

Martin DC, Hubert GD, Levy BS. Depth of infiltration of endometriosis. *J Gynecol Surg* 5(1):55-60, 1989

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Published Abstract:

Because of the finding of decreased residual endometriosis after excision when compared with coagulation and vaporization, this study was undertaken to determine the depth needed for ablation (coagulation, vaporization, or excision) of endometriotic lesions. The maximum depth of infiltration of endometriosis past the peritoneum or bowel serosa was examined in 132 patients. The median measured depth of penetration was 3 mm. Lesions penetrating greater than 2 mm were seen in 61% of the patients, and lesions with penetration greater than 5 mm were seen in 25% of patients. These data suggest that techniques for destruction or removal of endometriosis must be effective at these depths. This is expected to be most important in patients with pelvic pain but also may be important in the short-term or long-term management of patients with infertility. (*J Gynecol Surg* 5:55, 1989)

Notes (updated 1/4/19):

Patients in an infertility referral practice

132 patients with endometriosis in 9 months (Oct 1, 1987 to July 31, 1988).

Coagulation to 2-mm and limited vaporization to 5-mm would have missed the full depth of the endometriotic lesions in 61% and 25%, respectively, of patients in this study.

Five patients had laparoscopic resection of bowel endometriosis.

Two of those had immediate laparotomies and three delayed laparotomies. The fifth is reported in Martin, D. C. (1991). Carbon dioxide laser laparoscopy for endometriosis. *Obstet Gynecol Clin N A* 18(3):575-582

These depths were used as a basis for investigation of deep infiltrating endometriosis (DIE) and referenced in publications including:

Cornillie FJ, Oosterlynck D, Lauweryns JM, Koninckx PR. Deeply infiltrating pelvic endometriosis: histology and clinical significance. *Fertil Steril* 1990, 53:978-83.

Koninckx P, Meuleman C, Demeyere S, Lesaffre E, Cornillie FJ. Suggestive evidence that pelvic endometriosis is a progressive disease, whereas deeply infiltrating endometriosis is associated with pelvic pain. *Fertil Steril*. 1991, 55:759-765.

Ripps BA; Martin DC. Focal pelvic tenderness, pelvic pain and dysmenorrhea in endometriosis. *J Reprod Med* 1991, 36: 470-472

Ripps, Barry A; Martin, Dan C. Correlation of focal pelvic tenderness with implant dimension and stage of endometriosis. *J Reprod Med* 1992, 37: 620-624

Also see: Martin DC, Ahmic R, El-Zeky FA, Vander Zwaag R, Pickens MT, Cherry K. Increased histologic confirmation of endometriosis. J Gynecol Surg 1990;6(4):275-9.

This retrospective documentation study was designed to study the possible causes associated with a 64% increase in histologic diagnosis of endometriosis between 1982 and 1986.

Low-volume gynecologists had a sensitivity of 41% in chart documentation compared with histologic diagnosis in 1986. That contrasted with low intermediate volume physicians at 54%, high intermediate at 73%, and high at 86%. Predictive positivities were 57%, 78%, 74%, and 99% respectively. Moreover, and possibly more indicative, lower sensitivity and predictivity occurred at open abdominal hysterectomy (55% and 66%) and higher values at laparoscopy (88% and 95%). If the physicians had been told they were going to be graded, and if they used magnification at open hysterectomy, the documentation would likely have changed.

<https://www.liebertpub.com/doi/abs/10.1089/gyn.1990.6.275>

[https://www.researchgate.net/publication/245678635\\_Increased\\_Histologic\\_Confirmation\\_of\\_Endometriosis](https://www.researchgate.net/publication/245678635_Increased_Histologic_Confirmation_of_Endometriosis)

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Depth of infiltration of endometriosis

Dan C. Martin, MD, Gary D. Hubert, MD, and Barbara S. Levy, MD

Abstract:

Because of a finding of decreased residual endometriosis after excision when compared with coagulation or vaporization, this study was planned to determine the depth needed for ablation (coagulation, vaporization or excision) of endometriotic lesions. The maximum depth of infiltration of endometriosis past the peritoneum or bowel serosa was examined in 132 patients. The median measured depth of penetration was 3 mm. Lesions penetrating greater than 2 mm were seen in 61% of the patients and lesions with penetration greater than 5 mm in 25% of patients. These data suggest that techniques for destruction or removal of endometriosis need to be effective at these depths. This is expected to be most important in patients with pelvic pain but may also be important in the short-term or long-term management of patients with infertility.

Introduction

This study was initiated due to finding of residual endometriosis sometimes associated with carbon after previous laser vaporization or bipolar coagulation. This residual disease had often presented as tender or palpable nodules on postoperative exam. This author found coagulation inadequate for deep tender lesions and vaporization difficult when the depth of the lesion and the location of deep vessels and bowel were unknown. The use of excision makes it easier to decrease tissue distortion and to determine the depth of infiltration. As a result, using excisional techniques for deep lesions has increased in clinical practice, particularly for the treatment of pain and tenderness.

23 This study's purpose is to document the depth of penetration of endometriotic lesions past the peritoneum or  
24 serosa as this is one parameter employed in determining the appropriate equipment and techniques for the  
25 destruction of such lesions.

26

## 27 Materials and Methods

28 One hundred thirty-two consecutive patients with excision of endometriosis at laparoscopy or laparotomy by  
29 one of the authors (DCM) from October 1, 1987 to July 31, 1988 were prospectively studied. Excision was  
30 performed using a combination of carbon dioxide laser, sharp scalpel, scissors, biopsy forceps and grasping  
31 forceps.

32 Prior to submitting the specimens for routine histology, the lesions were sectioned in the operating room  
33 and the maximum depth of each specimen was measured and recorded on a study sheet. Then, the specimens  
34 were submitted to pathology for preparation and histologic exam. The depth was estimated in patients who  
35 had residual disease but did not undergo laparotomy. Patients who had bowel adhesions but no visible  
36 endometriosis were tabulated by peritoneal lesions.

37

## 38 Results

39 There were 132 patients with histologically documented endometriosis who underwent 124 laparoscopies and  
40 16 laparotomies. All recognized lesions were excised at laparoscopy in 112 patients or at laparotomy in 16  
41 patients. An additional 4 patients had residual disease which was controlled with medical suppression.

42 In this group, 8 patients had both laparoscopy and laparotomy with 6 on the same day and 2 on separate  
43 days. The 6 patients included 5 who had anticipated bowel disease and 1 who underwent tubal anastomosis.  
44 The remaining 2 patients had unexpected deep bowel involvement and were evaluated further before having  
45 their laparotomy. Laparotomies were also performed for hysterectomy in 3 patients, myomectomy in 1  
46 patient and a 14 cm left cyst in 1 patient.

47 There were 3 other patients who had a laparotomy for bowel disease without laparoscopic evaluation.  
48 These included 2 patients with rectal bleeding during their periods and 1 patient with a large cul-de-sac mass  
49 with fixation to the rectosigmoid junction.

50 There were also 18 patients with suggested bowel involvement who had laparoscopy without laparotomy.  
51 Of these, 2 had palpable muscularis involvement, 4 had apparent serosal lesions, 3 had bowel adhesions  
52 which appeared nonspecific, but may have had hidden endometriosis, and 9 had peritoneal lesions  
53 immediately adjacent to the rectosigmoid junction. The 2 patients with palpable muscularis involvement at  
54 laparoscopy were treated by medical suppression providing sufficient pain relief that no laparotomy has been  
55 performed to date. The remaining 16 patients had every identifiable lesions ablated at laparoscopy by  
56 excision, coagulation or vaporization. In all, there were 16 patients with proven or probable bowel  
57 endometriosis and an additional 12 with possible involvement.

58 In addition to the 16 patients treated at laparotomy, 4 patients had apparent residual disease after  
59 laparoscopy. Two of these were previously discussed as bowel lesions and the other 2 had lateral extension  
60 into the broad ligament and deep pelvis. Dissection planes were inadequate for deep dissection. The 2  
61 patients with lateral infiltration have had sufficient pain relief that no suppressive therapy has been initiated.

62 Of the 132 patients, 14 patients had a maximum depth of penetration of 1 mm, 38 of 2 mm, 23 of 3 mm, 13  
63 of 4 mm, 11 of 5 mm, 6 of 6 mm, 6 of 7 mm, 3 of 8 mm, 7 of 10 mm and 11 of >10 mm. These are displayed  
64 in Table 1.

## 65 Discussion

### 66 Recognition

67 Infiltrating fibrotic endometriosis was noted in 1921 by Sampson.(1) This lesion is a combination of  
68 fibromuscular scar plus the glands and stroma of endometriosis.(2) Surface peritoneum must be viewed

69 carefully as lesions may be subtle and difficult to appreciate.(3,4) On the other hand, infiltrating and deep  
70 lesions may be easier to palpate than to see.(5,6) Attempts to develop visual criteria to distinguish deep  
71 infiltration from superficial disease by surface observation have so far been unsuccessful.

72 Deep disease is generally suspected for one of three reasons: palpable nodules on clinical exam, focal  
73 tenderness on clinical exam and palpable nodules on rectovaginal examination under anesthesia. Therefore,  
74 careful palpation of the posterior vagina, cul-de-sac, uterosacral ligaments, rectovaginal septum and  
75 rectosigmoid junction is needed preoperatively. When nodularity is noted, this exam should be repeated  
76 before finishing surgery in order to rule out persistence of the deep nodules.(5) Other deep infiltrating areas  
77 have been noted in the process of excising what had appeared to be superficial lesions. Although surgical  
78 techniques can remove clinically recognizable (palpable and visual) disease, deep nonpalpable nodules,  
79 subtle lesions and microscopic disease may remain and be responsible for clinical manifestations of  
80 endometriosis.(3,4,5)

81 The senior author has attempted laparoscopic resection of bowel infiltration associated with pain and  
82 rectovaginal tenderness in 5 patients. Immediate laparotomy was performed for bowel resection in 2.  
83 Although the other 3 patients had apparent resection of their endometriosis, persistent pain and tenderness  
84 has resulted in delayed laparotomy in 2 more, while the remaining 5th patient is currently on medical  
85 suppression for persistent pain and considering laparotomy. All 4 treated at laparotomy had deep muscularis  
86 involvement. This data agrees with previous conclusions on the need for palpation at laparotomy for  
87 recognition and removal of lesions in this group.(6,7)

88

#### 89 Medical suppression

90 Medical suppression can be used to decrease the size of the lesions and to increase the pregnancy rate.  
91 However, the lesions remain intact and responsive to a resumption of cyclic estrogen and progesterone  
92 stimulation.(8)

93

#### 94 Coagulation

95 Coagulation can be successfully used on certain of these lesions.(7,9,10) Although unipolar coagulation is  
96 capable of ablating any of the lesions in this study, the final depth of unipolar coagulation is highly variable  
97 and can result in significant damage. On the other hand, bipolar coagulation, set on cutting with sufficient  
98 energy, can effectively coagulate tissue held between the grasping forceps. But, ablation is limited to 1 to 2  
99 mm if the lesion is flat and cannot be grasped. The amount of energy required to destroy discretely  
100 endometriotic lesions at specific depths without unacceptable contiguous damage has not been determined.  
101 Further education and study is needed to evaluate electrical methods of destruction.(11,12)

102 Thermal coagulators are considered the safest form of coagulation but are limited to a coagulation depth of  
103 no greater than 2-mm. Deeper lesions are scraped before using a thermal coagulator.(7)

104 The coagulation depth of lasers is determined by penetration, power density, power density distribution,  
105 time of exposure and tissue type. Coagulation with the carbon dioxide laser is generally limited to 0.04 to 0.5  
106 mm.(11,13) Although argon and potassium-tantinyl-phosphate (KTP) lasers usually penetrate 0.4 to 0.8 mm,  
107 they can coagulate to 2 mm due to a combination of penetration and thermal effect. The neodymium:  
108 yttrium-aluminum-garnet (YAG) laser provides deeper penetration and can coagulate 0.3 to 4.4 mm.(14)

109

#### 110 Vaporization

111 Endometriosis is irregularly distributed throughout the matrix of deep fibrotic lesions. Thus, a vaporization  
112 technique needs the capability for uniformly destroying the entire matrix without creating skip zones.  
113 Although skip zones have been a problem using small spot sizes of the carbon dioxide laser and sapphire  
114 tipped neodymium, yttrium-aluminum-garnet laser, such techniques have been used for ablation of  
115 endometriosis with good success in the treatment of infertility. However, residual endometriosis has been

116 associated with carbon and granulation from previous vaporization. In addition, incomplete removal of deep  
117 tender, clinically palpable nodules has been noted in an uncounted number of patients at postoperative  
118 examination. Excisional technique provides a decrease in residual endometriosis and carbon at second look  
119 laparoscopy and in persistent nodularity at postoperative exam.(5,15,16)

120

#### 121 Excision

122 Studies demonstrate that utilization of carbon dioxide laser excisional techniques increase the ability for  
123 documenting a variety of endometriotic appearances.(3,4,15,16) At the same time, using high peak power  
124 density superpulse carbon dioxide laser developed tissue planes which facilitated deep dissections.  
125 Dissections were taken through the cul-de-sac and into the vagina in the form of an intentional laparoscopic  
126 colpotomy with these techniques.(17) Although one can use coagulation prior to cutting with scissors for  
127 excision, coagulation decreases visual discrimination because of an increase in tissue distortion.

128

#### 129 Current study

130 These lesions were excised while observing the tissue appearance during rectovaginal examination, manual  
131 palpation at laparotomy or palpation with a blunt probe at laparoscopy. Palpation with a probe at  
132 laparoscopy was most helpful in localizing lesions beneath the peritoneum and around the uterosacral  
133 ligaments when visualization could not differentiate between the fibrotic white of scarred endometriosis and  
134 the white of the uterosacral ligaments. Visualization was adequate to differentiate loose connective tissue  
135 and fat from the appearance of endometriosis in most other areas. The histologic presence of adequate  
136 healthy tissue at the margins of these lesions confirmed the ability to make this distinction.

137 Manual palpation at laparotomy provided recognition of deep lesions, subperitoneal nodules, epiploic fat  
138 nodules, appendiceal nodules and infiltrating bowel lesions. The distribution of the penetration depth of  
139 lesions in the 10 patients who had laparotomy (6 to 30 mm) and the laparoscopic appearance of the other 18  
140 patients with proven, probable or possible bowel involvement suggests that some of these 18 patients have  
141 penetration in the 1 mm to 10 mm range possibly unrecognized at laparoscopy. Smaller lesions associated  
142 with the lesions of maximum penetration in this study also suggest that this conclusion is correct. However,  
143 these patients are currently sufficiently free of symptoms at 6 to 15 months of follow-up that exploratory  
144 laparotomy is not currently anticipated.

145 In this study, 61% of the patients had clinically recognized lesions penetrating greater than 2 mm, 43%  
146 penetrating greater than 3 mm and 25% penetrating greater than 5 mm. Coagulation to 2 mm and limited  
147 vaporization to 5 mm would have missed the full depth of the endometriotic lesions in 61% and 25%,  
148 respectively, of patients in this study.

149

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185  
186

187 Table 1. Patients (N = 132) with a specific maximum depth of infiltration at laparoscopy or laparotomy.

| 1mm | 2mm | 3mm | 4mm | 5mm | 6mm | 7mm | 8mm | 9mm | 10mm | >10mm |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|-------|
| 11% | 29% | 17% | 10% | 8%  | 5%  | 5%  | 2%  | 0%  | 5%   | 8%    |

190 Resection of all identifiable endometriosis was completed at laparoscopy in 85% (112) of 132 patients.  
191 The distribution of these lesions was 14 at 1 mm, 3 at 2 mm, 21 at 3 mm, 12 at 4 mm, 11 at 5 mm, 5 at 6 mm,  
192 6 at 7 mm, 3 at 8 mm, 3 at 10 mm and 1 at 15 mm. These are displayed in Table 2.

193  
194

195 Table 2. Patients (N = 112) with all recognizable lesions ablated at laparoscopy.

| 1mm | 2mm | 3mm | 4mm | 5mm | 6mm | 7mm | 8mm | 9mm | 10mm | 15mm |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| 13% | 33% | 19% | 11% | 10% | 4%  | 5%  | 3%  | 0%  | 3%   | 1%   |

198 The 10 patients with bowel involvement resected at laparotomy had a distribution of 1 (10%) at 6 mm, 3  
199 (30%) at 10 mm, 4 (40%) at 20 mm and 2 (20%) at 30 mm.