

Safe laser endoscopic excision or vaporization of peritoneal endometriosis

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Operative laparoscopy is being used with increasing frequency in the treatment of endometriosis. This technique requires skill and practice, and a formidable understanding of the nature of the disease. The risks of injuring sensitive areas such as bowel, ureter, bladder, and major blood vessels are great; therefore, these sites are often excluded from surgical intervention. This is detrimental to the patient, as endometriosis should be treated thoroughly wherever it is encountered if possible. We have used a technique that we believe makes treatment with the carbon dioxide (CO₂) laser in these high-risk areas more safe. This technique, which we call hydrodissection, is successful because the CO₂ laser beam does not penetrate fluid. Thus, treatment can be confined to the endometrial lesion, leaving adjacent normal tissue unharmed. By creating a bed of water beneath the peritoneum (or serosa of the bowel), the risk of laser beam penetration to underlying tissue is reduced.

MATERIALS AND METHODS

For treatment of endometriosis of the bladder, a thorough evaluation of the extent of the endometrial lesions is performed. Then, via an aspiration needle through the suprapubic second puncture site, approximately 20 to 30 ml of Ringer's lactate solution (Travenol Laboratories, Inc., Deerfield,

IL) is injected subperitoneally in an avascular area, with a sufficient margin (2 cm) from the endometrial implant (Fig. 1). By this means, the peritoneum is elevated and backed by a bed of fluid. The CO₂ laser then is used to create a 0.5-cm opening on this elevation. Then, 100 to 200 ml of lactated Ringer's solution is injected subperitoneally via this opening. We have recently used an irrigation hydrodissection system by Cabot (Cabot Medical, Langhorne, PA) for this purpose. However, this technique could be employed using a pressurized bag of lactated Ringer's solution or normal saline.

After the creation of the water bed, if the decision is made to vaporize the lesion, a superpulse mode of the CO₂ laser of between 20 and 80 W is used for treatment. The implant is vaporized with a circumference of 1 to 2 cm. Irrigation and washing should be done to remove all charcoal and so that the disease can be treated completely.

For excision, a circular line with a 1 to 2 cm margin is made around the lesion. The peritoneum then is grasped with an atraumatic grasping forceps and peeled away with the help of the CO₂ laser and the tip of the suction-irrigation probe.

In cases in which the endometriosis has formed scarring to the subperitoneal connective tissue, by creating openings in the above described manner and injecting fluid on lateral sides of the lesion, the water "tunnels" under the lesion, and in many cases separates the scarring. The implant then can be vaporized or removed.

Fortunately, most peritoneal endometriosis only involves the peritoneum superficially. In some conditions, however, where endometriosis has penetrated beyond the peritoneum but is still not deep

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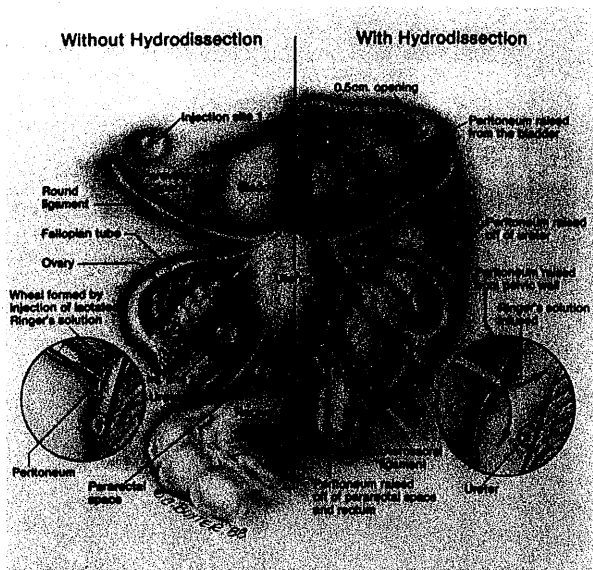


Figure 1 Hydrodissection technique in the treatment of endometriosis.

(involving the mucosa of the bladder), the remainder can be safely vaporized or removed after the removal of the peritoneum. Again, the area must be irrigated and washed so that all the charcoal is removed and the remaining endometriosis can be treated.

If the endometriosis is located on the broad ligaments under the ovaries and on the lateral pelvic wall, the initial needle injection and opening in the peritoneum is made anteriorly and laterally, close to the corresponding round ligament. The hydrodissection probe then is inserted into the opening and the pump pressure is increased to 300 to 400 mm Hg. An injection of 100 to 200 ml of fluid is made subperitoneally. The fluid finds its way under the peritoneum toward the broad ligament and over the ureter and lifts the inferior margin of the broad ligament and lateral wall of the pelvis. Again, by making a water bed subperitoneally and separating the peritoneum from underlying structures such as the ureter and vessels, vaporization with the laser beam becomes more safe. If the decision is made to dissect the lesion, it can be removed in the manner described for endometriosis of the bladder.

For endometriosis of the pararectal area, rectovaginal septum, and rectum, after the initial elevation of the broad ligament and lateral wall of the pelvis, a 0.5-cm opening is made with the CO₂ laser and additional fluid is injected (Fig. 1). The peritoneum then is completely lifted from the underlying

structures. After adequate elevation, treatment by vaporization or dissection can be frequently accomplished easily and safely. When treating the rectum or rectovaginal septum, an assistant should perform a rectal examination, both during and after treatment, as a guide for the surgeon. The assistant should never be able to detect the laser's heat. Of course, when the endometriosis involves the deep muscularis and/or mucosa, the safe choice becomes laparotomy with surgical resection.

RESULTS

In a series of 350 patients and over 750 sites treated with either vaporization or excision (275 bladder, 290 rectovaginal septum, 265 broad ligaments, ureters, lateral pelvic wall, and 35 rectal area), there have been no major complications involving injuries to the bowel, bladder, ureters, great vessels, or ligaments. In the 350 patients, 4 had ecchymosis of the anterior abdominal wall, which resolved spontaneously. Two patients were unable to void immediately following surgery; these patients responded to an indwelling catheter, which was removed the day after surgery. In 4 patients with endometriosis of the bladder, there was a minimal amount of hematuria, which cleared within a few hours of the procedure. During hydrodissection of the broad ligaments and lateral pelvic wall, about 5% of the patients have swelling of the external genitalia. This is most likely due to the penetration of water through the inguinal canal to the labia. This swelling usually disappears within 1 to 2 hours without any permanent sequelae.

During the course of this study, we entered the lumen of the bowel in one patient. This patient had had preoperative bowel preparation. The small defect in the bowel of this patient was closed primarily in layers. Another patient had severe bowel stricture due to fibrosis and required bowel resection by a colorectal surgeon.

DISCUSSION

The use of CO₂ laser laparoscopy has become popular in the treatment of endometriosis.^{1,2} Excision has been one of the methods used, but often and understandably, surgeons are afraid of damaging the underlying structures, such as bowel, bladder, ureters, and major blood vessels.^{3,4} Hydrodissection, by creating a water bed to safeguard the penetration distance of the CO₂ laser, is an attrac-

tive method for safe and complete treatment of the lesions in these sensitive areas.

Hydrodissection has two purposes: (1) separating the peritoneum from underlying structures (ureters, great vessels, etc), which permits a distance from those structures that facilitates treatment; and (2) protecting underlying structures from penetration and consequent damage by the CO₂ laser beam.

It should be pointed out that hydrodissection differs from the similarly named aqua dissection in both methodology and purpose. Aqua dissection—a technique devised following the development of the Aquapurator, a suction-irrigation pump, by Dr. Kurt Semm in Germany—is effected at a fixed water pressure for the purpose of splitting bands of acute and subacute adhesions.⁵ In contrast, in hydrodissection, an adjustable pressure is used for the purpose of separating peritoneal surfaces from adjacent organs, thereby creating a water bed as a safeguard to laser treatment.

We believe that physicians should be encouraged to advance themselves gradually in the technique of hydrodissection, as with any endoscopic technique. We caution that this technique does not provide a guarantee of protection from the potential hazards of endoscopy. The surgeon must be familiar with the principles of operative endoscopy and laser/tissue interaction.

SUMMARY

In using laser laparoscopy for the treatment of endometriosis, protecting patients from inadvertent injury to pelvic structures adjacent to diseased tissue has been a major concern. In many cases, because of this risk, surgeons have stopped short of effecting thorough treatment of endometrial im-

plants on the bowel, bladder, ureters, or great vessels. In a large series of patients, we have used hydrodissection successfully with few complications. We believe that the technique of hydrodissection is a safe and efficient method, permitting more thorough treatment of endometriosis that otherwise might be deemed untreatable by laser laparoscopy.

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COMMENT

The authors have reported on their large personal experience with the novel technique of "hydrodissection," variations of which have been described by others. While it may provide an extra margin of safety, it should be noted that this report does not provide a comparative study with more traditional techniques to support an advantage. As such, it represents a departure from the standard format of articles in this section of the journal.

The Editor