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Operative laparoscopy: A challenge for general gynecology?

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Gynecologic laparoscopy has regained popularity since the introduction of video imaging and advanced technologies such as laser and fine mechanical accessories. Gynecology in general is likely to benefit from the recent surge of enthusiasm concerning this method. However, at this stage, when technologic advances are not supported by sufficient clinical data, the classic surgical approaches should not be abandoned. (Am J Obstet Gynecol 1993;169:7-12.)

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A controversial issue—"Operative Laparoscopy: Surgical Advance or Technical Gimmick?"—was recently discussed by Pitkin.[1] Undoubtedly this is a difficult question. The Oxford dictionary defines gimmick as a tricky device, especially one adopted for the purpose of attracting attention or publicity." On the other hand, according to the Merriam-Webster dictionary, a gimmick is an "important feature that is not immediately apparent." As regards operative laparoscopy, both (somewhat contradictory) definitions are probably true. Gynecology, one of the classic disciplines of the medical arts, has undergone dramatic changes over the past two decades. It is beyond the scope of this article to discuss the progress that led to the formal division of gynecology into the three main subspecialties, as well as the creation of several other minor fields of interest. This trend was envisioned and analyzed by Pitkin[2] in his insightful article, "Whither Gynecology." Of these subspecialties, general gynecology has received the least attention in academic institutions.

In an era when even the gynecologist's traditional diagnostic tool, the hand, may be efficiently replaced by ultrasonic transducers, and classic indictions for hysterectomy or oophorectomy are being revised in light of the introduction of in vitro fertilization (IVF) and ovum donation, decisions must be made with utmost caution. Even opinions, even those of experts, may eventually appear somewhat speculative in this phase of transition, as shown by the following example.

In his article entitled "The Leader of the Band is Tired," DeCherney[3] predicted that ". . . the dictum that will *surely* emerge is that if the reconstructive surgery cannot be done through the endoscope, it should not be done at all, *except to make the ovaries accessible.*" However, almost concurrent with the publication of DeCherney's article, an alternative method for laparoscopic oocyte aspiration, the transvaginal approach, was introduced and invalidated this prediction.

A detailed list of contributors and milestones in the development of gynecologic endoscopy is provided by Gomel[4] in his article, "Operative Laparoscopy: Time for Acceptance." The main problem that remains is patient selection. Several factors, some of them having very little to do with pure professional opinion, can affect a physician's selection of a specific treatment modality for a given patient. Availability of an appropriate setup for endoscopic surgery and of the expanding facilities (and training) required for other assisted reproductive technologies is just one example. The structure of the medical services and their method of financing may also affect the decision. For instance, as a function of insurance reimbursement, the transvaginal follicle aspiration approach became standard in the United States almost 3 years after becoming a routine practice in Europe. Another important element that may affect patient selection is the patient's personal preference, which is often influenced by aggressive marketing and may be interpreted differently by each surgeon according to his or her own attitude. Scrimgeour et al.[5] advocate taking into account the patient's predilection when the decision is made whether to perform laparoscopic hysterectomy. On the other hand, Bloomfield[6] asks, "If the patient's preference is to be considered, and vaginal hysterectomy is to be done, why should patients be given prolonged anaesthesia and three unnecessary stab wounds?"

Technologic advances and splitting into subspecialties may also be catalysts of uncontrollable progress. At

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present this field is in a critically unstable phase. Technical feasibility of many laparoscopic procedures has already been proved; however, indications and contraindications for their application can still be manipulated in many ways. We discuss several aspects of the state of the art and patient selection for operative endoscopy.

What is a success?

It is often difficult to define "success" of a surgical procedure. The definition varies according to the indication for surgery. Generally speaking, one may agree that a happy patient is a success. However, as most surgeons will agree, the show may sometimes look different from the other side of the "curtain" (or the scar). A straightforward procedure that goes wrong can be masked by elegant suturing and compensated for by "princess-like" postoperative care.

In the treatment of an infertile couple, the ultimate goal, the achievement of which should be regarded as a success, is the taking home of a healthy baby (as soon as possible and at minimum cost and risk). But even now, in the era of new assisted reproductive technologies where the infertility specialist has at his or her disposal a large variety of alternatives, the rule of the thumb still plays a major role in the dilemma of the choice of treatment. It should be borne in mind that a short-term success may turn out to be a disappointment in the long run (e.g., simple laparoscopic ovarian cystectomy in a young patient should be evaluated according to her future fertility potential and not only according to the length of hospitalization). Determination of a success is made more difficult by the fact that sometimes a gain in one aspect may be offset by a loss in another. In evaluating the cost-benefit equation, one has to consider that rapid recovery after a long laparoscopic procedure may be outweighed by the high price of the disposable equipment used during the procedure.

Is the era of microsurgery over?

Since the introduction of IVF as a clinical service, many gynecologists have lost interest in microsurgical training. To discuss this trend, one has first to agree on what microsurgery is. More than a decade ago, infertility workshops hosted round-table discussions to elaborate on the definition of this kind of surgery. Is it the instrumentation set that is used? The extent of magnification? The suture material (6-0 or 8-0)?

There was a general consensus that appropiate training with a focus on tubal, ovarian, and peritoneal physiologic parameters, as well as meticulous tissue handling performed with fine instruments, may be considered "microsurgery." Loops magnify tissue by 4 to 6 times and the operating microscope offers magnification by 6 to 20 times. Laparoscopic optical apparatus connected to the television monitor magnifies the target tissue by 5 to 10 times. At the same time, a new generation of laparoscopic scissors and forceps have tip designs similar to those of the fine microsurgical instruments. The laser spot, when it is delivered through the operative microscope or laparoscope, ranges from 0.3 to 0.8 mm in diameter. It can be concluded that the surgical tools used in these two modalities allow minimal trauma to the reproductive organs if used properly. As far as tissue handling is concerned, one of the most significant contributions to operative laparoscopy (as we will discuss) was replacement of the eyepiece by video equipment. This allows careful tissue handling and further evaluation of the procedure by the review of recorded tapes. Clinical observations suggest that bleeding during laparoscopy is minimized. Accurate hemostasis under magnification and constant irrigation can (and should) be performed as in laparotomy, and dissemination of glove powder (which may cause "talc granuloma") is less likely to occur.

Almost all the procedures that were previously performed microsurgically (in the traditional sense of the term) can be performed similarly through the laparoscope. However, pregnancy rates may not necessarily be the same in both techniques. Microsurgical reversal of sterilization should result in a 70% to 80% intrauterine pregnancy rate.[7] Laparoscopic reversal is technically feasible; however, subsequent pregnancies are extremely rare. If the fallopian tubes are not severely damaged and if reanastomosis is expected to leave the tubes >4 cm long,[8] this microsurgical correction is indicated even before an IVF attempt. Tubal pregnancy, which is frequently diagnosed in an early stage, can be elegantly treated through the laparoscope, and a ruptured or damaged tube can be removed by the same technique while IVF remains a viable alternative. Cornual implantation, which requires special training and vast experience, may offer results similar to those provided by IVF; however, practitioners with this expertise are becoming less available.

The outcome of laparoscopic treatment of endometriosis is largely similar to that of conventional surgery. Because diagnosis is confirmed laparoscopically, an effort should be made to treat the lesion at the same session. In a recent literature review, Gant[9] stated that "... there was suggestive, but not yet proven, evidence that laparoscopic surgery with laser techniques may be superior to laparotomy in the management of infertility resulting from moderate and severe endometriosis." Yet the preferred modality for treatment of mild and moderate endometriosis (if any) is still a debatable issue. Adhesion formation after ovarian surgery and de novo adhesion formation after pelvic reconstructive surgery are well documented. This should be borne in mind whenever pelvic surgery is

T[illegible]I. Mean operation time and length of hospitalization after surgery

Study	Operative time (min)			Length of hospitalization (days)		
	Laparoscopic assisted vaginal hysterectomy	*Transvaginal hysterectomy*	*Transabdominal hysterectomy*	*Laparoscopic assisted vaginal hysterectomy*	*Transvaginal hysterectomy*	*Transabdominal hysterectomy*
Nezhat et al.[10]*	160	–	102	2.4	–	4.4
Grainger et al.[11]†	164	86	–	2.4	3.2	–
Reiner[13]‡	–	–	–	–	1	–
Joel-Cohen[12]§	–	15	25	–	–	–

*Laparoscopic assisted vaginal hysterectomy compared with transabdominal hysterectomy in 20 selected patients.
†Laparoscopic assisted vaginal hysterectomy compared with transvaginal hysterectomy in 100 consecutive operations.
‡Length of hospitalization in 40 consecutive transvaginal hysterectomy procedures.
§Recorded transvaginal hysterectomy time.

performed on a patient of reproductive age. The role of salpingostomy is a more complex issue and is discussed in subsequent text.

It may be fair to state that not all surgeons who operate with the aid of a microscope are microsurgeons, whereas not all operative laparoscopists are macrosurgeons. Microsurgical principles are largely responsible for prevention of iatrogenic damage during any type of pelvic interventions in the young patient, regardless of [illegible]kind of viewing scope that is being used.

[illegible] can be performed or what should be performed?

"Fashion" is an integral part of human nature, and it affects many aspects of modern life, including medicine and surgery. This, coupled with the difficulty of coping with the astonishing rate of technologic advancement, has become a constant source of embarrassment and lack of self-confidence to many well-experienced surgeons. Advanced technologies, such as computerized imaging, real-time scanners, videoendoscopy, and lasers, have induced reservations, hesitations, and misconceptions even among skilled surgeons. Twenty years ago, when a master of gynecologic surgery introduced a group of young residents to his department, he made the comment, "Let's focus on the new generation. One cannot teach old dogs new tricks." It is highly unlikely that even he, imaginative as he was, expected the emergence almost a generation later of a new method of laparoscopically assisted vaginal hysterectomy that would involve three superfluous suprapubic incisions and an additional 2 hours of general anaesthesia. Even the supposed advantages of this novel procedure, such as short hospitalization and reduced cost, are still to be proved beyond doubt.

[illegible] recent studies compared laparoscopically assisted vaginal hysterectomy with both transabdominal hysterectomy[10] and transvaginal hysterectomy[11] (Table I). The mean operation time for the laparoscopically assisted vaginal hysterectomy when performed by the two experienced teams was surprisingly similar (160 and 164 minutes, respectively) and significantly longer than that taken up by the conventional methods of surgery (102 minutes for transabdominal hysterectomy and 86 minutes for transvaginal hysterectomy). As stated by Joel-Cohen[12] in the introduction to his "15-minute transvaginal hysterectomy method," "Although speed as such is no criterion of the surgeon's ability, with simplicity and constancy of technique, no wastage of movements, and using instruments properly, there is an enormous saving of time." In the other two studies[10, 11] the average length of hospitalization was shorter after laparoscopically assisted vaginal hysterectomy (2.4 days in both groups) than it was after transabdominal hysterectomy (4.4 days)[11] and transvaginal hysterectomy (3.2 days).[12] On the other hand, Reiner[13] reported having discharged 40 patients within 24 hours of transvaginal hysterectomy without any complications that could be attributed to the procedure or to early hospital dismissal. Is there a real need for longer hospitalization after transvaginal hysterectomy, or is it just a fixation? Only time will tell whether the major contribution of laparoscopically assisted vaginal hysterectomy was to shorten the duration of hospitalization after transvaginal hysterectomy. Another factor that should be taken into account is that the estimated cost of disposable equipment for laparoscopically assisted vaginal hysterectomy is $1235 to $1635 and it might significantly affect the total cost of the "new method" (including operating room time and hospitalization) as compared with the "old-fashioned" approach.[14]

As for the technical aspects of this procedure, a quotation from a textbook of gynecology[15] may be relevant: "Vaginal hysterectomy is technically easy for the expert, even when there is no prolapse of the uterus. The tubes and ovaries can be removed as well if the need arises." Laparoscopic assistance may be appropriate in the exceptional cases mentioned in the same context: "The operation is difficult and unsafe in the presence of dense adhesions. . . . Its scope in these

cases depends very much on the skill and experience of the operator." The enthusiastic adoption of laparoscopically assisted vaginal hysterectomy may have another, undesired consequence. Whereas in the short term the vaginal approach may regain popularity (through the practice of various clip applications and endocoagulation techniques), in the long term, it may hamper training of surgeons in the classic approach, in the same way that the exaggerated trend toward cesarean sections impeded the training of obstetricians in conducting vaginal breech deliveries.

Although the laparoscope offers obvious advantages in a large variety of gynecologic operations, guidelines should be set regarding the type of surgical procedures to be performed endoscopically and the expertise level to be required of those who are to employ them. A key question is "where are the limits?" Just as a second-year resident will not be performing a Wertheim hysterectomy (without supervision), an average endoscopic team should not perform radical laparoscopically assisted vaginal hysterectomy (with laparoscopic pelvic or paraaortic lymph node dissection). The rationale behind this procedure (also known as vaginally assisted laparoscopic radical hysterectomy[16]), which is technically feasible in the hands of skillful endoscopic teams (and cannot be performed vaginally without laparoscopic assistance), is still debatable. Even aggressive endoscopic surgeons agree that some of their reported procedures should not become standard. Undoubtedly, the latest achievements set a new challenge for general gynecology. The "laparoscopically assisted vaginal hysterectomy pendulum" currently swinging between the technical advance and the surgical gimmick may come to rest by converting some abdominal hysterectomies into safe vaginal procedures. The line should be drawn according to technologic limits, financial resources, and, unfortunately, complication rate.

Apart from cases in which there are clear-cut surgical indications, laparoscopic procedures are being proposed in a wider range of contexts. Laparoscopic oophorectomy may be offered to patients considered at risk (according to family history and noninvasive screening tests) of ovarian cancer. In combination with medical treatment, uterine fibroids or endometriotic implants previously suppressed by gonadotropin-releasing hormone analogues can be endoscopically resected or vaporized. Moreover, in the future other procedures and modalities such as photodynamic therapy[17] and imaging-guided minimal invasive procedures may be carried out. However, as long as such procedures are not critically evaluated by institutional teaching programs, they should be considered only experimental, and instrumentation used during these procedures should be carefully selected to minimize unnecessary complications.[18] Whether to perform other procedures, such as laparoscopic uterosacral nerve ablation (also known as the modified Doyle procedure although originally described by Fraenkel[19] 46 years earlier), will remain open for the surgeon's judgment and should be based on subjective criteria such as magnitude of pain.

Laparoscopic ovarian cystectomy is a relatively simple and safe procedure. However, in view of the possibility of postoperative adhesion formation, it is of great importance to use meticulous tissue handling and perform surface reconstruction in the young patient. In the case of older patients, there is some concern about the potential risk of disseminating malignant cells when aspirating ovarian cysts (regardless of whether it is performed laparoscopically or guided transvaginally by ultrasonography). Gant[9] also concluded that there is ample evidence to recommend the use of multiple laparoscopic ovarian punctures for treatment of the polycystic ovary syndrome, which is refractory to therapy with clomiphene citrate.

The impact of technology on the evolution of endoscopic surgery

The development of new technologies and their use by innovative surgeons[20] preceded the recently increased interest in operative endoscopy. If there was a single factor that contributed to this increased interest in laparoscopic surgery, it was undoubtedly the incorporation of video equipment as an integral part of the standard endoscopic set enthusiastically promoted by Nezhat.[21] The consequent improvement in resolution dramatically enhanced the accuracy and therefore the safety of this approach. (This was also the main contributing factor to laparoscopic cholecystectomy.) The single-eye–single-hand procedure previously performed under inconvenient conditions was replaced by an impressive televised procedure. The passive assistant and nurse became active team members. Color videotapes are a complementary adjunct to the previously almost standard surgery protocol. In the future, images stored on videotapes or computer floppy disks may become mandatory for quality assurance and an integral part of the surgical record. Proper equipment and teamwork are key factors in microsurgical procedures, regardless of whether the laparoscope or the microscope is being used. Obviously, personal preference for new modalities also plays a role. One would expect the younger surgeons to be more receptive to newly developed equipment, sometimes without sufficient background and critical approach. The objective difficulty in clinical evaluation and comparison between the various surgical techniques renders arguments strictly theoretical.

Several operative tools can be employed to achieve similar goals. For instance, tissue cutting, coagulation, and vaporization can be performed with a cold knife or by deposition of thermal energy through electrocautery

or . Each one of these methods has special characteristics and under certain conditions may offer specific advantages. There is often a tendency to either exaggerate or underrate the effectiveness of one modality over another, attribute better results to the equipment used, or overemphasize the risk of the laser as compared with conventional tools. It should be noted that, if used properly, the laser is safe and accurate. For example, lasers can produce an accurate incision halfway through the cornea, penetrate a third of the zona pellucida's depth, and trap a single sperm or chromosome.[22] Scalpels and scissors can be as fatal as any other surgical tool if not properly used.

Endoscopically, laser beams offer several advantages over mechanical accessories when appropriate delivery systems that use the unique properties of light are employed. Mirrored probes, defocusing beams, tissue canning for single-layer ablation, and beam targeting with specific dyes are some examples. The use of lasers does not necessarily change the surgical outcome, but it can help simplify some procedures or enable an endoscopic approach that may otherwise be more difficult, dangerous, or even impossible to undertake. Desired laser effects may also be achieved by selection of the appropriate wavelengths or specific ultrashort pulse. For example, by virtue of its wavelength, the Co_2 laser is an ideal cutting tool because of the high absorption by water. However, the wavelength is not the only parameter that determines the effects on the tissue. Short exposures to high power may cause significantly less thermal damage to underlying tissue than low-power waves applied for long durations.

Patient selection and surgical outcome

Surgical expertise and proper patient selection are sometimes more important than any other factor that should be taken into consideration in the analysis of surgical results. Gant[9] reviewed the available literature on salpingostomy (laparoscopy vs laparotomy) and concluded that there is insufficient evidence to recommend one technique over the other. The technique that is shown to require the shorter hospitalization and recovery time may be favored. However, in this case, the choice of surgical approach is far less influential on the long-term results than is the extent of damage to the fallopian tubes that exists before the operation. In a prospective study Boer-Meisel et al.[23] described predictive prognostic criteria for intrauterine pregnancy after salpingostomy performed for treatment of hydrosalpinx. According to their results, salpingostomy on a small hydrosalpinx with minimal adhesions may offer a 77% chance of intrauterine pregnancy in the future. The same procedure carried out on moderately damaged tubes may yield a 21% pregnancy rate, whereas only 3% of those operated on for thick wall hydrosalpinx with dense adhesions would ever conceive spontaneously. Thus, although meticulous tissue handling and minimal thermal damage may influence the outcome of the operation, patient selection still appears to be the dominant factor affecting the success rate. Obviously, patient selection is largely affected by the treatment modalities available to the surgeon at a given time. In 1980 Winston,[7] who had pioneered and mastered microsurgical techniques, published his report on surgical procedures carried out before the IVF era. He reported an overall term pregnancy rate of 17.5% among patients who had undergone salpingostomy. This relatively low rate is a result of the inclusion of many patients with severely damaged fallopian tubes in his study group. In the last 5 to 7 years patient selection for this procedure has been (or at least should have been) different, and patients with a poor prognosis have been referred for IVF treatment. The high rate of tubal pregnancy rate in these patients after IVF and embryo transfer even justifies the preference for salpingectomy over salpingostomy for severely damaged fallopian tubes. Hence a comparison between the results of salpingostomy from periods before and after the introduction of IVF as a large-scale clinical service is irrelevant. Furthermore, to advocate the use of one type of laser over the other on the basis of a 6% difference in pregnancy rate after laparoscopic laser salpingostomy, especially in a nonrandomly selected study group and in two different phases (phase I: 1983 to 1986 and phase II: 1987 to 1988), is somewhat unsound.[24]

Envoi

Present technology makes prediction of the future almost impossible, and one should bear in mind the ancient Talmudic proverb: "When the temple was destroyed, prophecy was taken from prophets and given to fools and children." However, on the basis of recent developments and scientific data, one may anticipate possible future trends and challenges for future gynecology. Never before has gynecology been influenced by so many changes during such short intervals. Macrosurgery (for pelvic reconstruction) has been partly replaced by microsurgery. IVF has served thousands of couples without hope, contributed to the understanding of reproductive physiology, and was further developed into GIFT (gamete intrafallopian transfer), ZIFT (zygote intrafallopian transfer), TEST, PROST, SuZI, PZD, and many more "personal acronyms." Attention has been turned back to surgery, and operative laparoscopy has been steadily gaining new applications in general gynecology.

The acronym WYSIWYG ("what you see is what you get") is well known to readers of computer and laser journals. Perhaps alternative definitions are appropriate here: "What you *select* is what you get" or "what your *skills* (are) is what you get." Both patient selection and surgical skills are probably more important than any

other factors to the outcome of pelvic surgery. As for the dilemma "should I try it, or should I wait?" another analogy from the computer world may be helpful. If one is to evaluate one's own needs and develop personal preference, one must gain experience with the available technology. There will always be a better, a smaller, or a cheaper one, but personal experience is the only way to develop one's skills and a critical approach. The way to achieve optimal patient selection in an era of so many new alternatives is to ask: "What should be done?" and not "What can be done?" The fact that a certain surgical technique is feasible does not necessarily mean that it should be employed. Being involved in the development of laser[25] and conventional[26] accessories and techniques for operative laparoscopy during the last 15 years has made us appreciate its future role in surgery. However, technical feasibility is just a prerequisite, as can be concluded from Mr. P. Steptoe's[27] 1967 text *Laparoscopy in Gynecology:* "The value and safety of laparoscopy depends upon a proper appreciation of contra-indication and the application of careful techniques by an operator experienced in surgical procedures."

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