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Endoscopic Infertility Surgery

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Since the introduction of endoscopy by Jacobaeus in 1910, there has been a dramatic change in the pattern of and approach to the diagnosis and treatment of various diseases of the female reproductive organs. The advances in techniques of operative endoscopy, in high technology and in instrumentation (such as endoscopes, video cameras and videomonitors) have made it possible to perform laparoscopically many of the infertility-related procedures previously requiring laparotomy. The advantages of such surgery are the rapid recovery time, decreased time lost from work, smaller scars, reduced cost, avoidance of risks and complications of laparotomy, and, perhaps, better results.

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Introduction

Recent advances in endoscopic surgical techniques and the increased sophistication of surgical instruments have offered new operative methods and techniques for the gynecologic surgeon.[1] Endoscopy dates back to 1901, when Kelling published the first experimental study on endoscopy of the abdomen in dogs.[2] In 1910 Jacobaeus recorded the first endoscopic visualization of the human peritoneal cavity.[3] Pneumoperitoneum was introduced by Decker in 1944 and the Trendelenburg position by Palmer in 1946. Palmer also used a uterine cannula to elevate the uterus.

Laparoscopy has become an integral part of gynecologic surgery for the diagnosis and treatment of abdominal and pelvic disorders of the female reproductive organs, including pain and infertility.[4] The addition of a laser and a small video camera to the laparoscope (videolaseroscopy)[5] will greatly enhance the popularity of operative endoscopy because of the possibility of operating in a comfortable, upright position and using the magnification capabilities of the camera, monitor and special characteristics of the laser.

The adaptation of the medical laser to gynecologic laparoscopy, or laser laparoscopy, has greatly expanded the potential of laparoscopy in gynecology. The use of the CO_2 laser through the laparoscope was first reported on by Bruhat et al[6] and Tadir.[7]

Technique

The procedure is performed under general endotracheal anesthesia with the patient in the lithotomy position. The bladder is drained, and a Foley catheter is left in place throughout the procedure. A cervical cannula is used for manipulation of the uterus and intraoperative injection of dilute indigo carmine.

Each patient receives 1 g of cefoxitin intravenously preoperatively and postoperatively for prophylaxis.

After pneumoperitoneum is induced, the operating laparoscope is inserted intraumbilically. Either the Wolf (Richard Wolf Medical Instruments Corp., Rosemont, IL), Cabot (Cabot Medical, Langehorne, PA) or Storz (Karl Storz Endoscopy–America, Inc., Culver City, CA) is used.

A 5.5-mm, second-puncture trocar is inserted to the left of the midline approximately 4 cm above the symphysis pubis. A Nezhat suction-irrigator

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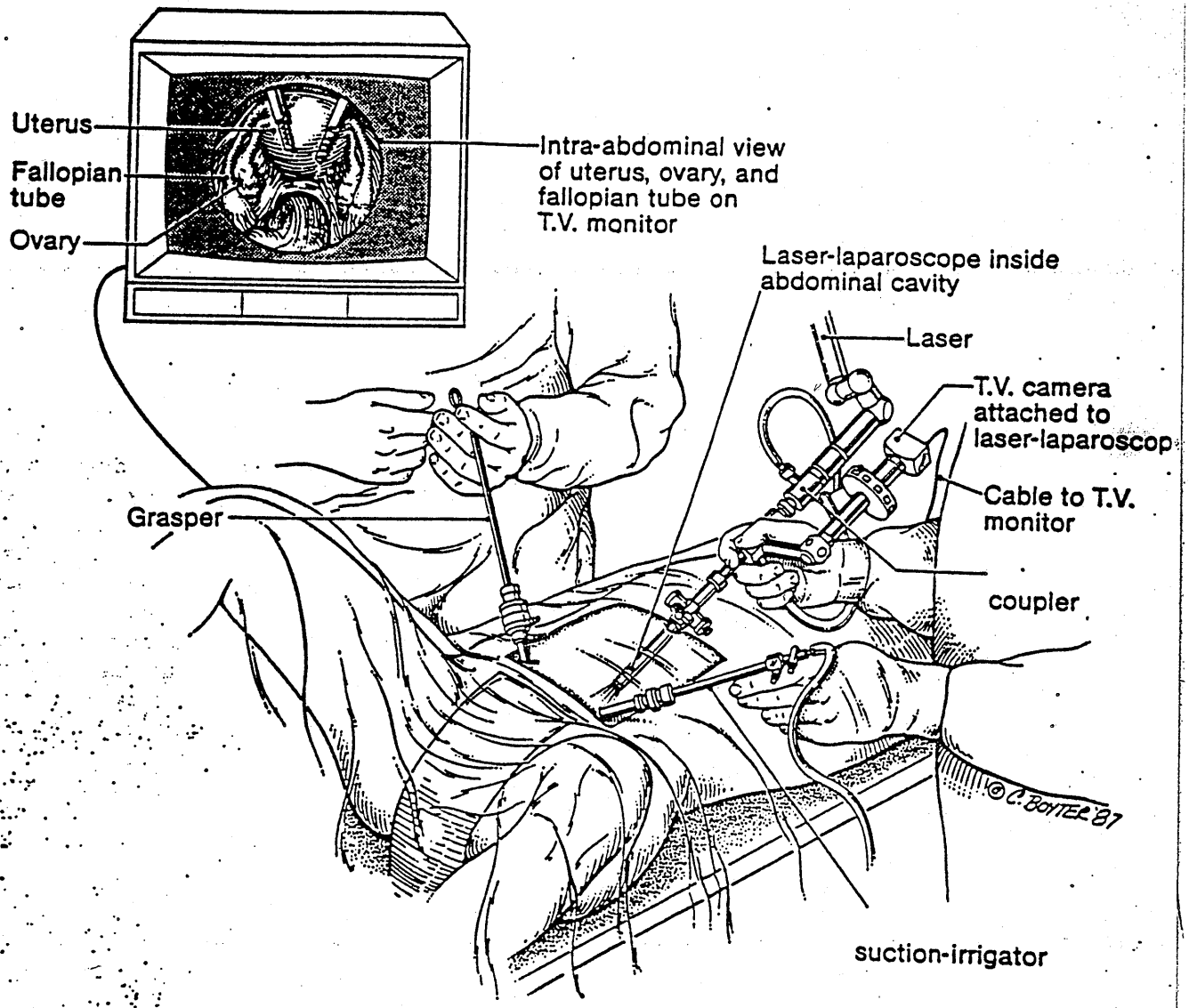

Figure 1
Videolaseroscopy.

probe (Cabot Medical) is introduced through the second puncture site. The irrigation fluid consists of 5,000 units of heparin in 1 L of Ringer's lactate.[4] Often a third incision is made along the suprapubic line approximately 10 cm from the second trocar site for inserting ancillary instruments (Figure 1).

Ancillary Instruments

Ancillary instruments are used through the second and third puncture sites and also are used through the operating channel of the laparoscope. We have used instruments produced by a variety of companies.[4]

Aspirator-Irrigator

An important instrument is the aspirator-irrigator probe and pump, which is used through the second puncture site and has multiple functions. With two trumpet valves the surgeon can easily irrigate with pressurized Ringer's lactate or suction any fluid or

laser plume, all with one probe.[10] This probe is composed of titanium and can also be used as a backstop during laser use or as a blunt probe for manipulation of tissue. The aspirator-irrigator is connected to a pump that has a maximum pressure of 800 mm Hg. With that power it is possible to perform hydrosurgery and dissect adhesions. Ovarian endometriomas and endometriosis involving the peritoneal surfaces could easily be lifted and vaporized or excised with water pressure (hydrodissection).

Grasping Forceps

Atraumatic grasping forceps are used to stabilize a structure, to handle the tubes and bowel, or to aid in removing a cyst wall, such as that of an endometrioma.[8] In cases of hydrosalpinx often two atraumatic grasping forceps are necessary to adequately expose the fimbria.

Biopsy Needle

A biopsy needle is often used to initially puncture and drain an ovarian cyst, such as an endometrioma. By attaching a 60-mL syringe to the top of the needle, the fluid gathered may be sent for cytologic review. A 22-gauge needle of this type may also be used when an injection of dilute vasopressin is desired.[11] The needle tips should be sharpened frequently since they become blunt after repeated usage. Fluid could be injected between the ovarian stroma and capsule of the ovarian cyst, making a plane for removing the cyst.

Instruments for Tissue Removal

Large pieces of tissue may be removed endoscopically either by using long grasping forceps through the operating channel of the 10-mm laparoscope or by enlarging the size of the 5.5-mm second puncture site to 7 or 10 mm. An appropriate-sized grasper with strong teeth could then be used to remove the tissue. Another option for tissue removal is cutting the tissue into smaller pieces. In removing a peritubal cyst, for example, the cyst may first be drained by puncturing it with the laser so that it would fit easily through a small sheath. Tissue removal then provides a pathologic specimen.[3] In the case of very large specimens, posterior colpotomy is an option.

Instruments for Hemostasis

Several methods of achieving hemostasis through the laparoscope are available depending on the diameter of the bleeder. A small bleeder, <0.5 mm in diameter, generally can be controlled with a defocused or 10- to 20-W, continuous mode CO_2 laser. The Nd:YAG, argon or KTP/532 flexible fiber laser could also be used.[12] In the case of a larger bleeder, bipolar electrocautery can be used through the second and third puncture sites. Sutures can also be used as a last resort if the bleeding cannot be controlled by any of the above methods.

Lasers

Endoscopic lasers have been developed and continuously improved over the past ten years. Our experience with intraabdominal lasers has been with the CO_2, argon and KTP/532. The CO_2 laser is a high-energy gas laser emitting infrared radiation that is absorbed by nonreflecting solids and liquids and is particularly well absorbed by water. When the laser beam is applied to soft tissue, the radiation is absorbed by the water within the tissue and converted to heat. The heated water in the tissue is converted to steam, resulting in the production of water vapor, cellular debris and smoke (the laser plume).[3] Thus, the tissue is vaporized. The depth of thermal damage below the vaporized tissue is <0.5 mm. That enables the experienced surgeon to use extreme precision for laser surgery on such areas as the ureter, bladder, bowel and rectum. The Cooper 500Z or 880Z CO_2 laser (Heraeus Laser Sonics, Inc., Santa Clara, CA) can be used with a direct coupler that contains a 28-cm zinc arsenide lens to focus the HeNe beam at the end of the 10-mm laser laparoscope. These lasers provide power outputs ranging from as little as 50 W for the 500Z to 80 for the 880Z. For precise dissection and vaporization the enhanced superpulse mode is used. That mode achieves a peak power five times that of the wattage output number displayed on the laser panel. Lower wattage power, 10–15 W on a continuous wave mode, is used for coagulation.

Although the argon, KTP/532 and Nd:YAG lasers are being utilized at some centers for intraabdominal laparoscopic surgery, experience with them remains limited at this time.[12] The argon and KTP lasers are quite similar. They are absorbed by reddish pigments and are more coagulating than cutting lasers. These lasers are used through the scope or via the second puncture site through an aspirator-irrigator fiber probe making aspiration and irrigation readily available through the same probe, with a small sheath in the middle of the probe housing the fiber. These lasers are limited in

their usage due to their low power capabilities, 12–14 W. At their maximum power output it is possible to cause breakage and/or melting of the fiber tip. Since their power output is far less than that of the CO_2 laser, they produce less smoke.[13] The smoke and occasional misalignment of the HeNe beam are the two major disadvantages of the CO_2 laser. Special power outlets and water hookups are necessary with fiber lasers. A monoshutter is used over the eyepiece of the laser laparoscope to protect the surgeon's eyes from the brightness of the laser when fired. Unfortunately, this shutter distorts the color of the tissue during laser surgery.

Initial research with the argon laser was done by Keye[14-16] on the treatment of endometriosis. Subsequently Diamond reported on use of the argon laser laparoscopically for neosalpingostomy, fimbrioplasty, adhesiolysis and transection of the uterosacral ligament.[17] The KTP/532 laser is the most recent addition to the group of lasers available for gynecologic surgery.[18]

The Nd:YAG laser is being used by Lomano[19] and others for the treatment of endometriosis.[20-22] It is important to note that the scatter and depth of penetration are different for the CO_2, argon, KTP/532 and Nd:YAG lasers. Thus, using a laser other than the CO_2 increases the potential for damage to tissue sites other than those intended to be treated with the laser. That is particularly crucial in the treatment of endometriosis on the bowel, bladder, rectum, ureter and blood vessels, when extreme precision is necessary.[12]

Sutures

The endoscopic use of sutures is another avenue being used by some surgeons. We prefer not to use sutures since their use in the abdomen may cause adhesion formation.[23]

Clips

New, absorbable clips are being developed that will make a large number of endoscopic procedures much more feasible. We have used Hulka clips for cuff salpingostomy in large hydrosalpinges with thick tubes.[24]

Video Cameras

With the use of the multiple-puncture technique, the role of the assistant in endoscopy has become extremely important. It is greatly facilitated by the attachment of a video camera to the laser laparoscope. The camera enables the entire surgical team to view the procedure on the videomonitor, th helping to provide better assistance. The vic equipment gives a panoramic and magnified vi of the abdomen from every angle. The zoc capability of the camera makes possible micros gery on the tubes and ovaries through the lapa scope. The surgeon operates from the videomoni in an upright position, which is more comforta than the traditional laparoscopy posture.

It is important that the camera system used lightweight and able to produce a bright, sha image. The newer cameras use a CCD-3 chip a have less glass between them and the telesco The result is higher resolution, producing a bright sharper image. Cameras have become less cumb some over the past several years. Today one c use a camera that weighs as little as 1.77 oz, th reducing the weight on the end of the laparosco

In videolaseroscopy the videomonitoring tec nique used incorporates a miniature, laparosco mounted video camera, a videorecorder and high-resolution videomonitor.

When using the video with laser laparoscopy, is necessary to use a more powerful light source give a bright-enough picture on the videomonit With this technique, 0.50- or 0.75-in videotapes m be made of each procedure, producing a permane record for the surgeon's or referring physician future reference.

Due to the increased light used in videolase scopy, it is necessary, when using the CO_2 laser, have an HeNe beam of at least 5 mW so the pict is seen easily on the videomonitor while operati the laser.

Conditions Treatable Laparoscopically

Ectopic Pregnancy

Ectopic pregnancy is a problem of epidem proportions in the United States. With a high ind of suspicion, rapid quantitative β–human chorion gonadotropin titers and accurate sonograms, good laparoscopic surgeon can often diagnose a treat the condition before the tube ruptures.[2] Several techniques are available, and the choice procedure should be based on the patient's desi for fertility or sterilization.

If the patient does not desire future pregnanc the coagulation technique described by Gomel a Taylor[25] is the simplest of the sterilization proc dures. For small ectopic pregnancies in either t isthmus or proximal ampulla, the tube is grasp

across the site of the pregnancy, and the segment containing the fetus is coagulated. That destroys the pregnancy and a segment of the fallopian tube.

For pregnancies in the isthmus or proximal half of the ampulla, segmental excision may be necessary. This procedure has been performed with unipolar and bipolar electrosurgical techniques and with lasers. The tube is coagulated and incised both proximally and distally to the ectopic pregnancy. The segment is elevated, and the mesosalpinx is cut and burned away from the tube. The margin of the mesosalpinx is examined and recoagulated if bleeding continues.[29] Segmental excision allows the possibility of future tubal anastomosis via standard microsurgical technique.

Linear salpingostomy was introduced to preserve fertility without requiring additional surgery: The antimesenteric border of the tube containing the fetus is cut electrosurgically or with a laser, and the products of conception are gently extruded. Irrigation of the tube often will cause the products of conception to pop out easily. Hemostasis is maintained by injecting the mesosalpinx with dilute vasopressin before the incision is made and by either compression or electrocoagulation after the tissue is cut. The incision is left open and allowed to close by secondary intention. In experienced hands this procedure is safe for even large ectopic pregnancies. Termination of a 12-week ectopic pregnancy via laparoscopic salpingostomy has been reported.[29] Bruhat et al[31,32] and DeCherney et al[27,28,33] advocate the use of this procedure when the patient wishes to maintain fertility.

If a ruptured ectopic pregnancy has destroyed the tube or maintaining fertility is not desired, a salpingectomy may be done. The technique is similar to the segmental excision described above except that the distal end of the tube is also removed. The mesosalpinx is divided from the tube beginning at the fimbriated end and continuing to the proximal portion containing the products of conception. If the products of conception are located in the terminal ampulla, the patient is best treated with a salpingostomy, with an extension of the incision to the fimbriated end if fertility is desired and with partial salpingectomy when fertility is not an issue.[29]

Endometriosis

Operative laparoscopy has proven to be a cost-effective and clinically efficacious technique in the treatment of endometriosis.[4-7] The CO_2 laser has proven useful in situations requiring precise application, safety and minimal tissue damage.[34,35] The fine beam provides precise control for the vaporization or dissection of endometriomas through the laparoscope.[5,14-16,19,34,36,37,40,41] Bruhat,[6] in France, and Tadir,[7] in Israel, were the first to report on the use of the CO_2 laser for laparoscopy; other surgeons have also reported on this laser technique.[36,37,40,42,43]

In 1986 we reported very good pregnancy rates for stages III and IV endometriosis treated with videolaseroscopy, but the numbers in the study were small.[1] Recent data, however, show that videolaseroscopy for infertility secondary to endometriosis yields results better than does laparotomy.[44,45] In a study using videolaseroscopy on 156 patients suffering from infertility due exclusively to endometriosis, we found a "cure" rate of 65% 6–18 months postoperatively.[5]

In a small series of patients with stage III endometriosis, laser laparoscopy produced better results than did laparotomy.[41] A focused beam of 6,000–18,000 V/cm² of energy is used to remove or vaporize endometriosis implants from the ovaries, pelvic sidewall, cul-de-sac, tubes, uterosacral ligaments, bladder flap and peritoneum and from capsules of endometriomas. If there is one place in reproductive surgery where the laser is truly valuable, it is in the treatment of endometriosis of the ureter, bladder and bowel.

For the treatment of endometriomas the cyst wall is opened, halved and dissected. Removal of the capsule of an endometrioma can be done with scissors, the laser or injection of fluid between the capsule or stroma. After the capsule is stripped from the ovary, the base is lasered to seal tiny blood vessels and to help ensure that the entire endometrioma has been removed. Removal of the endometrioma capsule is important. If the capsule is not removed, recurrence of the endometrioma is very likely.[45] Sutures should not be used in the ovaries since they can cause adhesion formation.[5] It is important to overlap the exposed edges of the ovary in order to discourage adhesion formation.

Periadnexal Adhesions

Salpingoovariolysis as a fertility-enhancing procedure is done by separating periadnexal adhesions with laparoscopic scissors, electrocautery or the laser. Before being divided, the adhesions can be stretched with laparoscopic forceps and an intrauterine cannula. Vascular adhesions should be coagulated before being separated.[4] Of 92 patients

who underwent this procedure, 57 (62%) achieved at least one intrauterine pregnancy, while 54 (58.7%) had one or more full-term pregnancies.[46] Fayez reported reported tubal patency in 100% of patients undergoing salpingolysis, 100% undergoing ovariolysis and 100% undergoing salpingoovariolysis. The pregnancy rates were 67%, 72% and 50%, respectively.[47] Endoscopic laser surgery is precise enough that adhesions may be excised without destroying surrounding tissue or damaging vital structures, such as the ureters, bladder and bowel. In experienced hands lasers can remove all adhesions and essentially restore the normal anatomic relationship of the pelvic organs.[44]

Hydrosalpinges

When hydrosalpinx is demonstrated in a recent hysterosalpingogram or at laparoscopy, the tubes can be opened with microscissors, cautery or the laser.[48] Thirty-three selected patients were followed for at least 12 months. During that period at least one tube remained open in 32 of the patients, for a patency rate of 96%, as verified by hysterosalpingogram or intrauterine pregnancy. A total of 14 pregnancies (42%), including 12 intrauterine (36%) and 2 ectopic (6%), occurred.[24]

In a group of 21 patients with hydrosalpinges whose cilia and minor and major folds of the fallopian tubes were evaluated with salpingoscopy and found to be well preserved, the pregnancy rate was 48%. In 16 patients with hydrosalpinges whose tubal lumens were severely damaged, as observed at salpingoscopy, the pregnancy rate was 6%. It appears that despite good patency rates achieved after repair, pregnancy is dependent more upon the quality of the tube than on the method of repair.[24]

Another dilemma that confronts the laparoscopic surgeon is dealing with thick hydrosalpinges. It is very difficult to keep these tubes everted after laparoscopic repair. We have approached them in the following manner. Using a double- or triple-puncture technique to stabilize and expose the tubes, the distal ends are opened with the laser beam in a satellite fashion by defocusing on serosal surfaces. The tubal ostium is everted and salpingoovariolysis performed.[24] One or two Hulka clips are easily applied to the everted edge of the tubes. Of 11 patients who had clips applied to their tubes, 7 underwent second-look laparoscopy within two to three months after the initial laparoscopic tubal repair. The clips kept the tubes everted and were removed during second-look laparoscopy.

Laparoscopic Procedures

Second-Look Laparoscopy

Second-look laparoscopy has traditionally referre laparoscopy after laparotomy. Second-look lapa copy is performed to follow a previous treat and to treat recurrent disease, such as adhes that re-form after laparotomy or that result laparotomy. There is much debate in the me community about the role of second-look lap scopy; Gomel and Taylor[49] no longer perfor because it has had no effect on their pati pregnancy rate. In our practice the indication second-look laparoscopy are similar to those fo initial procedure—ongoing infertility or inca tating pelvic pain and after repair of seve damaged tubes that have been held everted Hulka clips, in which case the clips are remo and the tubes reevaluated.

Ovarian Biopsy

Biopsies are often useful in obtaining an acc diagnosis of lesions in the pelvis. A punch bio from the antimesenteric border of the ovary be sufficient for most purposes, but true we resection will yield the best picture of the ova histologic features. No sutures should be ap to the ovaries to minimize postoperative adhe formation.

Cystectomy

Ovarian cysts in women of childbearing age largely benign, with the overall risk of cancer 4.5 in 200,000 women between the ages of 30 35.[49] Therefore, the majority of the cysts ma treated safely laparoscopically, as suggested Cunanan et al,[50] who reported on the laparosc aspiration of unilateral, unruptured ovarian c in 48 patients under the age of 35, with intraoperative complications or adverse postop tive sequelae. Similarly, for women under 35 y of age the benefits of definitive diagnosis management with laparoscopy seem to far weigh the remote risk of inadvertent puncture malignant neoplasm.[51] However, it has been arg that in most clinical circumstances a unilo ovarian cyst does not require aspiration at all s the risk of aspiration outweighs any pote therapeutic benefits.[51] Although that may be for functional cysts, it is not for endometrio which frequently are symptomatic and can ture.[1]

Tubal Anastomosis and Proximal Tubal Obstruction

The technique of dilating the proximal tube with an intrauterine cannula has been reported on before[37,54] but is not always practical for anatomic or pathologic reasons.[55] We have attempted this procedure on 25 patients, 9 of whom have achieved tubal patency, as evidenced by indigo carmine reflux. There has been only one ectopic pregnancy so far in this group. Long-term follow-up is under way. At present, for the above reason, proximal tubal obstruction should be treated with tubal resection and anastomosis, reimplantation or *in vitro* fertilization.

Conclusion

It appears that laparoscopic surgery for infertility patients, when performed by an experienced endoscopist, is efficacious and, in the case of selected diseases of the reproductive organs, can produce results better than can other approaches. As DeCherney[56] has pointed out, experience performing laparoscopic surgery is not accumulated overnight.

Endoscopic surgery will continue to create profound changes in the field of reproductive surgery. It is associated with a shorter hospital stay, lower cost, less-unattractive scars and, in some instances, better results than is laparotomy.

References

1. Nezhat C, Crowgey C, Garrison C: Surgical treatment of endometriosis via laser laparoscopy. Fertil Steril 45:778, 1986
2. Steptoe PC: Laparoscopy in Gynecology. Edinburgh, E&S Livingstone, 1987, p 1
3. Taylor PJ, Gomel V: Introduction. *In* Laparoscopy and Hysteroscopy in Gynecologic Practice. Edited by V Gomel, PJ Taylor, AA Yuzpe, et al. Chicago, Year Book Medical Publishers, 1986, pp 1–6
4. Tulandi T: Reconstructive tubal surgery by laparoscopy. Obstet Gynecol Surv 42:193, 1987
5. Nezhat C, Winer W, Crowgey S: Videolaseroscopy for treatment of endometriosis and other diseases of the reproductive organs. Obstet Gynecol Forum 1:1, 1987
6. Bruhat M, Mage C, Manhes M: Use of the CO_2 laser via laparoscopy. *In* Laser Surgery III: Proceedings of the Third International Society for Laser Surgery. Edited by I Kaplan. Tel Aviv, International Society for Laser Surgery, 1979, pp 274–276
7. Tadir Y, Kaplan I, Zuckerman Z, et al: New instrumentation and technique for laparoscopic carbon dioxide laser operations: A preliminary report. Obstet Gynecol 63:582, 1984
8. Nezhat C, Hood J, Winer W, et al: Videolaseroscopy and laser laparoscopy in gynaecology. Br J Hosp Med 38:219, 1987
9. Nezhat C, Crowgey S, Garrison C: Surgical treatment of endometriosis via laser laparoscopy and videolaseroscopy. Contra Gynecol Obstet 16:303, 1987
10. Nezhat C, Winer WK, Nezhat F: Videolaseroscopy for the treatment of endometriosis. *In* Recent Advances in Human Reproduction. Edited by RH Asch. Umana, Italy, Foundazione Per Gli Studi, Sulla Reproduzione, 1987, pp 201–212
11. Nezhat C: Videolaseroscopy: A new modality for the treatment of endometriosis and other disease of reproductive organs. Colposc Gynecol Laser Surg 2:221, 1986
12. Martin DC, Diamond MP: Operative laparoscopy: Comparison of lasers with other techniques. Curr Prob Obstet Gynecol Fertil 9:565, 1986
13. Nezhat C, Winer W, Nezhat F, et al: Smoke from laser surgery: Is there a health hazard? Lasers Surg Med 7:376, 1987
14. Keye WR Jr, Matson GA, Dixon J: The use of the argon laser in the treatment of experimental endometrioma. Fertil Steril 39:26, 1983
15. Keye W: The present and future application of laser to the treatment of endometriosis and infertility. Int J Fertil 31:160, 1986
16. Keye WR Jr, Hansen LW, Astin M, et al: Argon laser therapy of endometriosis: A review of 92 consecutive patients. Fertil Steril 47:208, 1987
17. Diamond MP, DeCherney AH, Polan ML: Laparoscopic use of the argon laser in nonendometriotic reproductive pelvic surgery. J Reprod Med (in press)
18. Daniell JF: The KTP 532 nanometer crystal laser used laparoscopically. Presented at annual meeting, American Society for Colposcopy and Cervical Pathology, Boston, 1986
19. Lomano JM: Laparoscopic ablation of endometriosis with the YAG laser. Lasers Surg Med 3:179, 1983
20. Baggish MS, ElBakry MM: Comparison of electronically superpulsed and continuous wave CO_2 laser on the rat uterine horn. Fertil Steril 45:120, 1986
21. Lomano JM: Photocoagulation of early pelvic endometriosis with Nd:YAG laser through the laparoscope. J Reprod Med 30:77, 1985
22. Joffe SN: The Neodymium:YAG laser in general surgery. Contemp Surg 27:17, 1985
23. Ellis H: The aetiology of post-operative adhesions: An experimental study. Br J Surg 50:10, 1962
24. Nezhat C: Microsurgical treatment of hydrosalpinges and peritubal and periovarian adhesions via videolaseroscopy (abstract). *In* Program Supplement, 43rd Annual Meeting, American Fertility Society, Birmingham, 1987, p 68
25. Kadar N, Caldwell B, Romero R: A method of screening for ectopic pregnancy and its indications. Obstet Gynecol 58:162, 1981
26. Kadar N, DeVore G, Romero R: Discriminatory hCG zone: Its use in the sonographic evaluation for ectopic pregnancy. Obstet Gynecol 58:156, 1981
27. DeCherney AH, Kase N: The conservative surgical management of unruptured ectopic pregnancy. Obstet Gynecol 54:451, 1979
28. DeCherney AH, Romero R, Naftolin F: Surgical management