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# Minilaparoscopy: Here and Now

## Minilaparoscopia: Aqui e Agora

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**ABSTRACT**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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**RESUMO**

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

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

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