-lok clip to reapproximate capsular edges under tension. For larger tumors in which the excision leaves a wide defect, bolsters may be used.

Perioperative factors analyzed included total operative time (including abdominal insufflation, port placement, specimen extraction, and closure), warm ischemia time, hilar clamping technique, estimated blood loss (EBL), conversion rate, change in hemoglobin 24 hours after surgery, length of hospital stay, and length of follow-up. Complications were recorded using the Clavien classification system.[7] Change in the estimated glomerular filtration rate (GFR) from baseline was assessed 24 hours postoperatively and at follow-up visits one to three months after surgery using the Modification of Diet in Renal Disease formula.[8] Pathologic factors analyzed included tumor size, histology, pathologic stage using the 2002 American Joint Committee on Cancer (AJCC) staging criteria, Fuhrman grade, and positive surgical margin rate.

Preoperative parameters and postoperative results as well as pathologic and functional outcomes data were retrospectively analyzed and compared

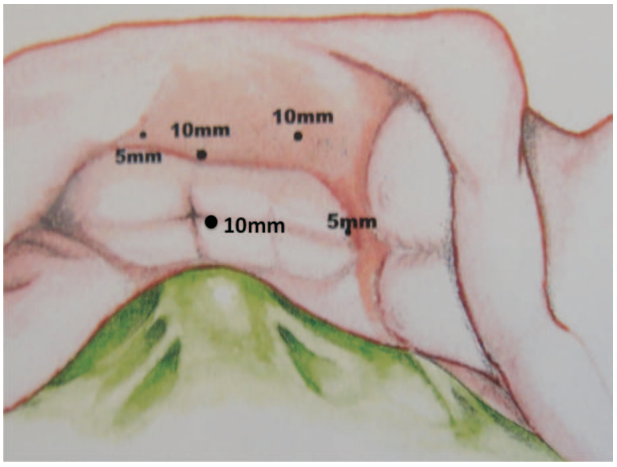

Figure 1 - *Port placement during laparoscopic partial nephrectomy on the right side.*

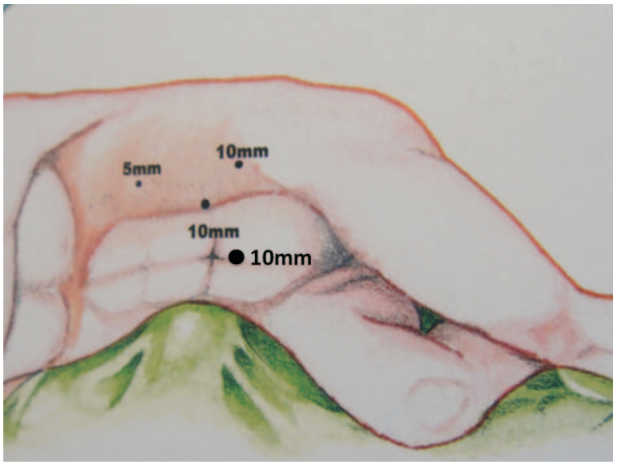

Figure 2 - *Port placement during laparoscopic partial nephrectomy on the left side.*

between groups. Statistical analysis was performed using Stata v.10 (StataCorp, College Station, TX, USA). Comparisons between groups were performed using X^2 and student t tests for categorical and continuous variables, respectively. A p value <0.05 was considered statistically significant.

3. RESULTS

A total of 171 patients underwent transperitoneal LPN at our institution during the study period, of which 32 patients had tumors larger than 4 cm on preoperative imaging. Baseline demographics and radiographic tumor characteristics are summarized in table 1. There was no significant difference in baseline characteristics between groups. Mean radiographic size was 5.9 cm (range: 4.1 – 9.2) and 2.3 cm (range: 0.9 – 4.0) for groups 1 and 2, respectively (p < 0.001).

Perioperative variables are summarized in table 2. Intraoperative variables, including EBL, clamping technique, and conversion rate, were similar between groups. One patient in group 2 with normal renal function and a normal contralateral kidney was converted from LPN to open nephrectomy because of difficulty encountered controlling the hilum with the laparoscopic clamp. All cases in both groups were performed under warm ischemia. The median warm ischemia time was longer for tumors > 4 cm (22 min vs 17 min; p= 0.011). The median total operative time was also longer for tumors > 4 cm (215 min vs 192 min) but did not attain statistical significance (p = 0.068). No patient required an intraoperative blood transfusion. Postoperative factors were similar

Table 1 – *Preoperative variables for patients undergoing laparoscopic partial nephrectomy.*

Characteristic		Group 1 (>4 cm)	Group 2 (≤ 4 cm)	*p* value
Patients , No.		32	139	-
Mean age in years (range)		58 (43-77)	62 (36-84)	0.675
Gender No. (%)	Male	20 (62.5)	83 (56.6)	0.868
	Female	12 (37.5)	56 (43.4)	-
Tumor side No. (%)	Left	21 (65.6)	92 (66.2)	0.663
	Right	11 (34.4)	47 (33.8)	-
Mean BMI, Kg/m^2 (range)	-	31.6(19.5-48)	30.2(20.5-47)	0.726
ASA Classification score No.%	1	0 (0)	3 (2.2)	0.856
	2	13 (40.6)	52 (37.4)	
	3	19 (59.4)	84 (60.4)	
Previous abdominal surgery No. (%)	yes	5 (15.6)	36 (25.9)	0.278
	no	27 (84.4)	103 (74.1)	
Incidental finding No. (%)	yes	23 (71.9)	101 (72.6)	0.997
	no	9 (21.1)	38 (27.4)	
Imperative indication for PN No. (%)	yes	2 (6.3)	18 (12.9)	0.526
	no	30 (93.7)	121 (87.1)	
Radiographic variables				
Mean tumor size, cm (range)		5.9(4.1-9.2)	2.3(0.9-4.0)	<0.001
Tumor location within the kidney No. (%)	Upper	15 (47)	47 (33.8)	0.428
	Mid	8 (25)	59 (42.5)	
	Lower	9 (28)	33 (23.7)	
Percent endophytic No. (%)	<50%	27 (84)	74 (53.2)	0.115
	50 <100%	5 (16)	50 (36)	
	100%	0 (0)	15 (10.8)	
Abutting collecting system, No. (%)	yes	23 (71.8)	79 (56.8)	0.275
	no	9 (28.2)	60 (43.2)	

Table 2 – *Perioperative variables for patients undergoing Laparoscopic Partial Nephrectomy.*

Characteristic		**Group 1 (> 4 cm)**		**Group 2 (≤ 4cm)**		***p* value**
Intraoperative variables						
Median total operative time, min (IQR)		215	(172-249)	192	(158-245)	0.068
Median warm ischemia time, min (IQR)		22	(18-32)	17	(8-24)	0.011
Median EBL, ml (IQR)		110	(80-215)	90	(40-210)	0.285
Elective conversion No. (%)		1	(3)	0	(0)	
Clamping technique No. (%)	none	0	(0)	5	(3.6)	0.400
	Bulldog	4	(12.5)	7	(5.1)	
	Satinsky	28	(87.5)	127	(91.3)	
Collecting system repair No. (%)	yes	2	(6.2)	8	(6)	0.275
	no	30	(93.8)	131	(94)	
Postoperative variables						
Median length of stay, d (IQR)		2	(2-4)	2	(2-3)	0.196
Mean change inhemoglobin 24 hours after surgery, g/dl(range)		-2.4	(-4.5 to 0.9)	-1.7	(4.0 to 0,7)	0.259
duration of follow-up in months No. (range)		16	(0.9-45)	15	(0.3-45)	0.283

IQR=interquartile range; EBL = estimated blood loss

between groups with regard to hospital stay, change in hemoglobin 24 hours after surgery, and follow-up. The overall mean follow-up for our study was 30 months; the longest duration of follow-up incorporated in the analysis was 120 months. There has been no renal-related mortality in our series to date (Table 3).

4. DISCUSSION

Partial Nephrectomy has demonstrated equivalent cancer control to Radical Nephrectomy for small renal masses,[1,2] with improved long-term clinical, functional, and survival outcomes over RN.[9-13] LPN, which was introduced in 1993,[14,15] has emerged as a viable alternative for the surgical management of small renal masses, with oncologic and functional outcomes similar to OPN.[4,16] However, LPN is technically challenging, requiring advanced skills to perform precise tumor excision and intracorporeal sutured reconstruction while minimizing ischemia times. Large tumors may present additional challenges during PN that may add to the challenges of LPN, including tumor resection and renal reconstruction under warm ischemia. A number of studies have demonstrated the feasibility of LPN.[4,5,6,8]

Open PN for tumors > 4 cm has been reported with satisfactory results[3], and initial reports in 2008 and 2009 from experienced surgeons demonstrated the feasibility of the laparoscopic approach for these larger tumors.[5,6] Our study is the first to evaluate LPN with a specific focus on patients with tumors > 4 cm and to compare outcomes with LPN for tumors < 4 cm.

Rais-Bahrami and cols.[5] compared results of LPN for 34 patients with tumors > 4 cm and 274 patients with tumors d" 4 cm. There were no differences in preoperative characteristics or intraoperative outcomes between the two groups. Patients with larger tumors had more complications (32.3% vs 25.1%, p=0.039) and longer hospital stays (4.1 days vs 3 days; p= 0.026). Simmons and cols.[6] compared results of LPN for 58 patients with tumors > 4 cm to 278 patients with 2-4 cm tumors, and 89 patients with tumors < 2 cm. There were no statistically significant differences among the three groups in operative time, EBL, and length of hospital stay. Patients with larger tumors were more likely to require pelvicalyceal repair and had a longer mean warm ischemia times (38 min vs 30 min; p = 0.002), but there was no differences in complications among the three groups.

In our study, patients undergoing LPN for renal masses > 4 cm had similar demographic and preoperative characteristics to patients undergoing LPN for smaller renal masses. Both groups had similar intraoperative outcomes. There was a

Table 3 - *Comparison of intraoperative and postoperative complications.*

	Group 1 (> 4 cm)		Group 2 (≤ 4 cm)		*p* value
Intraoperative complication No. (%)					
No	30	(94)	136	(97.9)	0.602
Yes	2	(6)	3	(2.1)	
Postoperative complication, No. (%)					
No	23	(71.9)	126	(90.6)	0.066
Yes	9	(28.1)	13	(9.4)	
Complication					
Intraoperative, No. (%)					
*Enterotomy No. (%)	0	(0)	2	(1.4)	
Postoperative, No. (%)					
Atelectasis No. (%)	0	(0)	2	(1.4)	
Urinary retention No. (%)	0	(0)	2	(1.4)	
**Urine leak No. (%)	4	(12.5)	0	(0)	
***Bleeding No. (%)	4	(12.5)	5	(3.5)	
Pulmonary embolism No. (%)	0	(0)	2	(1.4)	
Postoperative complication					
(Clavien classification) No. (%)					0.622
1	0	(0)	5	(3.5)	
2	2	(5.1)	2	(1.4)	
3a	4	(12.5)	2	(1.4)	
3b	0	(0)	0	(0)	
4a	2	(5.1)	2	(1.4)	
4b	0	(0)	0	(0)	
5	0	(0)	0	(0)	

** Enterotomy during lysis of adhesions; repaired laparoscopically without sequelae.*
*** Urine leaks resolved spontaneously after stenting.*
**** Bleeding resolved spontaneously after transfusion in one patient in each group. One patient in group 1 with platelet dysfunction required reexploration for delayed rupture of a hepatic subcapsular hematoma. One patient in group 2 with normal renal function and a normal contralateral kidney was converted from LPN to open nephrectomy because difficulty to control the hilum with a laparoscopic clamp.*

trend toward greater blood loss for larger tumors, although this did not reach statistical significance. Similar to Simmons and cols.[6], the mean warm ischemia time in our study was longer for larger tumors (22 min vs 17 min; p= 0.011), and we did not find a significant difference in complications based on tumor size.

Our postoperative complication rate of 28.1% for tumors > 4 cm is similar to laparoscopic report of 24% and 37%.[5,6] Four delayed urine leaks occurred on group 1 in which extensive collecting system repair was performed without pre-placement of a ureteral catheter and prior to the adoption of the sliding Hem-o-lok clip technique. Patients with larger tumors had a relatively greater decline in mean estimated GFR in the short term (Table 4). Possible explanations include a larger amount of tissue resected, longer warm ischemia times, and more parenchymal suturing required to complete the renorrhaphy and achieve hemostasis.

Limitations of our study include the retrospective nature our analysis, and the fact that it analyzes the experience of a single surgeon. Inclusion of different surgeons with varying levels of experience, however, might confound a comparison of outcomes based on tumor size because of the technical

Table 4 - *Change in renal function in patients undergoing Laparoscopic Partial Nephrectomy.*

	Group 1 (>4 cm) N(19)	Group 2 (≤ 4cm) N(68)	*p* value
Mean baseline estimated GFR, No. (range)	86.2 (57.3-168.7)	73.5 (37.5-107.0)	0.447
Mean estimated GFR 24 hours after surgery, No. (range)	58.4 (33.3-97.3)	68.9 (37.5-113.5)	0.119
Mean change from baseline in estimated GFR 24 hours after surgery , No. (range)	-13.9(-102.5 to 64.2)	-4.6(-30.7 to 32.0)	0.295
Mean estimated GFR (at 1-3 months follow-up), No. (range)	74.0 (33.3-168.7)	76.5 (27.4-126.9)	0.339
Mean change in estimated GFR from baseline (at 1-3 months follow-up), No. (range)	-12.3 (-64.2 to 28.6)	3.0(-37.3 to 64.8)	0.063

GFR = glomerular filtration rate.
Patients were included if they had preoperative, 24 hour postoperative, and follow-up creatinine 1-3 months after surgery. All values in milliliter per minute per 1.73m^2.

Table 5 - *Pathologic variables for patients who underwent Laparoscopic Partial Nephrectomy.*

Characteristic		**Group 1(>4 cm)**		**Group 2(≤ 4cm)**		***p* value**
All patients						
Histology, No. (%)	RCC	21	(65.6)	102	(73.4)	0.813
	AML	6	(18.7)	15	(10.8)	-
	Oncocytoma	3	(9.4)	12	(8.6)	-
	Other benign	2	(6.3)	12	(8.6)	-
Pathologic size, cm Mean (range)		5.8	(4.1-9.3)	2.0	(0.8-4.2)	<0.001
PSM No. (%)		1	(3.1)	7	(5.0)	0.360
RCC Patients						
Subtype, No. (%)	Clear cell	12	(57.1)	67	(65.7)	0.360
	Papillary	7	(33.3)	9	(8.8)	-
	Chromophobo	2	(9.6)	26	(25.5)	-
Fuhrman grade, No. (%)	1	0		15	(14.7)	0.267
	2	12	(57)	55	(53.9)	-
	3	9	(42.9)	32	(31.4)	-
	4	0	(0)	0	(0)	-
Pathologic stage, No. (%)	pT1a	4	(19)	91	(89.2)	<0.001
	pT1b	14	(66.7)	0	(0)	-
	pT2	0	(0)	0	(0)	-
	pT3a	3	(14.3)	11	(10.8)	-

RCC= renal cell carcinoma; AML= angiomyolipoma; PSM = positive surgical margins.

challenges of LPN for tumors > 4 cm. The level of experience may influence a surgeon's choice of treatment of renal cell carcinoma (RCC), even as much as tumor size, demographic characteristics, or comorbidities.[13] The statistical power of our study to detect a difference between groups is limited by the smaller number of patients with tumors > 4 cm (Table 5). Only early oncologic and functional outcomes are available at this time, and further studies with longer follow-up are needed. Our warm ischemia times were shorter than in comparable laparoscopic series of patients with tumors > 4 cm,

but a potential criticism is that our total operative times were longer. The most important component of the operative time is the warm ischemia time, as this factor affects subsequent renal function. We feel that the investment of additional time for preparation to save even a few minutes of warm ischemia is time well spent. Other explanations for our longer operatives times include the fact that many of our patients are obese (mean BMI was 31.6 Kg/m^2 in group 1 and 30.2 Kg/m^2 in group 2), and 15.6% of group 1 patients and 25.9% of group 2 patients had undergone prior abdominal surgery.

5. CONCLUSION

In our initial experience, LPN for tumors > 4 cm is safe and feasible, showing comparable outcomes to OPN for smaller tumors, although with longer warm ischemia times. We do not advocate LPN for all patients with renal masses, but it may allow select patients with larger tumors to achieve the convalescence benefits of a minimally invasive approach. Studies with longer follow-up are needed to more definitively evaluate the efficacy of LPN for large tumors.

RESUMO

Introdução: Cirurgia minimamente invasiva por nefrectomia parcial laparoscópica (NPL) normalmente é feita para tumores renais < 4 cm em tamanho. NPL para tumores> 4 cm não tem sido a rotina. **Objetivo:** Para avaliar a segurança e factibilidade da NPL para tumores > 4 cm comparou-se dois grupos de pacientes: um com tumores ≤ 4 cm e outro com tumores > 4 cm. **Materiais e Métodos:** Revisamos dados consecutivos de 171 pacientes que foram submetidos a NPL transperitoneal entre maio de 2002 e maio de 2012 feitas por um mesmo cirurgião. Pacientes foram estratificados em dois grupos: 32 com tumores> 4 cm na imagem pré-operatória (grupo 1) e 139 com tumores ≤ 4 cm (grupo 2). Dados pré-operatórios, perioperatórios, resultados patológicos e funcionais foram analisados e comparados entre os grupos. Usamos o teste X^2 e student t. O valor $p < 0,05$ foi considerado estatisticamente significativo. **Resultados:** Tamanho médio radiográfico do tumor foi 5,9 cm (4,1 – 9,2) para o grupo 1 e 2,3 cm (0,9 – 4,0) para o grupo 2. Não foi encontrada diferença significativa entre os grupos na perda sanguínea estimada, tempo total da cirurgia, tempo de hospitalização, taxa de complicações e mudança na taxa de filtração glomerular. Pacientes com tumores maiores tem tempo maior de isquemia quente (22 vs 17 min; p= 0,011). **Conclusões:** Em nossa experiência, NPL para tumores > 4 cm é segura e factível, mostrando resultados comparáveis a NPL para tumores menores. Mais estudos são necessários para determinar a viabilidade da NPL para tumores maiores como uma forma efetiva de tratamento.

Key words: *L*aparoscopia. Nefrectomia. Nefrectomia parcial. Carcinoma de células renais.

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Original Article

Does Collagen-Coated Polyester Mesh Decrease the Rate of Intraperitoneal Adhesions in Incisional Hernia Repair?

A tela de Poliéster recoberta por colágeno diminui a taxa de aderências intraperitoneais no reparo da hérnia incisional?

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ABSTRACT

Objective: The aim of this study is to evaluate the formation of adhesions after polypropylene (PP) and collagen-coated polyester (PC) mesh intraperitoneal placement. **Materials and methods**: Twenty six female Wistar rats were randomly assigned to three groups. In the Sham group there was no prosthesis placement, in the PP group the prosthesis was placed at the peritoneal surface, and in the PC group the collagen-coated polyester mesh was placed at the peritoneal surface. The rats were killed on postoperative day 21 to evaluate adhesions regarding their grade, percentage of the mesh surface involved, bowel involvement, and force needed to cause rupture of the adhesion. **Results**: There was no difference in weight between the groups. The sham group did not develop any adhesions. The PP and PC groups developed prosthetic mesh surface adhesions, mostly in the omentum. There was no difference in adhesion grade and percentage of surface involved between PP and PC groups. The collagen-coated polyester mesh did not develop adhesions. Adhesions occurred at the free edge of the mesh, in contact with the polyester. The PP group presented 80% of the surface involved with adhesions, while the PC group presented 10% ($p<0.005$). **Conclusion:** There was no difference between adhesion, grade of adhesion and strength needed to cause rupture. However, the PP mesh presented significantly higher surface of adhesion when compared to the PC mesh.

Key words: Adhesions. Ventral hernia. Polyester. Collagen. Polypropylene. Mesh.

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INTRODUCTION

More than two million abdominal surgeries are performed annually in the United States. Incisional hernia is the most common complication, occurring in 11% of the patients who undergo abdominal surgery and in 23% of those who develop post-operative wound infections. About 100,000 incisional hernia repair surgeries are performed each year.[1,2]

Nearly half of incisional hernias develop within two years of abdominal surgery, and 74% occur within three years of surgery.[3-5] The ideal mesh should have good tensile strength, be inert, non-carcinogenic, stable in the setting of infection and any accompanying inflammatory response, and must not provoke tissue rejection.[7] An ideal mesh for use inside the peritoneal cavity – in contact with the bowel – needs to have one side with high reactivity to promote tissue growth at the abdominal wall, while the another side should have the capacity to minimize adhesions.[8]

Among meshes used in open incisional hernias repairs, the polypropylene (PP) mesh, introduced by Usher in 1963,[9] is the most commonly used due to its flexibility, ability to stimulate cellular growth, satisfactory inflammatory response, easy manipulation, and low price. However, when in contact with the intra-abdominal contents PP mesh induces the formation of adhesions.[10-12] An experimental study with rats showed that the inflammatory process in the PP mesh may become chronic and delay the proliferative stage of healing. Collagen production

increases, reaching a maximum level on postoperative day 21, with a predominance of type III collagen in the early process and type I collagen after that.[13] This demonstrates the need to protect the bowel-facing surface of the mesh for longer than that. The Parietex Composite® mesh achieved satisfactory results in extra-peritoneal hernias because of low adhesion formation, appropriate tissue growth, absence of enterocutaneous fistulas, and low recurrence rates.[14-15]

Comparisons between bilaminar mesh and other components that include one sheet for temporary tissue separation were conducted in only a few *in* vivo studies.[16] The recurrence rate after surgical repair was as high as 49%.[17-18] The main postoperative complications are related to adhesions, and include bowel obstruction and fistulas. Up to 44% of these complications require surgical intervention, which demonstrates the importance of avoiding adhesion formation.[19]

OBJECTIVE

The aim of this study is to evaluate the formation of adhesions after intraperitoneal placement of polypropylene (PP) or collagen-coated polyester (PC/CCP) mesh.

MATERIALS AND METHODS

This study was performed at the Lutheran University of Brazil (ULBRA) bioterium according to institutional experimental animal model protocols. 26 Wistar female rats (*Rattus Norvengicus*) were used. They were kept at room temperature, fed standard laboratory chow, and were allowed tap water *ad libitum*. The choice to use exclusively female rats was due to their smaller size (weight around 200g), that allowed better use of the available meshes. The meshes were provided by venders at no cost. To calculate the sample size, we used *Sample Size determination in health studies* software.[20] We calculated the sample size considering a statistical power of 80% and a p value < 0.05, parameters used by other published studies.

The rats were randomized into three groups:

Group 0 (Sham group): consisted of six animals. A midline laparotomy was performed, with primary closure of the abdominal wall, without prosthetic implant.

Group 1 or PP: consisted of 10 rats. A midline laparotomy was performed and the defect was repaired with a 2 x 2 cm intraperitoneal PP (Marlex®) mesh.

Group 2 or PC: consisted of 10 rats. A midline laparotomy was performed and the defect was repaired with 2 x 2 cm intraperitoneal collagen-coated polyester (Parietex Composite®) mesh which was previously hydrated in normal saline during one minute.

Operative technique

The rats received intramuscular injection of 5 mg/kg xilazine (0.1 ml of solution at 2% diluted in 0.2ml of 0.9% normal saline) followed by 50 mg/kg intramuscular ketamine (0.35 ml of solution 50mg/ml). Abdominal trichotomy and antisepsis with 2% alcoholic chlorhexidine were performed.

In Group 0 a 3 x 4 cm midline incision was made with dissection of the subcutaneous tissue; the peritoneal cavity was opened through the linea alba. The abdominal wall was closed using 3-0 polypropylene sutures without mesh implantation.

In Group 1 a 3 x 4 cm midline incision was made with dissection of the subcutaneous tissue; the peritoneal cavity was opened through the linea alba. A 2 x 2 cm PP mesh was implanted using 4-0 polypropylene sutures at the four quadrants. After that, the skin was closed using 3-0 polypropylene sutures (Figure 1).

In Group 2 the same procedure as the group 1 was performed, except a 2 x 2 cm collagen-coated polyester mesh was implanted after it was hydrated in normal saline for one minute. 4-0 polypropylene sutures were made at the four corners of the polyester portion without damaging the collagen layer. The abdominal wall was closed with 3-0 polypropylene sutures (Figure 2).

After the procedure, the rats received 0.5 ml of subcutaneous 0.9% normal saline and recovered in a heated place. After recovery they were transferred to their cages with food and water ad libitum. Dipirone (90 mg/ml) diluted in water was offered for three days.

The variables evaluated were: presence or absence of adhesions (Table 1); structures adhered: liver (including round ligament), omentum, intestinal loop; retraction size; percentage of the prosthetic surface involved (less than 50%, or 50% or more); and the location of adhesion (periphery or central area

of the mesh). Tensile strength was measured using a millimeter ruler with a 5N dynamometer; it was pulled and the force needed to rupture the adhesion was measured. The assessment was performed by a surgeon and a pathologist, both blinded to type of mesh. Due to the lack of histologic analysis the force needed to cause rupture was used as a proxy for the amount of collagen.

Statistical analysis

Statistical analyses were performed using version 17 of the Statistical Package for Social Sciences (SPSS). The average, standard deviation, and minimum and maximum values were determined for the continuous variables. The Wilcoxon test verified if there was any difference between the average weight before and after the surgery with each of the meshes. Frequency distributions (number and percentage) were determined for the categorical variables. The Fisher's exact test was used to verify the associations between the categorical variables.

Ethical aspects

The study was approved by the Ethics and Research Committee of the Lutheran University of Brazil (Protocol number 2009-005A).

All of the animals were initially kept inside cages in groups of 4 or 5. There were 12 hour day and night shifts. The rats were kept at room temperature with appropriate sanitation. All of them received anesthesic induction before the surgical procedure and before being sacrificed.

RESULTS

There was one death in the sham group during the anesthesia, before surgery was begun. None of the other five animals in Group 0 had adhesions at the abdominal wall. One rat had the omentum sutured to the abdominal wall an unintended consequence of the surgical procedure.

The weight of the animals was measured before the surgical procedure and after their death. Statistical analysis using the Wilcoxon test,

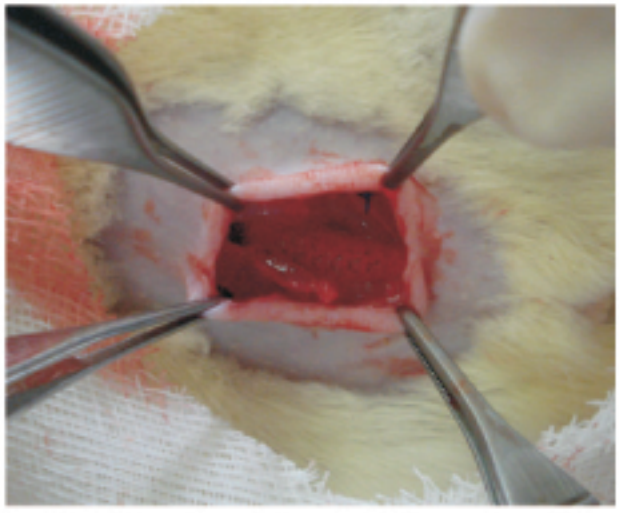

Figure 1 *- Intraperitoneal placement of polypropylene mesh.*

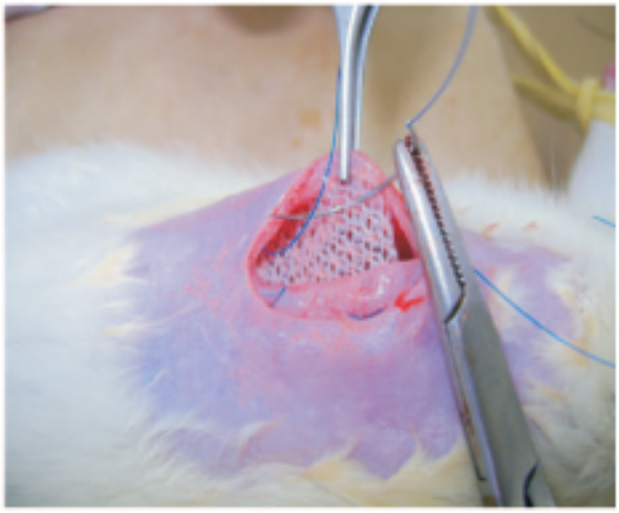

Figure 2 *- Intraperitoneal placement Parietex Composite® mesh.*

Table 1 - *Definition of Grades of adhesion.*

Adhesion Grade		Definition
0	None	Absence of adhesions.
1	Mild	Thin adhesions that are easily released.
2	Moderate	Adhesions that need blunt dissection to be released.
3	Severe	Firm adhesions which require significant force to release, partially or totally injuring the involved gut.

Table 2 - *Comparison between initial and final weight according to mesh type.*

Mesh type	Variable	n	Average	Standard deviation	Median	Minimum	Maximum	P*
Sham group	Initial weight	6	198.2					
	Final weight	6	220.2	15.55	209.2	182	248.1	0.005
Polypropylene	Initial weight	10	190.4	13.9	192.0	165.0	210.0	0.005
	Final weight	10	218.7	13.8	220.5	193.0	238.0	
Parietex Composite®	Initial weight	10	212.6	22.0	217.0	175.0	250.0	0.005
	Final weight	10	229.7	18.0	230.0	205.0	265.0	

** Wilcoxon test, p value.*

demonstrated a statistically significant difference between the initial and final weight for both the PP and PC groups, with the weight gain independent of the mesh type (p=0.005). (Table 2).

Evaluation of the incidence of adhesion according to type of mesh demonstrated that 100% of the rats that received the PP mesh developed adhesions. These adhesions involved the omentum in 100% of the rats, the liver in 30%, the small intestine in 30%, and the round ligament of the liver in 60% (Figure 3). 100% of the rats that received the PC mesh also had adhesions, involving the omentum in 100% of the rats, and involving the small intestine in 10%. There were no adhesions involving the liver or the round ligament (Figure 4). The only statistically significant difference between the two types of mesh was for round ligament adhesions. (Table 3)

The average force needed to cause rupture of the bowel adhesion for each of the two types of mesh can be seen in table 4; a statistically significant difference was found using the Mann-Whitney test.

There was no significant difference on mesh retraction between PP and PC. Regarding adhesion grade, 60% of the rats that received the PP mesh had grade 1 or 2 adhesions while 40% had level 3 adhesions. 90% of the rats that received the PC mesh presented developed level 1 or 2 adhesions and 10% had grade 3 adhesions. There was a predominance

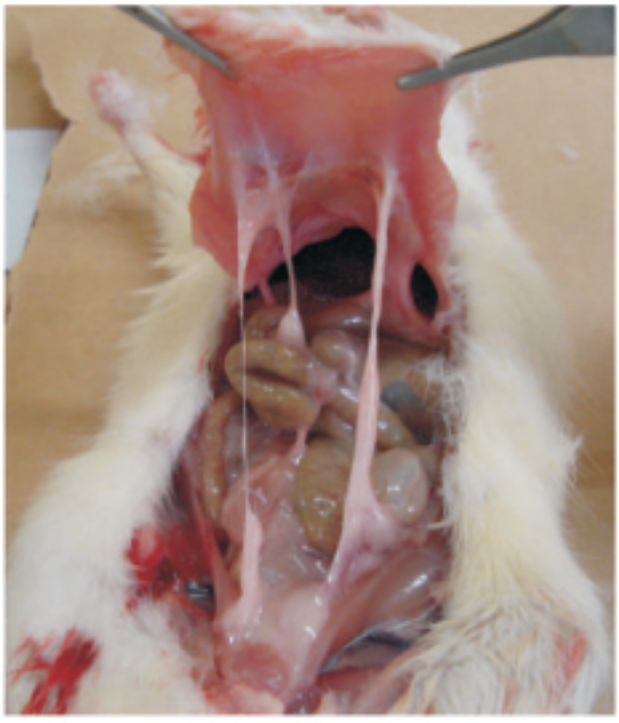

Figure 3 *- Marlex® mesh adhesions.*

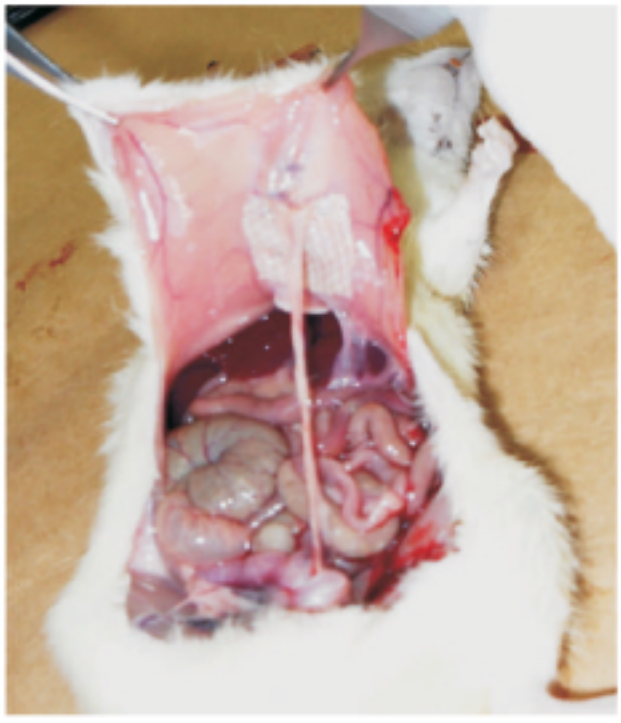

Figure 4 *- Parietex Composite® adhesions.*

Table 3 - *Frequency of adhesions according to type of mesh.*

	Adhesions				Parietex Composite®		
	Sham Group (no mesh)		Polypropylene				P*
Omentum	0	(0%)	10	(100%)	10	(100%)	-
Liver	0	(0%)	3	(30%)	0	(0%)	0.211
Small intestine	0	(0%)	3	(30%)	1	(10%)	0.582
Round ligament	0	(0%)	6	(60%)	0	(0%)	0.011

Data presented as n (%).
**P value for Fisher´s exact test.*

Table 4 - *Comparison between the two types of mesh of the force needed to cause rupture.*

Mesh	Adhesion strength (force needed to cause rupture)	
	Average	Standard deviation
Marlex polypropylene (n=10)	0.96	0.39
Parietex Composite (n=10)	0.37	0.18
p-value (*)	<0.001 (**)	

** Mann-Whitney test.*

of mild adhesions on the Parietex Composite® mesh (90%) in comparison to the polypropylene mesh (60%) according to Fisher´s exact test (p=0.303). Table 5.

The surface area of the mesh with adhesions was classified into two groups: one with adhesions involving less than 50% of the surface area and the other group with adhesions involving 50% or more of the surface. Eight PP meshes had adhesions involving 50% or more of the surface and two meshes had adhesions involving less than 50% of the surface.

90% of the PC meshes had adhesions involving less than 50% of the surface. The Fischer's exact test showed variation between the type of mesh and surface involvement (p=0.005). Table 6.

Regarding the location of the adhesions, they were found only along the edges of the PC mesh,

Table 5 - *Adhesion grades according to type of mesh.*

Type of mesh	Grade			
	1 or 2		3	
Polypropylene	6	60%	4	40%
Parietex Composite®	9	90%	1	10%

Data presented as n (%).
** p value=0.303 for Fisher's exact test.*

Table 6 - *Adhesion percentage according to type of mesh.*

Type of mesh	Percentage of mesh involvement			
	Less than 50%		50% or more	
Polypropylene (PP)	2	(20%)	8	(80%)
Collagen-coated polyester (PC)	9	(90%)	1	(10%)

Data presented as n (%).
** p value=0.005 for Fisher´s exact test.*

where the polyester layer was exposed . There were no adhesions in the center of the mesh, where the collagen coating was continguous. In the PP mesh 100% of the adhesions developed in the center. No statistical analysis was performed due to the fact that the adhesions developed in different locations on the two types of mesh.

DISCUSSION

The sham group should be viewed as the control group. The study found by postoperative day 21 the animals had gained weight.

There was no difference between the types of adhesions. Adhesions developed in the omentum and small intestine with both types of mesh. Adhesions developed in the liver and round ligament of the liver only with the PP mesh, a statistically significant difference (p=0.011). There was a statistically significant difference in the surface area of the mesh involved with adhesions between the two types of mesh (p=0.005) with greater involvement of the intraperitoneal PP mesh.

An analysis of the collagen-coated polyester mesh showed adhesions only at the edges of the prosthesis. The mesh designed for humans had been cut to use in the experiment with rats. Thus, the polyester component was exposed at the edges. Cutting the mesh is contraindicated by the manufacturer. There were no adhesions in the center of the mesh, as described in the literature.[21-22] Adhesions developed in the center of 100% of the implanted PP meshes. This is a limitation of this experimental model that can be solved with upcoming studies.

When the PP and PC meshes were compared the collagen layer appears to have a protective effect on adhesion formations, as there was a statistically significant difference in the surface area with adhesions (p=0.005).

CONCLUSION

There was no significant difference between PP and PC meshes when adhesion, adhesion grade, and force needed to cause rupture of the adhesion were evaluated. However, the PP mesh has significantly larger surface area with adhesions. Based on these data, the authors recommend collagen-coated polyester mesh for incisional hernia repair.

RESUMO

OBJETIVO: Comparar as aderências formadas após a colocação intraperitoneal da tela de polipropileno (PP) ou poliéster recoberta com colágeno (PC) em um modelo experimental. MATERIAIS E MÉTODO: Foram utilizadas 26 ratas fêmeas da raça Wistar, randomizadas em 3 grupos. No Grupo Sham não houve colocação de prótese, apenas laparotomia. No grupo (PP) houve implantação intraperitoneal da prótese de polipropileno e no grupo (PC) implantação da prótese composta por poliéster coberta por colágeno. Todos os animais foram mortos 21 dias após o procedimento e avaliados quanto às vísceras envolvidas nas aderências, o grau das aderências, o percentual de acometimento da tela pelo processo aderencial, bem como a força necessária para a sua ruptura. RESULTADOS: Não houve difeença entre os pesos dos grupos. O grupo Sham não apresentou aderências. Os grupos PP e PC apresentaram aderências na superfície da prótese, sendo que o orgão mais acometido foi o Omento. Não houve diferença entre os grupos quanto ao grau de aderências tela nos grupos PP e PC. O grupo PC nao desenvolveu aderências na região central da tela. As aderencias se formaram na área exposta das bordas da tela do poliester. O grupo PP apresentou 80% da superfície envolvida por aderências, enquanto que o grupo PC apresentou apenas, 10% (p<0,005). Conclusão: Não houve diferença entre o grau de aderências, tipo de aderências e de força necessária para causar ruptura. No entanto, a superfície da tela PP apresentou significativamente maior área de aderencias em comparação com a tela de PC.

Descritores: Hérnia ventral. Poliéster. Colágeno. Polipropileno. Aderências. Telas.

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Original Article

Transabdominal Pre-Peritoneal (TAPP) Inguinal Hernioplasty by Laparoendoscopic Single Site Surgery (LESS). Is it Feasible and Safe?

Hernioplastia Inguinal Transabdominal Pré-Peritoneal por Cirurgia Laparoscópica de Acesso Único. É Viável e Segura?

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Study conducted at the Red Cross / Positivo University Hospital, Curitiba, PR, Brazil.
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ABSTRACT

Objectives: To present the first transabdominal pre-peritoneal (TAPP) Laparo-Endoscopic Single-Site Surgery (LESS) inguinal hernioplasties series. **Patients and Methods:** From June to December 2011 the first six LESS TAPP inguinal hernioplasties, were performed at the Red Cross University Hospital in Curitiba, Paraná, Brazil. The Single Trocar Access (SITRACC) Platform (EDLO, Brazil) was used in 5 cases, while the SILS Platform (Covidien, USA) was used in one case. All patients were male; their ages ranged from 18 to 45. Five had NYHUS II hernias and one had a NYHUS IIIa hernia. **Results:** The mean operative time was 44 minutes. None of the surgeries required an extra trocar or conversion to a conventional laparoscopic procedure. All patients were discharged within 24 hours. **Conclusions:** The TAPP inguinal hernioplasty using a LESS approach is feasible and safe. It constitutes a new option in the scarless surgery field, as well as a new technique in the ongoing pursuit of surgical innovation that benefits our patients.

Key words: Minimally Invasive Surgery. LESS. Inguinal Hernioplasty. SITRACC.

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INTRODUCTION

Since the introduction in 1987 of videosurgery and the concept of minimally invasive surgery, the benefits of less discomfort, milder metabolic alterations, faster recovery, and good aesthetic results have been amply demonstrated, and the techniques have disseminated through the operating rooms of the world quickly and enthusiastically.

Ongoing improvements in optical equipment and refinements in the instrumentations employed in videosurgery have made it possible for increasingly complex procedures to be performed by minimally invasive methods.

Over the same period new technologies and approaches have emerged, such as Natural Orifice Translumenal Endoscopic Surgery (NOTES), Needlescopy, and Laparo-Endoscopic Single-Site Surgery (LESS).

Several platforms to perform LESS have become available in recent years. Two of them are the Single Trocar Access (SITRACC), a disposable multiport trocar (EDLO, Brazil – Figure 1) that uses instruments specially designed for this approach, and the Single Incision Laparoscopic Surgery (SILS) platform (Covidien, USA).

Laparo-Endoscopic Single-Site Surgery (LESS), now with several variations, has emerged as an alternative to NOTES. One multichannel

input device is inserted in a single incision through which specialized instruments are introduced for the proposed procedure. Several surgical procedures – from cholecystectomy to bariatric surgery – are being performed using this approach.[1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16]

This paper presents the initial experience with TAPP (transabdominal pre- peritoneal) laparoscopic hernioplasty using the Laparo-Endoscopic Single-Site Surgery (LESS) approach.

PATIENTS AND METHODS

The protocol was approved by the Red Cross - Positivo University Hospital Ethics Committee. From June to December, 2011, the first six TAPP inguinal hernioplasties, were performed by LESS at the Red Cross University Hospital, in Curitiba, Paraná, Brazil.

The SITRACC® platform (EDLO, Brazil) was used in five procedures. This new device consists of a four channel trocar, through which special articulated instruments and a 5 mm optical device are introduced. Articulated graspers, scissors, hook and clip appliers have been developed for this approach. In the sixth case the SILS® three channel platform supplied by Covidien (USA) was used.

***Figure 1** – SITRACC LESS System, Edlo, Brazil.*

All patients were male; ages ranged from 18 to 45. Five patients had unilateral NYHUS II inguinal hernias; one was a NYHUS III hernia.

All patients underwent a classic Trans-Abdominal Pre-Peritoneal (TAPP) Inguinal Hernioplasty using light polypropylene meshes anchoredwith the Protack® endofixating system (both manufactured by Covidien, USA), Figures 2a,b,c.

RESULTS

The mean surgical time was 44 minutes. No additional trocars were necessary.

All patients were discharged from the hospital within 24 hours with standard analgesics.

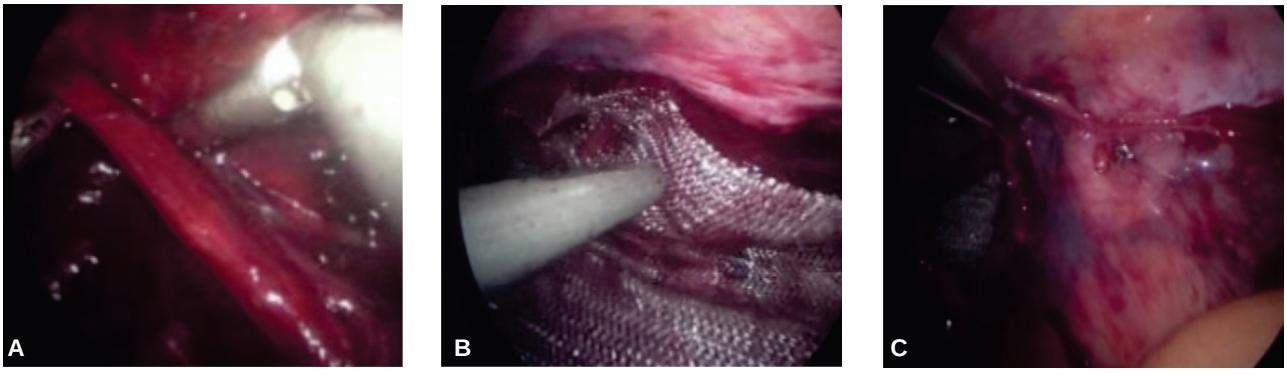
All patients were seen one week and one month after the procedures. There were no major post-operative complications.

There were no wound healing complications and no early hernia recurrence. Aesthetic results were considered quite good by the patients (Figure 3).

DISCUSSION

As noted above, in recent years interest in new minimally invasive approaches had been increasing in the surgical field around the world.

The advantages of the LESS approach are similar to those of NOTES – less pain, faster recovery, and a scarless operation – without the disadvantages of translumenal surgery.



***Figures 2a, b, c** – (a) Hernia sac dissection using distal articulated instrument, (b) mesh placement and (c) mesh fixation.*

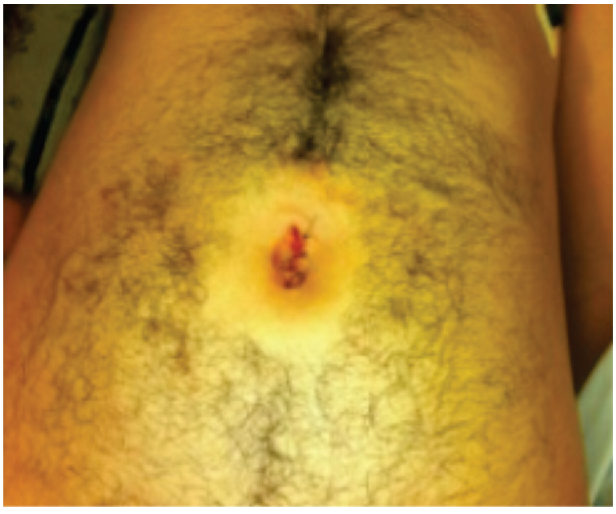


Figure 3 – *Aesthetic result immediately after the procedure.*

Because of the challenges of access, orientation, and visceral closure in NOTES as well as the risk of infection, LESS may emerge as a preferred approach in scarless abdominal surgery.

Wheeless is credited as being the first to use the principles of single access surgery, in 1969, while performing a tubal ligation[17].

LESS then entered in a period of latency, resurfacing in 2007, when Zhu published his first experience using the umbilical scar as the sole access to the peritoneal cavity. Zhu performed a fenestration of a hepatic cyst, followed by abdominal exploration and appendectomy, designating this new technique as *Transumbilical Endoscopic Surgery* (TUES).[18,19,20]

In Brazil the pioneering attempt to develop a platform for surgery by single access, called Single Trocar Access began in 2007. The SITRACC trocar (EDLO, Brazil) has four work channels (three 5 mm and one 10 mm or four 5 mm). After studies in experimental animals, the first cases of SITRACC cholecystectomy performed in humans were published in 2008 and 2009.[21,22,23]

In 2010 Ishikawa et al[24] reported the performance of laparoscopic hernioplasty using a TAPP technique, and Agrawal et al[25] performed a hernia repair by a totally extraperitoneal (TEP) technique, both using a multiport trocar.

The main challenge to overcome is the need to work with the instruments in parallel along a single axis. The solution to this challenge was the development of instruments that are flexible and articulated at their distal extremity, enabling some degree of triangulation, albeit limited when compared to conventional laparoscopic surgery.[26,27]

The internal instrument movement, even adapted for LESS, is arduous. Because the movement of a single instrument tends to move the whole in a single axis, a team trained and experienced in the technique is required, so that the visual field is not changed. The use of optics with at least 30 degrees of angulation is strongly recommended, providing better visualization of the operative object.

The training requires patience and perseverance; it is not a simple variation of laparoscopy, but rather a new approach. Practice in courses with experimental animals, as well as in simulations are essential for good results in human surgery.

Because large surgical series using this surgical approach have not been performed, published, and validated by the worldwide surgical community, we can only reply on what the preliminary data suggests, namely that LESS is a reasonable option among minimally invasive procedures, with all the advantages associated with them: better aesthetics, milder pain, and a faster return to routine activities.[28]

Procedures using LESS access should be viewed as part of the surgical armamentarium, which has evolved from open surgery, videosurgery and NOTES. Because each patient is unique, it is up to the surgeon to determine the ideal surgical approach to maximize safety while obtaining the best operative and aesthetic results.

The TAPP Hernioplasty by LESS could represent an advance especially for those patients that need to undergo two procedures at the same time: inguinal and umbilical hernioplasties.

CONCLUSION

TAPP Inguinal Hernioplasty using the LESS approach is feasible and safe, representing a new important option in the surgical arsenal. This is a new technique and should be compared to conventional laparoscopy in controlled clinical trials.

RESUMO

Objetivos: Apresentar a primeira série de hernioplastias inguinais videolaparoscópicas TAPP (trans-abdominal pré-peritoneal) LESS - Laparoendoscopic Single Site Surgery. Pacientes e Métodos: De junho a dezembro de 2011 foram realizadas seis hernioplastias inguinaisTAPP, pela abordagem LESS, no Hospital Universitário da Cruz Vermelha - Universidade Positivo, em Curitiba - Pr. A plataforma utilizada em cinco casos foi o SITRACC - Single Trocar Access (Edlo, Brasil) e em um deles o SILS (Covidien, USA). A idade dos pacientes variou entre 18 e 45 anos e todos foram do sexo masculino. Cinco deles apresentavam hérnia unilateral tipo NYHUS II e um NYHUS III-A. Resultados: O tempo operatório médio foi de 44 minutos. Nenhuma cirurgia necessitou introdução de trocárter extra nem mesmo conversão para videolaparoscopia convencional. Todos os pacientes receberam alta hospitalar em até 24 horas após o procedimento. Conclusão: A hernioplastia inguinal TAPP pela abordagem LESS é viável e segura. Esta técnica é uma nova opção para realização da chamada scarless surgery, assim como uma nova arma no contínuo esforço para levar maiores benefícios à nossos pacientes.

Palavras chave: Cirurgia Minimamente Invasiva. Hernioplastia Inguinal. LESS. SITRACC.

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