Laparoscopic Appearance of Endometriosis

Volume I

Dan C. Martin
David B. Redwine
Harry Reich
Arnold J. Kresch

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Second Edition
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Dan C. Martin
Baptist Memorial Hospital
University of Tennessee, Memphis
Memphis, Tennessee

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Notice: Our knowledge in clinical sciences is constantly changing. As new information becomes available, changes in treatment and surgery become necessary. The author and the publisher of this volume have taken care to make certain that the standards of diagnosis are correct and compatible with the standards generally accepted at the time of publication.

The reader is advised to consult carefully new information as it is available. The reader is also advised to consider that diagnosis, therapy and management of endometriosis are separate concepts. Techniques discussed in this publication may have been modified or abandoned by the time of publication.

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201 Wakefield Road, Richmond, Virginia (VA 23221-3258)
Google Voice messages (901) 761-4787
danmartinmd@gmail.com

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Glenn Ann, Josh and Adam,

Thank you for all you are and do.

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Contributors

Dan C. Martin, M.D.
Baptist Memorial Hospital
University of Tennessee, Memphis
Memphis, Tennessee

David B. Redwine, M.D.
St. Charles Medical Center
Bend, Oregon

Harry Reich, M.D.
Nesbit Memorial Hospital
Kingston, Pennsylvania

Arnold J. Kresch, M.D.
Stanford University Medical Center
Palo Alto, California

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Recognition of Endometriosis

Dan C. Martin, M.D.

Introduction

John Albertson Sampson (1873-1946) published a series of articles on endometriosis from 1921[1] to 1940.[2] He described chocolate cysts, blebs, adenomyomatous infiltration in the rectovaginal septum, adherent surfaces,[1] red raspberries, purple raspberries, blueberries, deep infiltration, cancer arising in endometriotic implants[3] and peritoneal pockets.[4] He changed his definition of small from 2 to 4 cm in 1921[1] to a few mm in 1924.[3]

Protean Appearance

The diagnosis of endometriosis is often made by observation of puckered black or bluish "typical" lesions.[5-8]

- Dark lesions are the easiest to see and document.[9-12]
- Subtle forms are more common.[12,13]
- Subtle forms may be more active than black lesions.[14,15]

The subtle hue and color changes make diagnosis by direct visualization difficult[8] and endometriosis has been diagnosed by taking biopsies of areas of abnormal peritoneum which were not specific for endometriosis.[16,17] Lesions can hide in or at the rim of peritoneal pockets.[4,18]

Goldstein, et.al.[19] documented that 53% (74 of 140) of his adolescent patients had endometriosis using the magnification of the laparoscope for a *close-up* view. Petechial and bleblike endometriotic lesions were the only finding in 20% (13) of 65 adolescent patients.

Redwine discussed the use of *near-contact laparoscopy* for better visualization of these lesions.[20] Redwine found black lesions in 60% and other lesions in 66% of 137 patients.[13] These more subtle lesions were found in 36% of 202 patients by Jansen.[9] At the same time Jansen noted puckered bluish lesions in 85% of his patients. Quantitation of histologic confirmation of gross appearances have been reported in studies with up to 20 descriptive types.[12]

The magnification of the laparoscope and video monitoring systems are useful in increasing the resolution of lesions which are detected. The detection of lesions is related to the color contrast and resolution at lower powers. At present, detection and resolution have been adequate for histologic confirmation of:

- Red lesions as small as 400 μ,
- Clear lesions as small as 180 μ[10] and,
- Carbon particles as small as 40 μ.

Martin[12,21] sent specimens of abnormal appearing tissue seen at second look laparoscopy in a search for atypical transformation in the remnant tissue following intra-abdominal CO_2 laser surgery. Although atypical transformation was not noted, endometriosis was found in association with carbon from previous laser surgery and also in lesions that did not appear to be endometriosis. This was compatible with other studies in Table 1.

Table 1. Histologic confirmation of lesions of specific descriptions.

Author	Black	White	Red	Glandular	Subovarian Adhesions	Yellow Brown Patches	Pockets
Jansen[9]	ns	81%	81%	67%	50%	47%	47%
Stripling[10]	97%	91%	75%	ns	ns	33%	ns
Stripling[11]	98%	78%	92%	ns	ns	40%	43%
Martin[12]	94%	80%	75%	66%	39%	22%	39%

ns = not stated

When all patients had excision or biopsy of any abnormal appearing tissue the diagnosis of endometriosis increased (Table 2) from 42% in 1982 to 72% in 1988.[10,11,12] Furthermore, histologic confirmation of endometriosis increased from 62% in 1982[21] to 98% in 1988.[12] The largest increase appears to be due to the increased documentation of subtle lesions. This was associated with an increased awareness of these lesions and with use of the intrinsic accuracy of documentation using excisional techniques and the CO_2 laser laparoscope.

Table 2. Finding at laparoscopy[10,11,12]

	1985	Early 1986	1986-87	1987-88
Endometriosis	42%	47%	63%	71%
"Typical" lesions	?	43%	53%	60%
"Subtle" lesions	?	15%	58%	65%

This increase in diagnosis and documentation of endometriosis also suggested that the diagnosis was missed in at least 7% of patients and identifiable lesions were not recognized in at least 50% of patients in early 1986.[12] This is in spite of a 47% diagnosis rate associated with a 95% confirmation of submitted tissue in 1985.[21] Many of these findings occurred after the histologic confirmation rate was 97% or greater with tissue submitted on all endometriosis patients.[12,21] (Table 3)

Table 3. Patients with specimens confirmed at laparoscopy[12,21]

	1982	1984	1986	1988
Patients sampled	13%	71%	100%	100%
Specimens positive	62%	91%	97%	98%

Scanning Electron Microscopy

Vasquez[22] and Cornillie[23] documented the scanning electron microscopic appearance of polypoid, intraperitoneal and retroperitoneal associated with subtle appearances at laparoscopy. Murphy[15] reported lesions with scanning electron microscopy, which had not been seen on gross observation. Both laparoscopic and microscopic diagnosis of lesions of less than 400 μ has relied on analysis of the epithelium[11] and associated lesions as lesions of this size do not commonly have a well defined stroma.

Infiltrating Lesions

Infiltrating endometriosis (adenomyoma) was noted by Sampson in 1921.[1] This lesion is a combination of fibromuscular scar plus the glands and stroma of endometriosis.[24,25] The distribution of the depth of infiltration has been reported with:

- 61% of lesions penetrating greater than 2 mm,
- 43% penetrating greater than 3 mm and,
- 25% penetrating greater than 5 mm.[26]

Infiltrating and deep lesions may be easier to palpate than to see[21,27,28,29] and attempts to develop visual criteria for distinguishing deep infiltration from superficial disease by surface observation have so far been unsuccessful. Palpation and removal of all identifiable disease in addition to medical suppression appear important in treating pain and in decreasing the number of repeat surgeries performed.

Deep disease is generally suspected for one of three reasons:

- palpable nodules on clinical exam,
- focal tenderness on clinical exam and
- palpable nodules on examination under anesthesia.

Due to this, careful palpation of the posterior vagina, cul-de-sac, uterosacrals, rectovaginal septum and rectosigmoid junction is needed preoperatively. When endometriosis is seen in the posterior vagina, this almost uniformly represents extension from peritoneal disease.[29]

Deep infiltrating endometriosis is hard to dissect with it's irregular infiltration and indistinct planes. Palpation at laparoscopy was most helpful in localizing lesions beneath the peritoneum and around the uterosacral ligaments where visualization could not differentiate between the fibrotic white of scarred endometriosis and the white of the uterosacral ligaments.

- Fibrosis surrounding endometriosis is white and firm.
- Fat is yellow and soft.[30]
- Loose connective tissue is easily dissected and spreads freely with a blunt probe.

Visualization is adequate to differentiate loose connective tissue and fat from the appearance of endometriosis in most other areas. The histologic presence of adequate healthy tissue at the margins of these lesions confirmed the ability to make this distinction.

Manual palpation at laparotomy increases recognition of deep lesions, subperitoneal nodules, epiploic fat nodules, appendiceal nodules and infiltrating bowel lesions. The distribution of penetration depth of lesions in the patients who had laparotomy (6 to 30 mm) and the laparoscopic appearance of patients with proven, probable or possible bowel involvement suggests that some patients have penetration in the 1 mm to 10 mm range possibly unrecognized at laparoscopy.[26] This is, to some degree, confirmed by patients with 6 to 20 palpable nodules at laparotomy which had not been seen at laparoscopy.

When nodularity is noted on preoperative exam, this exam should be repeated before finishing surgery. This is in order to rule out persistence of deep nodules.[27] In addition, other deep infiltrating areas have been noted in the process of excising what appeared to be superficial lesions.

Leiomyomatosis Peritonealis Disseminata

Decidualization of foci of endometriosis may result in death of the cells and replacement with muscle metaplasia. This is associated with a variety of unusual histologies. Of these, the most dramatic is leiomyomatosis peritonealis disseminata. In this, the appearance is one of disseminated smooth muscle nodules throughout the pelvis.[31]

This may be similar to the process seen in the clear fibrotic lesions of slides 6 to 10 and slides 21 to 24 and the infiltrating lesions of slides 43 to 49. The reactive tissue of these processes contains both fibrous and muscular components[10] as noted in slide 10 and could represent a local tissue reaction to an infiltrating process or the end appearance of decidualization, death and metaplasia of the stroma of endometriosis.

Other Lesions

Other peritoneal lesions have been confused with endometriosis. These include epithelial inclusions, inflamed lesions, adrenal rest tumor, reaction to oil base hysterosalpingogram dye, cul-de-sac ectopic pregnancy, metastatic carcinoma, peritoneal inclusions associated with positive Chlamydia titers, carbon from previous laser surgery, psammoma bodies (dystrophic calcification), old suture remnants, splenosis, Walthard Rests, ovarian cancer, inflammatory cystic inclusions, inflammation associated with psammoma bodies, and hemangiomas.[9,12,21,27,32]

Conclusion

Endometriosis has a protean appearance which can be confused with other pelvic pathology. Characteristic, identifiable lesions included puckered black lesions, white scars, red polypoid lesions, clear vesicles, brown vesicles, adhesions, yellow brown patches, yellow lesions, deep nodules and peritoneal pockets.

- For complete destruction or removal of all recognizable endometriotic lesions, these areas must be ablated with techniques appropriate for the size of the lesion.
- There may be unrecognized deep lesions or microscopic lesions that can respond to nonsurgical therapy.
- There are many lesions with some characteristics of endometriosis that represent other pathology. These should not have a permanent diagnosis of endometriosis.

Concepts of "classical", "typical" or "burned-out" lesions and lack of careful observation and palpation may interfere with the surgeon's ability to make a proper diagnosis and to provide adequate surgical therapy for these patients. History (Appendix A), clinical palpation, surgical visualization, surgical palpation and histologic documentation aid in recognition and patient care.

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Laparoscopic Excision of Endometriosis (LAPEX) by Sharp Dissection

David B. Redwine, M.D.

Introduction

There is no medicine that eradicates endometriosis. Birth control pills[1,2], danazol[3-7], GnRH agonists[8,9], and gestrinone[7,9] have all been shown to result in persistent disease. The reason for this is that all medical therapy is based on clinical observations that endometriosis is more common in nulligravidas or infertile women[10-16] and uncommon after the menopause.[17,18] Over the years, this has been accepted as evidence that these two special hormonal states eradicate the disease. Unfortunately, there has not been a biopsy-controlled study proving that pregnancy or the menopause eradicates endometriosis, so medical therapy has flawed beginnings, based on symptomatology rather than pathophysiology.

- Endometriosis has low and varying levels of hormonal receptors as compared with normal endometrium,[19-22] so there is no reason to think that it will respond "normally" to the presence or absence of hormones.
- The notions that endometriosis predictably changes in appearance with the hormonal cycle or commonly bleeds during menstruation are also in error.[23]
- There is a relatively high rate of "background" pregnancy with untreated endometriosis without a lot of adhesions.[24-26] Against this background, medical therapy has an unimpressive pregnancy rate which may be largely due to the background pregnancy rate. Danazol has been shown in some studies to have no effect upon or to decrease fertility compared to simply doing nothing[24,25,27] or to operative laparoscopy.[28]
- Recurrent pain occurs relatively quickly after medical therapy (if the patient gets any pain relief at all).[29-33] This is predictable since medicines do not eradicate the disease process.

Unfortunately, most of the studies of medical or surgical treatment of endometriosis concentrate on fertility rather than pain relief. Pain seems to be a more common and specific symptom of disease than is infertility, so current research directed toward the minority of patients complaining of infertility may be misdirected and may not be shedding useful light on the disease. Moreover, using information gleaned from infertility studies to guide therapy in patients with pain is off the mark and hazardous and is one of many reasons for our present confusion.

Why use medical therapy at all? This is a question that must be answered by those who use it. (The opposite opinion is in Chapter Three.) I do not use medical therapy in my own patients. Medicines treat symptoms, but not the disease. Surgery treats the disease. If one believes that the disease causes symptoms, surgery treats those as well.

Surgical Treatment of Endometriosis

Endometriosis is the most common gynecological disease resulting in surgery. If it is true that 5% to 20% of women are afflicted, then endometriosis is one of the most common human pathological conditions of all! This makes it mandatory that all gynecologists be expert in its diagnosis and treatment, since it is unreasonable to refer all cases to a select group of endometriosis surgeons.

- Like obstetrics, endometriosis surgery should usually be accomplished "at home".
- Since surgery is the main treatment for the disease, all gynecologists must be familiar with its performance.

If a gynecological surgeon feels uncomfortable performing operative laparoscopy for endometriosis, he can still probably do an excellent job for his patient by laparotomy.

Since medicine will not eradicate the disease, it is up to the surgeon to do so. Assuming that the patient with endometriosis is not misdiagnosed in the office as having less common causes of pain such as ruptured ovarian cysts, PID, irritable bowel syndrome, primary dysmenorrhea, psychogenic pain, etc, and is taken to surgery for proper diagnosis, the principles of surgical treatment fortunately are quite simple: identify and remove (or destroy) all disease using any method.

Identification of Endometriosis

An important finding of research in the last 70 years is the realization that we may have been underdiagnosing endometriosis at surgery.[34-37] Several studies have shown that the "black powderburn lesion" is not the most common visual manifestation of disease. When one considers that the endometriosis patient can be missed in the office by looking primarily for patients with infertility or by diagnosing pain of a less likely origin, and can be missed in surgery by not knowing what to look for, it seems likely that a large amount of inaccuracy and inertia has been built into our belief structure of endometriosis.

Although endometriosis can be subtle in appearance, this does not mean that it is invisible.[38] The concept of "microscopic" endometriosis is being debated in the literature, and its origin is from a laparotomy perspective in an era preceding accurate knowledge of what endometriosis looks like.[39] Simply put:

- If a peritoneal endometriosis complex of glands and stroma is between 75 and 200 μ in diameter, the human eye should be able to see it, particularly with the modest magnification provided by the laparoscope considering the diameter of a human hair is between 75 and 100 μ.[40] However, contradictory data is presented on page 2.
- Peritoneal blood painting aids in the visualization of subtle lesions.[41]
- Subperitoneal invasion occurs, but is generally noted due to the fibrotic nature of the peritoneal surface.

Destruction of Endometriosis

There has been renewed interest in surgical treatment of the disease at the time of initial laparoscopy which will continue to grow as reports of treatment outcomes reach the literature. Although most reports of laparoscopic treatment of endometriosis have described laser vaporization, endocoagulation or electrocoagulation with no biopsies obtained, it is not certain that what is being treated is endometriosis; it becomes a matter of opinion of the surgeon rather than a scientific fact. Furthermore, the surgeon has no objective way of knowing how deeply to burn in all areas and will naturally be hesitant to burn over vital structures such as the bowel, urinary tract, or great vessels. For these reasons, treatment failures are possible with vaporization or coagulation: disease is left behind. Before there was medical therapy for endometriosis, before electrocoagulation, before lasers, surgeons were cutting disease out of the pelvis. A natural step in the historical progression of surgical treatment is laparoscopic excision of endometriosis (LAPEX) by sharp dissection.

Laparoscopic Excision of Endometriosis (LAPEX) by Sharp Dissection

Advantages

There are many advantages of this form of surgical treatment. Most of the surgical techniques that the surgeon uses at laparotomy for excision of endometriosis can be duplicated through triple puncture laparoscopy using scissors, graspers and bipolar cautery. The magnification provided by the laparoscope allows state of the art identification of disease. A surgeon has only two senses that can be used at surgery: sight and touch. Laparoscopic excision protects these two senses, whereas a surgeon can't feel tissue with photon therapy or by touching a surface with an electrode. In addition, video monitors can decrease visual acuity. A tissue report confirms what was removed and gives the surgeon feedback as to how complete the removal was so surgical technique will constantly improve.

- Dissection of symptomatic diseased tissue out of the body is a medically ethical, historically rational goal of surgeons for thousands of years and needs no special justification beyond this to adopt its performance.
- It is appealing to patients since as it is understandable.

Disadvantages

The disadvantages of laparoscopic excision of endometriosis are related to the surgeon's time and skill restraints. A typical case can take from 1 to 4 hours to accomplish and a busy obstetrical practice can interfere with the time needed to treat endometriosis well. There is a considerable learning curve requiring experience and boldness to negotiate.

- The surgeon must be aggressive and unwilling to leave any abnormal tissue behind, since medical therapy can't be relied upon to "clean up" any amount of disease left behind.
- Lack of skill and poor knowledge of anatomy will lead to disaster with any surgical modality, and the surgeon must know his own limitations.

Instruments

An operating laparoscope, a suction-irrigator, 3 mm scissors, 3 mm graspers and bipolar cautery (Palmer tips) are the standard laparoscopic tools. Endo-loops are sometimes helpful. With these instruments, endometriosis have been removed from anywhere in the pelvis using triple puncture technique with lower quadrant incisions for the suction irrigator and grasping forceps.

Peritoneal Resection

Since pelvic endometriosis is a disease which appears to begin on the peritoneal surface, with greater or lesser amounts of local invasion, resection of involved peritoneum is the basis of treatment.

- The graspers are used to tent up an uninvolved area of peritoneum immediately adjacent to an abnormal area.
- The scissors are used to nick a pleat in the peritoneum and to undermine the peritoneum from the underlying areolar tissue.
- A circumscribed line of incision is made around the abnormal area.
- Deeper sharp or blunt dissection of the underlying areolar tissue is alternated until the abnormal area is progressively isolated and dissected off the underlying healthy tissue.

This technique can be used over the bowel, bladder, ureters, and great vessels. It is easier to accomplish at laparoscopy than at laparotomy because of the brilliant illumination of the laparoscope, the modest magnification, and the view down the axis of surgery. Invasive disease can be dissected out by following the fibrosis to its endpoint. This technique can be used to dissect the ureter completely down the sidewall of the pelvis to the uterine vessels and beyond.

Resection of Uterosacral Ligaments

The uterosacral ligaments are frequently involved by endometriosis which may be invasive. The peritoneum is less pliable over the uterosacral ligaments, so removal of the entire ligament or a portion of it is sometimes necessary. The ureter and uterine vessels are just lateral to the uterosacral ligaments, and these represent the structures which could most likely be damaged. To remove the uterosacral ligament:

- First incise the peritoneum lateral to the ligament in a line parallel to the ligament, extending from the point near the sacrum where you wish to take the ligament up to the insertion of the ligament into the posterior cervix.
- Then, bluntly push the ureter and uterine vessels laterally out of harm's way. The ureter is seen in its path over the pelvic brim while the uterosacral takes a route along the cul-de-sac toward the sacrum.
- Grasp the ligament with the bipolar cautery near the insertion point in the posterior cervix, coagulate this area, transect the ligament, and then dissect it off of the pelvic floor using a combination of sharp and blunt dissection with occasional use of bipolar cautery.

The key to avoiding trouble is the peritoneal incision lateral to the ligament which allows the vital structures to be identified and avoided. Tracking the uterosacral in its course to the sacrum also avoid confusion with the ureter.

Resection of Ovarian Endometrioma

A line of incision is made in the ovarian cortex over the cyst. Sometimes, most or all of the cyst can be shelled out without rupturing the cyst. This is helpful for stripping the cyst away from the ovarian stroma. More often, however, the cyst will rupture, in which case, irrigate out the contents, open the point of rupture slightly, grasp the cyst wall and dissect it away from the ovarian tissue using blunt dissection. Occasionally, a small portion of ovarian cortex must be removed in order to begin the cyst dissection successfully.

Ovarian Cortical Resection

The ovary is stabilized and the scissors are used to cut around the surface abnormality.

Tubal Endometriosis

Serosal endometriosis of the fallopian tube can distort the tube, and surrounding fibrosis may give the impression of a larger, more invasive lesion than actually exists. Endometriosis of the tube rarely involves the muscularis, and resection of the affected serosa can be done through the laparoscope. A small nick is made in the uninvolved serosa just beside the lesion. The lesion is then serially circumscribed with lines of incision with the scissors. The lesion is then dissected off of the muscularis. The blood supply to the muscularis runs along its surface in a coiled vessel resembling that which supplies the ureter.

Resection of Superficial Bowel Disease

Superficial serosal bowel plaques or small nodules up to one centimeter in diameter are removed safely from the rectum, sigmoid and cecum without suturing the serosa.

- The ileum is too thin to operate upon without significant risk of perforation.
- The large bowel is composed of four layers: serosa, two layers of muscularis, and mucosa.

The serosa is incised immediately adjacent to the lesion and the lesion is undermined with the scissors using largely blunt dissection. Before you do, you must be prepared to suture the bowel. It is important to work from all sides of the lesion toward the middle, since it is easy to get in a layer of muscularis and be carried beyond the lesion before you know it. As long as the dissection is in the muscularis, you are safe. With proper case selection, you should never see the mucosa. It is advisable that you do several open bowel cases with a general surgeon before bowel disease is tackled with the laparoscope. This way, you can learn the characteristics of the bowel. Transmural resection of larger bowel nodules through the laparoscope is possible if the patient has had a bowel prep and the surgeon has the ability to perform endoscopic suturing. The contrary opinion is on page 23.

Presacral Neurectomy

If a patient complains bitterly of painful uterine cramps with the menstrual flow, laparoscopic transection of the uterosacral ligaments and presacral neurectomy can be offered to her.

- After the pelvic dissection is complete and hemostasis achieved, a laparoscope is placed suprapubically and the surgeon operates between the patient's legs, looking toward the sacral promontory.
- The graspers elevate the peritoneum, the scissors create a nick, and then the peritoneum is incised transversely.
- The lateral margins of the incision are the ureter on the right and the base of the sigmoid mesentery on the left.

- The ureter will be seen through the transparent peritoneum directly upon the common iliac vessels. Be careful not to damage the vein!
- After the peritoneal incision is made, create windows down to the periosteum through the retroperitoneal areolar tissue using blunt dissection with the scissors or graspers. These windows are made at the lateral margins of the dissection.

Occasionally, large veins which appear to be collateral branches of the iliac veins will be seen. These can be hidden by the areolar tissue, so it is occasionally wise to make more than two windows in the areolar tissue in order to give yourself a chance to avoid these veins. The presacral veins are usually smaller veins which appear sometimes to be imbedded in connective tissue along the sacrum. These can be injured by dissection down to the periosteum and can bleed torrentially and be difficult to control even at laparotomy. Clips or sutures anchored through the periosteum are sometimes needed to stop this bleeding. The best treatment is prevention.

- After the windows are created, bipolar cautery is used to coagulate across the neural tissue as high along the peritoneal incision as possible.
- The coagulated neural tissue is transected with scissors.

The tissue will retract distally down the sacrum, and must be grasped then coagulated or looped distally, and a portion resected for a specimen unless just a neurotomy is acceptable to you. If too small a specimen is obtained, sometimes only lymphatic tissue may be obtained, despite laying bare a sizable area of periosteum.

Apical Vaginectomy

Hysterectomy and oophorectomy may relieve symptoms but do not make endometriosis go away. Persistent endometriosis after hysterectomy and oophorectomy frequently involves the uterosacral ligaments and cul-de-sac, so it may become involved in the postoperative fibrosis that can occur at the apex of the vagina.

- The dissection will occasionally lead into the vagina, and it is useful to excise the scar across the vaginal apex.
- This can be started laparoscopically and finished vaginally if the surgeon chooses this route.
- The vagina can then be stitched up from below. A vaginal prep is therefore helpful even in patients after previous so-called "definitive" surgery.

Occasionally, disease from the cul-de-sac or a rectal nodule will extend through the rectovaginal septum to the vaginal mucosa.[42] It is sometimes helpful to grab the normal mucosa immediately posterior to the vaginal lesion with an Allis clamp to aid intraoperative identification during laparoscopy. By moving the clamp during surgery, the point at which the vaginal apex should be entered can clearly be seen. The Allis clamp can then be removed and the scissors used to incise around the lesion and dissect it out. Also see page 26 and Appendix H.

The Future

As reports reach the literature on pain relief rates, recurrence rates and pregnancy rates following endoscopic treatment of endometriosis, the position of endoscopic surgery will be strengthened. For the physician with the interest and time, laparoscopic excision of endometriosis will be seen as a versatile tool which can very completely treat most patients with endometriosis. Postoperative scar tissue formation may be decreased by the use of Interceed® (TC7) Absorbable Adhesion Barrier (Appendix H), the oxidized regenerated cellulose adhesion barrier associated with decreased adhesion formation between the ovaries and the pelvic sidewalls.[43]

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Therapeutic Laparoscopy

Dan C. Martin, M.D.

Introduction

Laparoscopes magnify up to 7 power and increase resolution.[1] This has been used to identify, remove and confirm lesions as small as 180 μ. Video monitoring techniques:

- Increase the ability of the assistants and other personnel to assist at surgery and
- Provide increased magnification and resolution by using large monitor screens.[2]

However, video systems frequently decrease detection, resolution, depth of field or field of vision.

Dissection techniques have been used to resect lesions as deep as 14 mm and to dissect the ureter and bowel away from endometriosis and adhesions.[3-6] The CO_2 laser has been very useful in maintaining the precise visualization needed for these deep and delicate dissection. However, scissors, bipolar coagulation, thermal coagulation and unipolar knives are more generally available pieces of equipment.[7-10] In addition, it is advisable to master the use of scissors and coagulation before performing deep dissection with other surgical equipment.

Peritoneum and Soft Tissue

Small implants (≤ 2 mm) can be:

- Excised
- Vaporized or
- Coagulated.

Argon, KTP, and YAG lasers have effective depths of coagulation which appear to be greater than the intrinsic penetration but limited to no more than 2 mm for Argon and KTP. Bipolar or thermal coagulation is effective on lesions which can be held in the grasping jaws and on small surface lesions. Initial dissection may be needed so that the lesion can be grasped and controlled.

However lesions have infiltrated ≥ 3 mm deep in 60% of patients.[3] For these deeper lesions, vaporization or excision is continued down to the level of healthy tissue. The tissue distortion that occurs with vaporization techniques can be confusing and deep lesions can be missed due to this distortion. These deep lesions are most accurately excised.

- For lesions of 4 mm to 9 mm, 58 of 62 (94%) were removed at laparoscopy.
- For those lesions of 10 mm and greater, only 4 of 18 (22%) were excised at laparoscopy.
- Of the remaining 18 patients, 4 were treated with medical suppression and 14 underwent laparotomy.[3]

For excision, the lesion is outlined by cutting through the peritoneum and into the loose connective tissue with scissors, knife or laser. The underlying loose connective tissue and fat is noted and then a probe, irrigating solution,[7,11] knife or laser is used to dissect through these layers. Dissecting with a blunt probe or irrigating solution is used in vascular areas to try and avoid cutting across large vessels inadvertently and is used in the broad ligament to push the ureter away from the peritoneum.

Once tissue has been excised it is removed through the laparoscope. Tissue which is too large to remove through the trocar sheath is cut into smaller sizes with scissors or removed by minilaparotomy or colpotomy.

Excision:

- Creates less smoke than vaporization,
- Leaves less carbon than vaporization, and
- Provides tissue for diagnosis.

If carbon is allowed to accumulate, this obscures the field both at the time of the surgery and at subsequent laparoscopy. In both of these situations, carbon can easily be confused with endometriosis. This is particularly true where carbon has been left above endometriosis.[12,13] In that situation, the only way to find out what is beneath the carbon is to excise the entire area. Furthermore, carbon sublimates at 3652°C. High power density superpulse techniques decrease carbonization by facilitating rapid vaporization with a decrease in the amount of lateral tissue desiccated or coagulated.[14] Carbon is removed by lavage solutions or by use of pusher sponges.

Ovary

Certain general concepts appear to apply to ovarian endometriomas. These concepts are related to the size.

- Lesions of less than 5 mm are biopsied and coagulated, vaporized or excised.
- Between 5 mm and 2 cm, these are handled according to the general characteristics at the time of surgery.

- Ovarian endometriomas of 2 cm to 5 cm in size are stripped and sent to pathology.
- Those greater than 5 cm are difficult to handle through the laparoscope but can be done if the surgeon and patient are willing to risk 2 to 5 hours at laparoscopy with a realization that a laparotomy may be necessary 3 to 5 hours into the operation.[12]

The ovary is opened and drained and the inner wall inspected. The opening of the ovary for this stripping can be performed with any type equipment but should be at the dependent portion or on the lateral (broad ligament) side to avoid bowel adhesions. A relaxing incision to facilitate definition of the plane of the pseudocapsule may be useful. When the capsule is adherent to the hilar vessels, coagulation is used instead of stripping to avoid tearing these vessels. Interceed® (TC7) Absorbable Adhesion Barrier (Appendix G) may be useful.

Removing large cysts at laparoscopy or at laparotomy may increase the chance of sacrificing the ovary when compared with staged procedures. Plans used to drain and shrink large cysts include drainage at initial laparoscopy (Koninckx P, unpublished data) or aspiration using a vaginal sonographic probe, placing the patient on medical suppression and then performing a subsequent operative laparoscopy to excise the remnant.

Bowel

The possibility of bowel involvement is suggested by:

- Palpable tumor near the bowel,
- Rectal bleeding at the time of menses, or
- Persistent pain following laparoscopic removal of recognized lesions.

Recognition requires careful palpation of the rectovaginal septum, deep uterosacrals, lateral rectum and the rectosigmoid junction. Lesions smaller than 1 cm are easier to palpate than to see. This is true in the appendix. In addition, these small lesions are not generally seen on barium enema, colonoscopy, sonography, CAT scans or MRI scans.

Tumor in the rectovaginal septum generally requires a gynecologist or general surgeon familiar with bowel surgery in this area. Deep rectosigmoid resection and anastomosis is a distinct possibility at this level and laparotomy may be indicated.[15-17] Furthermore, the uterosacral ligaments can be infiltrated with extension toward the sacrum. This level of the uterosacrals is more palpable through the rectosigmoid area than through the vagina. If the mucosa is fixed, full thickness penetration is often present. With any concern regarding bowel muscularis involvement, a general surgical consult, barium enema, sigmoidoscopy and colonoscopy are considered. The contrary opinion is on page 14.

Laparoscopic dissection and excision in this area is intentionally superficial. The CO_2 laser is focused and in repeat pulse or superpulse. This is to avoid distortion and damage associated with coagulation and vaporization. A laparoscopic approach will generally be adequate for 50% to 90% of bowel lesions and adhesions. However, those patients who have persistent pain may require medical suppression and/or laparotomy.[3,16,18,19]

Resection of infiltration with bowel distortion associated with pain and tenderness was attempted at laparoscopy in 5 patients.[3] Immediate laparotomy was performed for bowel resection in 2 of these. Although the other 3 had apparent resection of their endometriosis, persistent pain and tenderness resulted in delayed laparotomy in all 3. All 5 had deep muscularis involvement. This agrees with previous conclusions on the need for laparotomy in patients with pelvic pain and bowel endometriosis.[15,17]

Patients prepared for laparotomy are generally bowel prepped as the most common indication for laparotomy is suspected bowel involvement. In addition, self blood banking is discussed with these patients as these procedures frequently last 3 to 5 hours and can be associated with significant blood loss and subsequent transfusion.

Bladder

Bladder implants of ≤ 5 mm are handled as previously discussed in peritoneal lesions. From 5 to 20 mm penetration, these approach and may invade the bladder muscularis. Deep bladder muscularis penetration should be anticipated as the lesions get larger. When the indication is pelvic pain, those lesions of 2 cm and greater have required resection of the bladder dome at laparotomy.

Ureter

When endometriosis lies over the ureter, a technique is used which is very similar to that used at laparotomy.

- An incision is made in the peritoneum above and away from the ureter.
- This peritoneum is then pulled toward the midline with pickups through an alternate puncture.
- A blunt probe is used to push the ureter away.
- The laser is not aimed at the ureter.

If the ureter does not push away from the peritoneum, the chance of infiltration in the ureter is too great to attempt this procedure laparoscopically. In addition, if the ureter is transected in the process of resecting disease, many urologists feel that an anastomosis in a diseased area should not be performed and that a implantation is indicated. If you are not prepared for ureteral implantation, avoid cutting near the ureter.

Staged Procedures

The initial approach at laparoscopy is to perform as much surgery as reasonable. Endometriosis, particularly around the ureter, bowel or major blood vessels, may be left behind intentionally with the anticipation that either observation or medical therapy may provide sufficient relief that laparotomy will not be necessary.

If the pain persists, then either a second laparoscopy or a laparotomy is considered. If the symptoms are decreased where there was significant endometriosis present, a second laparoscopy may remove additional lesions or recurrent lesions.[17] This appears particularly true in younger patients.

When the pain is severe, especially when this includes bowel symptomatology, a laparotomy may reveal palpable lesions that were not seen at laparoscopy. Due to the increased incidence of palpable bowel disease in this group, bowel prep is routinely performed on all patients who are prepared for laparotomy.

Morphine - Marcaine Incisional Block

A solution of 2 mg of morphine per 10 cc of 0.25% Marcaine is injected into the incision to decrease postoperative pain. This is useful both at laparoscopy and laparotomy and is similar to the use of morphine and Marcaine for focal blocks as discussed in Appendix H.

Pregnancy

Pregnancy rates analyzed for years of infertility and for presence of other factors suggest that young patients delaying their families and patients who have short term infertility have a good chance of having children and should not be overly discouraged about their prognosis. On the other hand, patients with long term infertility and male factor should not be inappropriately encouraged.[20,21] Also see page 40.

Pregnancy rates as a function of years of infertility and presence of other factors[20]

	Endometriosis only		With other factors	
Years of Infertility	Number of Patients	Number Pregnant	Number of Patients	Number Pregnant
1 - 2	17	14 (82%)	27	16 (59%)
3 - 7	17	9 (53%)	41	16 (39%)
8 - 13	0	0 (%)	13	1 (7%)

Pregnancy rates following coagulation varied from 24% to 74% with a collected rate of 46% in 417 patients in eight series. (Appendix C) In twelve studies following laser ablation with a total of 1536 patients there was a range of 47% to 69% and a collected rate of 56%. The collected rate was 45% in 782 patients with other factors were present while in the 754 patients with no other factors the collected rate was 68%. (Appendix D)

Life table analysis in three separate studies[2,22,23] points out that laparoscopic techniques are equal to medication or laparotomy in mild or moderate cases and equal to or better than laparotomy in severe cases.

Pain

Pain relief is a much harder to quantitate as pain may be due to endometriosis, due to endometriosis and other factors, or due only to other factors with endometriosis as a coincidental finding. Pain relief has been reported to be similar to that occurring after laparotomy.[24]

The presence of endometriosis does not identify the cause of pain in all patients. In general focal pain associated with focal disease responds to removal or destruction. Diffuse pain is much harder to predict and pain associated with chlamydia is the hardest to relieve.

Pain mapping by patients (Appendix A) and by the physician are useful in identifying lesions at surgery. These maps are helpful with deep unseen disease.

Resection of the vaginal apex is covered on page 15. However, when the cuff following hysterectomy is free of endometriosis but remains tender, local block is considered. This is covered in Appendix H.

Medical Suppression

Medical suppression (oral contraceptives, progestins, danazol and GnRH analogs) has been used in specific clinical situations. Of these, danazol and GnRH analogs have produced the most rapid and predictable relief of pain and have been preferred for short-term (six months or less) use while oral contraceptives are less expensive and are more generally used for long-term (more than six months) purposes.

Although tender pelvic nodules commonly require surgical excision for pain relief, medical suppression can be used to delay and, on occasion, to avoid surgery altogether. The author has also used suppression, usually danazol or GnRH analogs:

- As preoperative preparation,
- For persistent infertility following surgical excision,
- For patients who have recurrent miscarriages,
- To initiate therapy prior to use of oral contraceptives,
- As a preoperative medication for patients who have cornual occlusion and
- Preoperatively for myomectomy.

Laparotomy

Laparotomy has been the standard for surgical therapy of endometriosis. Palpation, examination of retroperitoneal spaces, examination of bowel, and delicate handling of deep lesions are enhanced at laparotomy when compared with laparoscopy. Laparoscopic excision of deep bowel lesions is associated with a high persistence.[3] Open surgery is used when circumstances indicate a need for laparotomy. (Appendix B) However, exposure and visualization are improved by using laparoscopic techniques and these are preferred when they are advantageous for the patient. Laparotomy is most useful in patients with persistent pelvic pain following initial laparoscopic approach.

A comparison of hysterectomy and conservative surgery is not in the scope of this chapter. However, many of the concerns of myomectomy (Appendix F) are present with conservative surgery for endometriosis.

Disease of Coping

Emotional counseling is helpful as endometriosis is a "disease of coping."[16] Pelvic pain, pelvic discomfort, dyspareunia, dysmenorrhea, marital discord, infertility, recurrent miscarriages, medical expenses, unsuccessful medical therapy, unsuccessful operations and the inability of multiple physicians to correct the problem lead to extreme frustration. Even the most skilled surgeon may be unable to properly treat the patient without utilizing many modalities and consulting with other health care providers. Patients frequently appreciate being told that this difficulty exists. It helps confirm what they already knew but feared that their physician did not.

Self-help and support groups such as the Endometriosis Association and Resolve, Inc. are helpful to many patients and their families.

Endometriosis Association
8585 North 76th Place
Milwaukee, WI 53223

Resolve, Inc
5 Water Street
Arlington, MA 02174

Conclusion

Bipolar coagulators, unipolar knives, thermal coagulators,and lasers have been used to ablate (coagulate, vaporize or excise) endometriosis. A combination of these techniques is superior to concentrating on one of them.

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Cyclic Calendar

Day of Cycle	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Date																															
Menses																															
Medications:																															
Cramps - Pelvic																															
Cramps - Other																															
Backache																															
Pelvic pain - Left																															
Pelvic pain - Right																															
Pelvic pain - Low middle																															
Pelvic pain - Other																															
Painful Bowel Movement																															
A. Before																															
B. During																															
C. After																															
Painful Sexual Intercourse																															
A. During																															
B. After																															
Urinary Problems																															
A. Pain																															
B. Urgency																															
C. Frequency																															
General Aches/Pains																															
Feeling the Blues																															
Feeling Depressed																															

Menses:
X = Menses
S = Spotting

For medications, list the initials and medications used:
_____ = _____
_____ = _____
_____ = _____

Grading of Symptoms and/or Complaints:
1 = Mild, but does not interfere with activities.
2 = Moderate and interferes with activities but not disabling.
3 = Severe and disabling, unable to function.

PAIN QUESTIONAIRE

Name: _____ Date: _____

1. Pain History
   a. Brief history of present pain to point of origin:

   b. Prior treatment:

   c. Use of medications:

   d. Description of things that increase pain:

   e. Description of things that decrease pain:

2. Pain Description
   a. Describe typical pain:

   b. Rate average pain (1-10):
   c. Rate lowest degree of pain (1-10):
   d. Rate highest degree of pain (1-10):
   e. Overall interference of pain with life (1-10):

3. Related History
   a. Any history of sexual abuse:

   b. Any history of affective disorder:

WHAT DOES YOUR PAIN FEEL LIKE?

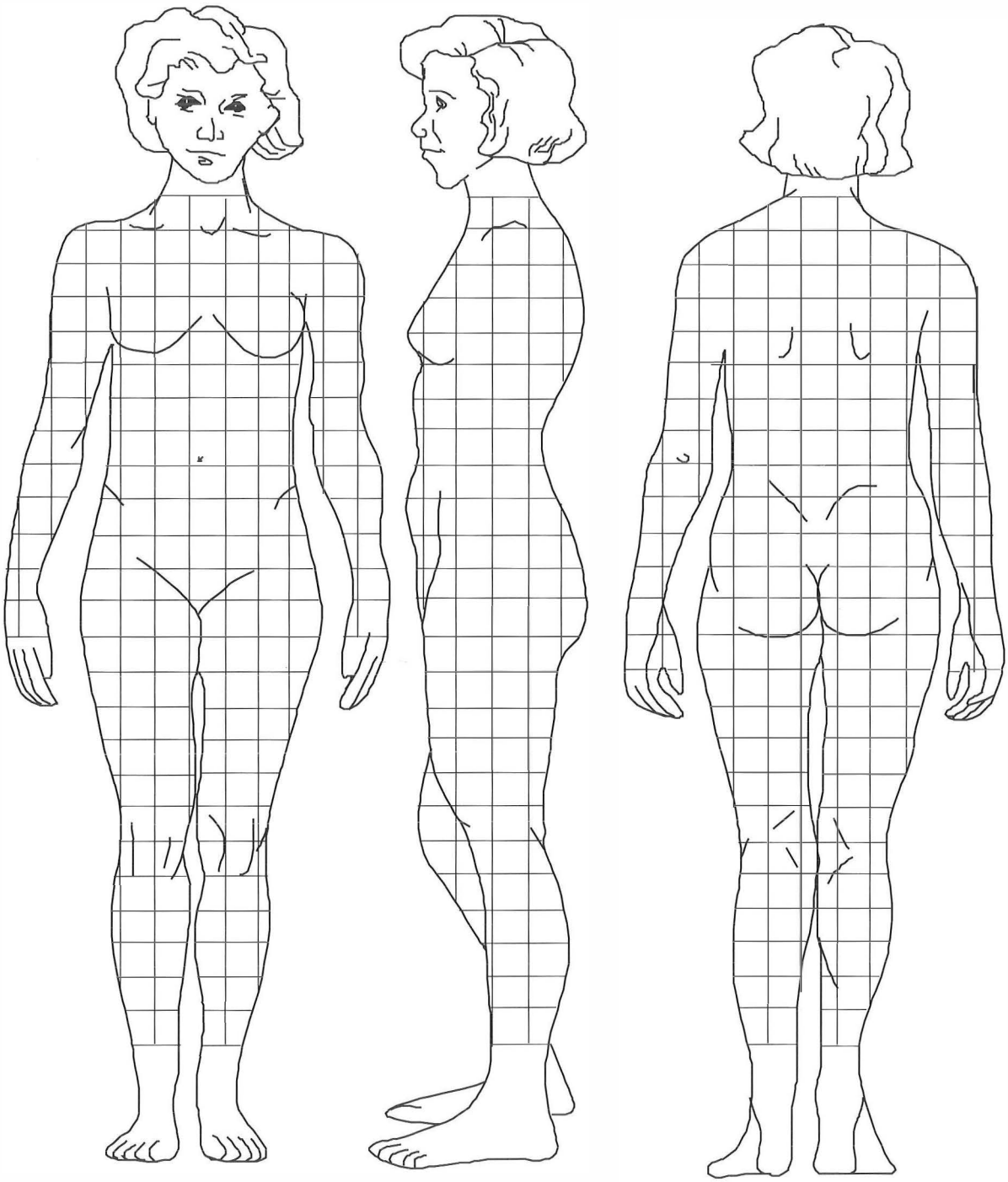
Some of the words below describe your present pain. Circle ONLY those words that best describe it. Leave out any category that is not suitable. Use only a single word in each appropriate category -- the one that applies best.

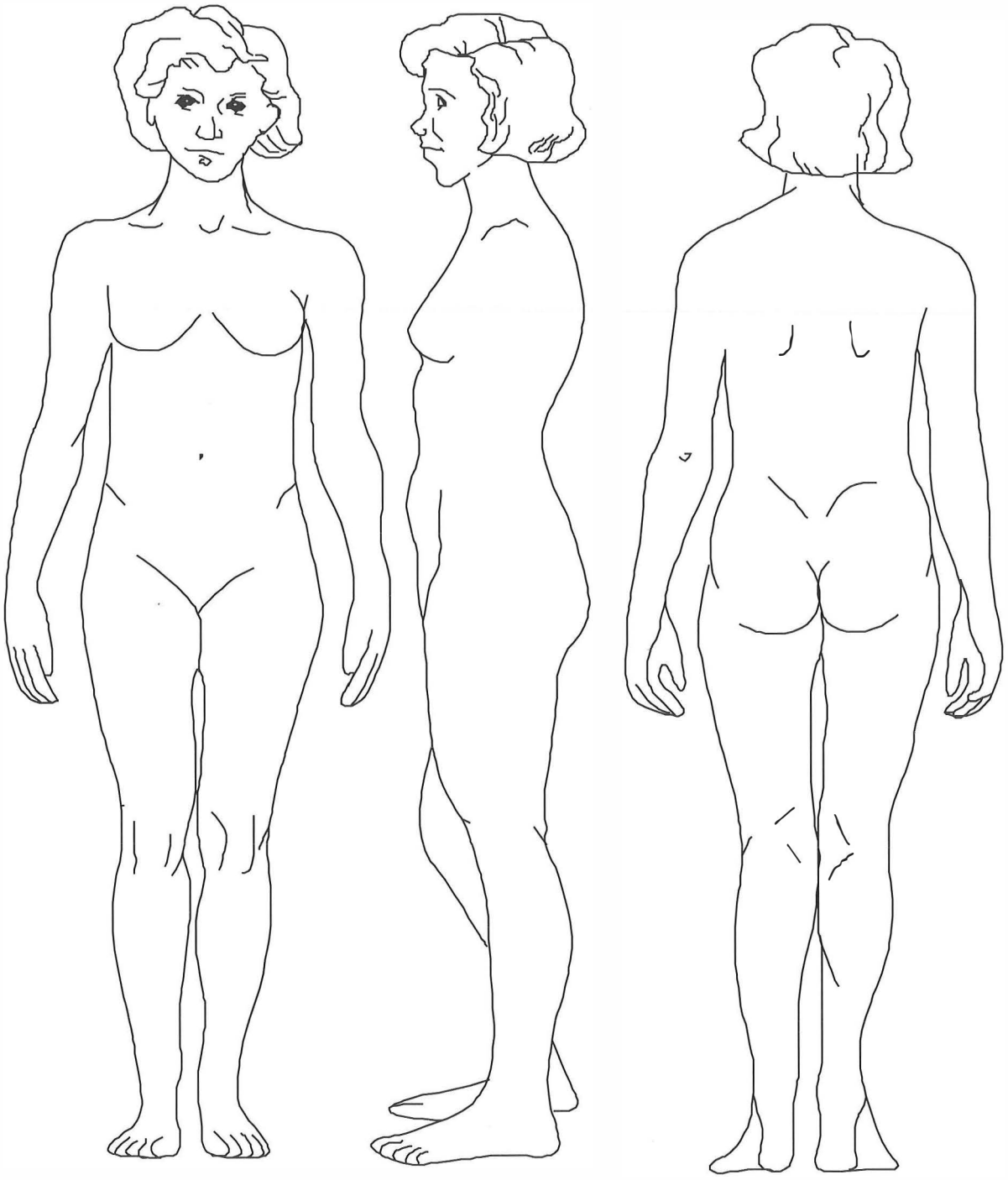
1	2	3	4	5
Flickering	Jumping	Pricking	Sharp	Pinching
Quivering	Flashing	Boring	Cutting	Pressing
Pulsing	Shooting	Drilling	Lacerating	Gnawing
Throbbing		Stabbing		Cramping
Beating		Lancinating		Crushing
Pounding				

6	7	8	9	10
Tugging	Hot	Tingling	Dull	Tender
Pulling	Burning	Itchy	Sore	Taut
Wrenching	Scalding	Smarting	Hurting	Rasping
	Searing	Stinging	Aching	Splitting
			Heavy	

11	12	13	14	15
Tiring	Sickening	Fearful	Punishing	Wretched
Exhausting	Suffocating	Frightful	Gruelling	Blinding
		Terrifying	Cruel	
			Vicious	
			Killing	

16	17	18	19	20
Annoying	Spreading	Tight	Cool	Nagging
Troublesome	Radiating	Numb	Cold	Nauseating
Miserable	Penetrating	Drawing	Freezing	Agonizing
Intense	Piercing	Squeezing		Dreadful
Unbearable		Tearing		Torturing





LAPAROSCOPY INFORMATION

The laparoscope is placed in an **incision in the belly button** in order to see. **Incisions may be made at the hairline** for lasers and instruments for major surgery. Dr. Martin is usually assisted by surgical assistants or by hospital personnel. Other doctors in practice or in training will be introduced to you if they are present.

Laparoscopy is **generally an out-patient procedure**.

- However, **you may be asleep from 1 to 4 hours**.
- Common side effects include shoulder pain, bloating, itching where hair was shaved, bladder spasm, vaginal bleeding, and sore throat.
- About **1 in 20 patients stay overnight** due to nausea, drowsiness or pain.

Complications such as bleeding, infection, allergy, and urinary retention require hospitalization in 1 in 400 patients. Major complications that require further surgery or blood transfusion occur in 1 in 1,200 patients. Complications such as hysterectomy, paralysis or death are so rare that **this is safer than driving your car this year.**

Pictures may be taken during surgery to show you what was seen and done. They are also used to teach other patients and other surgeons.

After surgery

- **You should avoid any activities that require concentration for 2 days.**
- **You can usually return to work and normal tasks by 3 to 10 days.**
- **You may take 3 to 10 weeks to return to normal health and energy.**

If your tubes are scarred, you will need sonograms and blood pregnancy tests early in pregnancy to check for tubal pregnancy. Treatment by 3 to 4 weeks may save the tubes.

At the time of laparoscopy, open surgery (laparotomy) may be needed to care for an emergency or it may be seen as a better approach. **We are always ready to do open surgery in an emergency.** However, additional preparation such as medication,bowel prep or banking your own blood may be useful in other situations. Also, open surgery generally requires 3 to 8 days in the hospital and 6 to 8 weeks for recovery. If there are reasons for this before surgery, we will make plans for decisions about open surgery. Otherwise, we will stop and make decisions at a later date.

Your insurance plan may not cover the total cost of extensive operative laparoscopy. In addition, some insurance plans have participating physicians. You should clarify your insurance coverage before you schedule surgery.

Be sure to have your questions answered before the day of surgery.

I have discussed this with and have given a copy to_____.

A permit is to be signed later.

_____ _____

Date Signature

COAGULATION RESULTS

Laparoscopic electrical and thermal coagulation

Author	Number of Patients	Length of Follow-up	Pregnancies
Eward[1]	25	1-2 yrs	14 (56%)
Hasson[2]	8	1-4 yrs	6 (75%)
Mettler[3]	90	1-6 yrs	22 (24%)
Sulewski[4]	100	1-5 yrs	40 (40%)
Daniell[5]	60	1-2 yrs	34 (57%)
Seiler[6]	45	7 mos	20 (44%)
Reich*[7]	20	1-7 yrs	12 (60%)
Nowroozi§[8]	69	8 mos	42 (61%)
Total	417	—	190 (46%)

* 92% (12 of 13) with endometriosis as an isolated factor and endometriomas greater than 2 cm.
§ Patients with no other factors and mild endometriosis
(adapted from Martin DC: J Reprod Med 1986;31:1089-94)

1. Eward RD: Cauterization of stage I and II endometriosis and resulting pregnancy rate. In: Endoscopy and Gynecology. Edited by JM Phillips. California, American Association of Gynecologic Laparoscopists, 1978, pp 276-8.

2. Hasson HM: Electrocoagulation of pelvic endometriotic lesions with laparoscopic control. Am J Obstet Gynecol 1979;132:115.

3. Mettler L, Giesel H, Semm K: Treatment of female infertility due to obstruction by operative laparoscopy. Fertil Steril 1979;32:384.

4. Sulewski J, Curcio F, Bronitsky C, et al: The treatment of endometriosis at laparoscopy for infertility. Am J Obstet Gynecol 1980;138:128.

5. Daniell JF, Christianson C: Combined laparoscopic surgery and danazol therapy for pelvic endometriosis. Fertil Steril 1981;35:521.

6. Seiler JC, Gidwani G, Ballard L: Laparoscopic cauterization of endometriosis for fertility: A controlled study. Fertil Steril 1986;46:1098.

7. Reich H, McGlynn F: Treatment of ovarian endometriosis using laparoscopic surgical techniques. J Reprod Med 1986;31:557.

8. Nowroozi K, et al: The importance of laparoscopic coagulation of mild endometriosis in infertile women. Int J Fertil 1987;32:442.

CO_2 LASER RESULTS

CO_2 Laser Laparoscopy: Endometriosis in all patients

	All Patients		Minimal/Mild		Moderate		Severe/Extensive	
Author	Number	Pregnant	Number	Pregnant	Number	Pregnant	Number	Pregnant
Kelly[1]	10	6 (60%)	3	3 (100%)	7	3 (43%)	0	0 (%)
Feste[2]	140	82 (59%)	106	62 (58%)	31	18 (58%)	3	2 (67%)
Daniell[3]	48	26 (54%)	24	16 (67%)	15	7 (47%)	9	3 (33%)
Martin[4]	115	54 (47%)	56	23 (41%)	45	22 (49%)	14	9 (64%)
Davis[5]	64	37 (58%)	31	20 (65%)	26	15 (58%)	7	2 (29%)
Nezhat[6]	102	65 (64%)	24	18 (75%)	51	32 (63%)	27	15 (56%)
Bowman[7]	35	18 (51%)	19	12 (63%)	13	4 (31%)	3	2 (67%)
Donnez[8]	70	40 (57%)	42	26 (62%)	21	11 (52%)	7	3 (43%)
Paulsen[9]	431	225 (52%)	257	144 (56%)	174	81 (47%)	0	0 (%)
Gast[10]	122	57 (47%)	105	49 (47%)	17	8 (47%)	0	0 (%)
Adamson[11]	156	86 (55%)	133	77 (58%)	20	7 (33%)	3	0 (0%)
Nezhat[12]	243	168 (69%)	39	28 (72%)	86	60 (70%)	118	80 (68%)
Total	1536	864 (56%)	839	478 (57%)	506	268 (53%)	191	116 (61%)

(adapted from Martin DC, Diamond MP[13])

CO_2 Laser Laparoscopy: Endometriosis as an Isolated Factor

	All Patients		Minimal/Mild		Moderate		Severe/Extensive	
Author	Number	Pregnant	Number	Pregnant	Number	Pregnant	Number	Pregnant
Feste[2]	60	42 (70%)	44	31 (70%)	14	10 (71%)	2	1 (50%)
Martin[4]	34	23 (67%)	13	9 (69%)	11	6 (55%)	10	8 (80%)
Nezhat[6]	102	65 (64%)	24	18 (75%)	51	32 (63%)	27	15 (56%)
Paulsen[9]	228	169 (74%)	140	109 (78%)	88	60 (68%)	0	0 (%)
Gast[10]	27	7 (26%)		NA		NA	0	0 (%)
Adamson[11]	60	39 (65%)	47	31 (66%)	11	7 (61%)	2	0 (0%)
Nezhat[12]	243	168 (69%)	39	28 (72%)	86	60 (70%)	118	80 (68%)
Total	754	513 (68%)	307	226 (74%)	261	175 (67%)	159	104 (65%)

NA = not available
(adapted from Martin DC, Diamond MP[13])

References

1. Kelly RW, Roberts DK: CO_2 laser laparoscopy: A potential alternative to danazol in the treatment of stage I and II endometriosis. J Reprod Med 1983;28:638-40.

2. Feste JR: Endoscopic laser surgery in gynecology. In: Reproductive Surgery. Postgraduate Course Syllabus, American Fertility Society, Chicago, 1985.

3. Daniell JF: Management of endometriosis. Presented at the Fourth Annual Gynecologic Surgery Seminar, Baptist Memorial Hospital, Memphis, Tennessee, 1985.

4. Martin DC: CO_2 laser laparoscopy for endometriosis associated with infertility. J Reprod Med 1986;31:1089.

5. Davis G: Management of endometriosis and its associated adhesions with the CO_2 laser laparoscope. Obstet Gynecol 1986;69:422.

6. Nezhat C, Crowgey SR: Surgical treatment of endometriosis via laser laparoscopy. Fertil Steril 1986;45:778.

7. Bowman EA: quoted in Martin and Diamond.

8. Donnez J: CO_2 laser laparoscopy in infertile women with endometriosis and women with adnexal adhesions. Fertil Steril 1987;48:390-4.

9. Paulsen JD, Asmar P: The use of CO_2 laser laparoscopy for treating endometriosis. Int J Fertil 1987;32:237.

10. Gast MJ, Tobler R, Strickler RC, et al: Laser vaporization of endometriosis in an infertile population: the role of complicating infertility factors. Fertil Steril 1988; 49:32.

11. Adamson GD, Lu J, Suback LL: Laparoscopic CO_2 laser vaporization of endometriosis compared with traditional treatments. Fertil Steril 1988;50:704-10.

12. Nezhat C, Crowgey SR, Nezhat F: Videolaseroscopy for the treatment of endometriosis associated with infertility. Fertil Steril 1989;51:237-9.

13. Martin DC, Diamond MP: Operative laparoscopy: comparison of lasers with other techniques. Curr Prob Obstet Gynecol Fertil 1986;9:564.

ARGON AND Nd:YAG LASER RESULTS

Argon laser laparoscopy

	All Patients		Mild		Moderate		Severe	
Author	Number	Pregnant	Number	Pregnant	Number	Pregnant	Number	Pregnant
Keye[1]	56	19 (34%)	41	15 (37%)	10	3 (30%)	5	1 (20%)

Argon laser laparoscopy

	0 to 2 years of infertility		3 or more years of infertility	
Author	Number	Pregnant	Number	Pregnant
Keye[1]	44	30 (68%)	71	26 (37%)

Nd:YAG laser laparoscopy

	All patients		Isolated factor		With other factors	
Author	Number	Pregnant	Number	Pregnant	Number	Pregnant
Kojima[2]	29	15 (52%)	16	11 (69%)	13	4 (31%)

1. Keye WR, Hansen LW, Astin M, Poulson AM: Argon laser therapy of endometriosis: a review of 92 consecutive patients. Fertil Steril 1987;47:208-12.

2. Kojima E, Yanagibori A, Yuda K, Hirakawa S: Nd:YAG laser endoscopy. J Reprod Med 1988;33:907-11.

MYOMECTOMY / HYSTERECTOMY

Myomectomy and hysterectomy are both **major surgeries**. Each can require **3 to 8 days in the hospital and 3 to 8 weeks for recovery**. Both can have major complications. These include hemorrhage (bleeding), infection, allergy, damage to the tubes and ovaries, damage to the ureters, and damage to the bowel. Severe complications such as colostomy, paralysis or death are rare. With respect to your life, these operations appear to be about as dangerous as driving a car this year.

Myomectomy has several advantages. Your uterus may be preserved. Your fertility may be preserved or enhanced. However, sometimes hysterectomy may be necessary to remove the myomas because of their position. Sometimes the tubes may be blocked by removing the myomas. There seems to be an increased miscarriage rate in women who have myomas. This may also be true for women who have had myomas removed. In addition, at delivery of a baby, there is the worry that the incision will not hold during labor. Scheduled C-section may be needed.

Advantages of **hysterectomy** include shorter operating time. This decreases the chance of an adverse reaction to the anesthesia. Generally, there is less blood loss and a lower chance of transfusion. There is a decrease in the chance of post-operative adhesions, post-operative bowel obstruction and repeated operations. The cost is usually lower. Your insurance plan may provide better coverage.

For either operation, you should consider banking your own blood so that it will be available if you need it. This is particularly true for myomectomy. However, the use of laser techniques to remove myomas decreases the blood loss and decreases the chance of blood transfusion. We expect that there will be fewer post-operative adhesions after laser myomectomies, compared to older methods. This appears to be due to use of the laser decreasing tissue handling and suturing.

Medicines such as GnRH and danazol are being used to shrink myomas to make the surgery easier in some patients. These may also be useful for patients who are trying to avoid surgery because of medical problems.

I have received a copy of this form. I am considering the options and issues discussed.

Date	Signature	Witness

Placement of Interceed® (TC7) Barrier

FDA material was removed as it was dated.

MORPHINE BLOCK OF FOCAL PAIN

This approach is for those patients who have localized tenderness (e.g. post hysterectomy cuff) which is constant and repeatable on subsequent exam. The plan is to use local morphine injection to desensitize and/or deaden the area. These injections are repeated at intervals determined by the rate of return of pain and have required from four injections over two months to 15 injections over two years.

Patients who have diffuse tenderness, those with no localized areas and those with less than 24 hours relief have a high failure rate. The best success rates are in patients who get 2 to 5 days relief following the first injection.

Consider laparoscopy prior to injection to assure that bowel is not adherent to the cuff and to evaluate possibility of pathology such as endometriosis and/or adhesions.

Injection technique

1. Examine patient to map areas for injections.
2. Use 3 1/2" 23- to 27-gauge spinal needle.
3. Administer 0.25% Marcaine before morphine as the morphine injection is initially painful.
4. Wait 10 to 15 minutes for effect of local anesthetic.
5. Re-examine patient to assure that the areas have been anesthetized.
6. Morphine 2 mg / 10 cc saline.
7. Repeat injection when patient notes return of pain.
   - Every 2 to 3 days for two weeks.
   - Every week for six weeks.
   - Every month for six months.
   - Every 2 to 6 months for two years.
8. Discontinue injection if patient
   - Has more pain from injection than from sensitive focal points.
   - Does not tolerate injection.
   - Is not increasing the injection interval by the second week.

Potential Complications

- Abscess - bacterial or sterile.
- Bowel injection/penetration/surgery.
- Uterine artery damage/hematoma/surgery.
- Ureter damage/occlusion/surgery.

The slides were scanned and are at:
1990 Color Atlas (PDF): www.danmartinmd.com/files/coloratlas1990.pdf
1988 Slide Set (PDF): www.danmartinmd.com/files/lae1988.pdf

1.

Laparoscopic Appearance of Endometriosis

2.

Dark and Scarred Lesions

Black Lesions

3. Puckered black lesions are the easiest to see at laparoscopy and to document by biopsy or excision of the dark area.

4. Tissue from this lesion has a diffuse mixture of glands, stroma, intraluminal debris, fibrosis and muscle.

5. In this lesion, fibrosis, stroma, hemorrhage and hemosiderin laden macrophages separate the glands.

White Scarred Lesions

6. White scarred areas are easier to see when the intraluminal areas of the glands contain debris from bleeding.

7. These glands are deep in the fibrotic scar.

8. The white lesion involves the left uterosacral. The black particles on the surface are carbon from previous vaporization.

9. In this area, sparse stroma and glands surrounded by fibrous tissue and muscle is the predominant picture.

10. Trichrome stain was used to differentiate the fibrous and muscular components. The muscular portion may be metaplasia and may not represent true muscle.

White Scarred Lesions with Red Polyps

11. When white scarred areas are associated with red polyps, the red polyps were most commonly endometriosis.

12. Red polypoid endometriomas can be associated with deeper glands and stroma in the white fibrotic scar.

13. The red polyps are predominantly endometrial glands and stroma.

The slides were scanned and are at:
1990 Color Atlas (PDF): www.danmartinmd.com/files/coloratlas1990.pdf
1988 Slide Set (PDF): www.danmartinmd.com/files/lae1988.pdf

14.

Subtle Lesions

Pockets

15. A small developing pocket is in the right lower cul-de-sac. In the rim, immediately above and to the left of the pocket is a small white lesion that is best seen by direct visualization or magnified on monitors or with photography. Panoramic monitors and photography can easily miss these lesions.

16. A section across the rim and pocket reveals that the white lesion is a small area of endometriosis and there is stroma at the other margin of the pocket.

17. Secretion into this type glandular structure is a common feature.

Clear Lesions

18. Clear polyps and vesicles may be endometriosis or other pathology.

19. This endometriosis is seen as a dilated vesicle with scant stroma and little vascularization.

20. Other patients have edematous endometriosis presenting as clear polypoid lesions.

21. The angle of light inflection was important in noting these clear and white lesions. In this slide, lesions are seen at 3 or 4 locations. The next slide shows a different light angle of this same section.

22. When the angle of the view was changed (slide 34), more lesions were seen. It is not uncommon that the angle of light on the peritoneal surface needs to be changed in order to see lesions of this type.

23. This clear vesicle is a dilated gland within fibrosis.

24. Other sections in the same patient show both glands and stroma.

Red Lesions

25. Red polypoid areas have been as large as 7 mm.

26. Red polypoid lesions usually contain glands and stroma with variable degrees of vascularity and hemorrhage. Scarring is uncommon.

27. The cluster of red endometriotic lesions at the right cornua on this patient demonstrates several types of histology represented in the following slides (31 - 33).

The slides were scanned and are at:
1990 Color Atlas (PDF): www.danmartinmd.com/files/coloratlas1990.pdf
1988 Slide Set (PDF); www.danmartinmd.com/files/lae1988.pdf

28. Highly vascular glands and stroma are represented by the most distal cornual lesion.

29. The most proximal lesion is an "early mini-endometrioma" with red blood cells dilating the glandular structures.

30. This collapsed vesicle has stroma and can be contrasted to the nonspecific vesicle of slide 68.

31. Teenagers commonly have small red or pink polyps and white blebs as isolated findings. In this 19 year old, the largest lesion was 400 μ in diameter and is the small red polyp near the center of the slide. The white light reflections on the left of the slide are 200 μ epithelial lesions.

32. The 400 μ polyp was comprised of endometrial glands and stroma.

33. The small clear areas were epithelial lesions. The epithelial lining of these was compatible with endometriosis.

34.

Infiltrating Lesions

Wide Infiltrating Lesions

35. Endometriosis and red adhesions cover the posterior left broad ligament. The left ovary is seen in the upper portion of the field and the left uterosacral at the depth of the field. Black areas of endometriosis are noted to the left. Red adhesions are noted in the center. These red adhesions hide endometriosis in approximately 40% of the cases.

36. Due to the anticipation that endometriosis cannot be seen in adherent tissue, the area was excised in its entirety. The excision was started by opening the peritoneum away from the ureter and then pushing the ureter off with a blunt probe. Blunt probes protect the ureter. If the ureter will not bluntly dissect away from the peritoneum, it is assumed that the endometriosis may be infiltrating into the ureter and this is not removed unless the patient has been preoperatively prepared for ureteral implantation. However, in the majority of the circumstances the ureter has pushed away easily and the broad ligament has been excised.

37. In this low power view, glands and stroma are seen infiltrating the broad ligament.

38. In this section of the red adherent area, endometriosis is seen infiltrating through the entire field.

The slides were scanned and are at:

1990 Color Atlas (PDF): www.danmartinmd.com/files/coloratlas1990.pdf

1988 Slide Set (PDF): www.danmartinmd.com/files/lae1988.pdf

Deep Infiltrating Lesions

39. This right uterosacral ligament is interesting in two aspects. The first is that the brown appearance may be related to the positive chlamydia culture from this surface. We know that patients with endometriosis can also have chlamydia.

40. The second point is that this lesion goes much deeper than is apparent.

41. After dissection, the depth is almost to the level of the rectosigmoid colon and the vaginal apex.

42. The lesion was measured to a depth of 7 mm toward both the rectum and vagina. Bipolar and thermal coagulation are inadequate to coagulate this lesion. In addition, lasers which coagulate to a depth of no greater than 0.4 to 4.2 mm are also inadequate. Destruction of this lesion requires vaporization or excision.

43. Diffuse endometriosis is seen in the cul-de-sac. However, the lesion at the center is the one of note. This is the fibrotic white lesion behind the black surface endometriosis. This lesion was palpated on bimanual exam as a 2 cm nodule.

44. The lesion extended from the peritoneum to the vagina and is seen in the posterior vaginal fornix.

45. The laparoscopic dissection was taken to the level of the vagina. A probe in both the vagina and the rectum was used for recognition of these areas. The rectum was avoided and the probe in the vagina used so that the dissection could be taken immediately adjacent to the probe around the circumference of the lesion. Once this was developed, an incision was made directly through the vagina. A wet sponge is in the vagina to decrease loss of the pneumoperitoneum. The lesion was pulled through the vagina after mobilization.

46. The left side of the slide is the peritoneum and the right side the vaginal epithelium. Endometriosis infiltrates through the entire fibromuscular scar area.

47. What appears to be a small lesion on the sigmoid colon may represent the "tip of the iceberg".

48. The red area at the top of the bowel is an edematous vascular area of glands and stroma. The muscular infiltration can be seen beneath this.

49. The muscular infiltration extended through 80% of the muscle wall. This is in spite of the appearance of superficial endometriosis. This type lesion is easier to palpate than to see.

The slides were scanned and are at:
1990 Color Atlas (PDF): www.danmartinmd.com/files/coloratlas1990.pdf
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50.

Chocolate Cysts

Endometrioma

51. On opening a chocolate cyst, the appearance may be one of irregular brown and red areas. The red areas most commonly have glands and stroma. The browner areas are more commonly hemosiderin laden.

52. Other endometriomas have diffuse areas of red patches with no obvious hemosiderin. These are more likely to have glands and stroma.

53. Hemosiderin laden macrophages are seen in the brown area.

54. A polypoid area of glands and stroma is seen in the red areas immediately adjacent to the hemosiderin.

Corpus Luteum

55. Chocolate cysts may also be corpus lutea or albicans. These frequently have clots within them or may have a yellowish rim. The clot may be firmly attached or may be easy to strip away from the wall of the cyst.

56. The diffuse hemosiderin laden macrophages associated with an involuting corpus luteum can scatter throughout the granulosa lining, accumulate at the base of the old granulosa lining or accumulate at the surface.

57.

Foreign Bodies

Carbon and Endometriosis

58. Low power density CO_2 laser vaporization can leave carbon on top of residual endometriosis. This is particularly true in areas such as the broad ligament immediately overlying the ureter. The white scarred area behind the carbon is endometriosis in the vicinity of the ureter.

59. When the area is resected, carbon and granulation tissue is directly above the endometriosis seen in the right lower area.

Granulation Tissue and Endometriosis

60. High power density CO_2 laser vaporization avoids carbonization, but granulation tissue may form.

The slides were scanned and are at:
1990 Color Atlas (PDF): www.danmartinmd.com/files/coloratlas1990.pdf
1988 Slide Set (PDF): www.danmartinmd.com/files/lae1988.pdf

61. This area was resected and the surface has granulation tissue lying over the residual endometriosis which was not removed by vaporization. Resection is a more predictable technique for this type lesion.

Suture

62. Scarred black areas are not always endometriosis. The right uterosacral lesion is a foreign body. The black lesion in the mid left uterosacral lesion is endometriosis.

63. Old suture material was seen in the right uterosacral ligament lesion from the specimen of slide 62.

64.

Other Lesions

Dystrophic Calcification (psammoma bodies)

65. A diffuse red and brown appearance is seen in this patient who has a high chlamydia IGG titer but no other identified pathology.

66. The finding of diffuse psammoma bodies is a common occurrence in patients with high chlamydia IGG titers.

67. A black vesicle is in the right cul-de-sac.

68. This vesicle is nonspecific and appears to be an old inflammatory epithelial inclusion.

69. The flat lining is seen at a higher magnification view.

70. Psammoma bodies are associated with this inclusion.

Walthard Rest

71. Clear and white vesicles on the tube are rarely endometriosis.

72. These clear and white inclusions of the tube are almost uniformly Walthard Rests.

Hemangiomata

73. Small red lesions in the deep cul-de-sac have an appearance similar to that of endometriosis.

74. However, these red lesions are highly vascular structures compatible with hemangiomas.

75. High power view of this hemangiomatous area shows no signs of endometrial glands, stroma or epithelial lining.

The slides were scanned and are at:
1990 Color Atlas (PDF): www.danmartinmd.com/files/coloratlas1990.pdf
1988 Slide Set (PDF): www.danmartinmd.com/files/lae1988.pdf

Reimplanted Ectopic Pregnancy

76. Hemorrhagic red lesions are seen in this patient four weeks after a salpingotomy for the excision of a right tubal pregnancy. At this time, her HCG titer was rising.

77. Several of these lesions were clot and hemorrhage.

78. However, with all lesions resected, others contain villi from the reimplanted trophoblastic tissue.

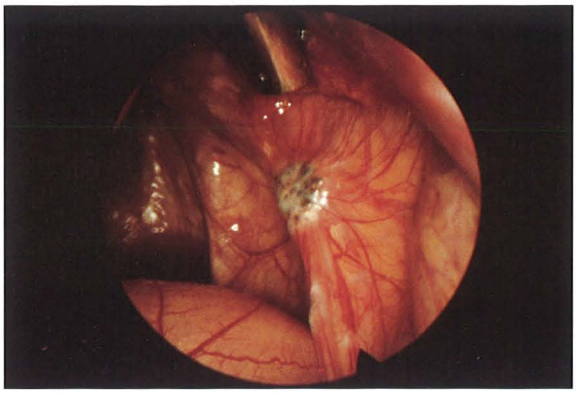
Metastatic Breast Cancer

79. White nodules in the deep pelvis can also be seen in other diseases.

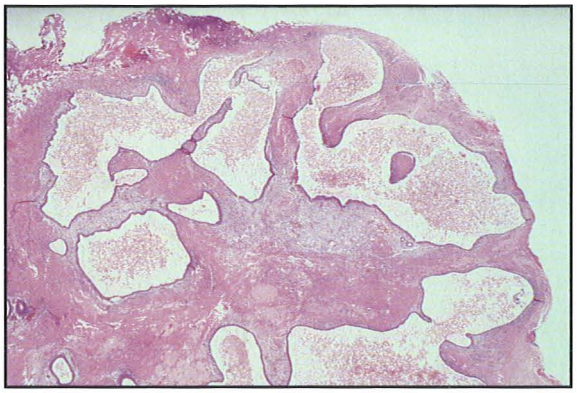
80. These white nodules are metastatic breast cancer.

These illustrations come from the slides and atlas described in the legends (pages 45-51) and on page 55. The slide set and the atlas cover similar material.

Cover: Slides 25,26



Slide 3



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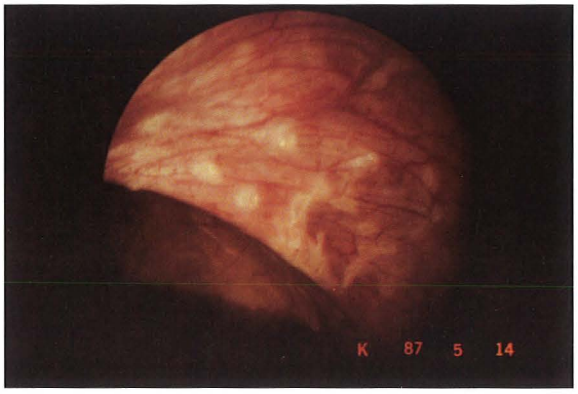

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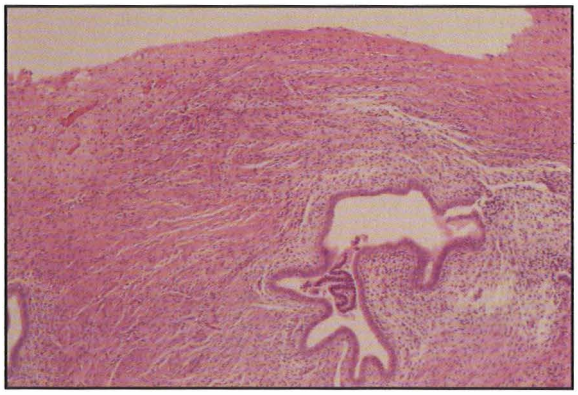
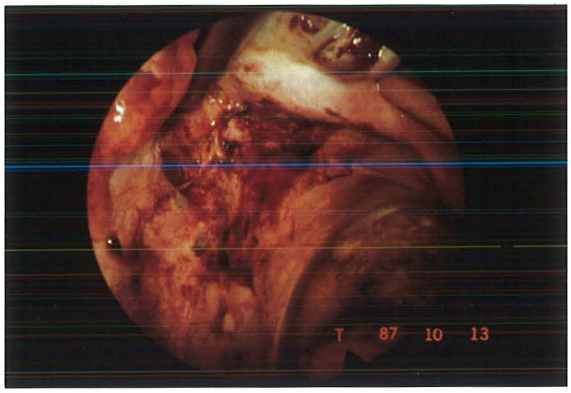


Slide 24

Slide 31

Slide 32



Slide 35

Slide 38

Ordering information removed as it was dated.

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Index