

Laparoscopic Appearance of Endometriosis

Color Atlas



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Laparoscopic Appearance Of Endometriosis

Second Edition

Web Revision

Color Atlas

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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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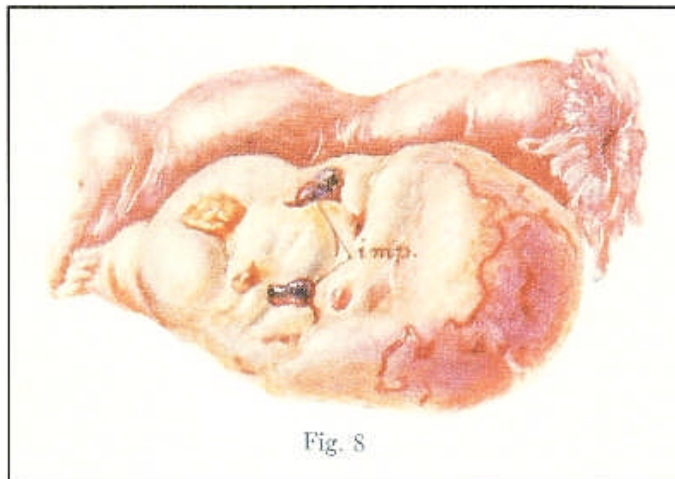
Foreword

Recognition of endometriosis is necessary for diagnosis, informed consent and therapy. As this volume demonstrates, the diagnosis of endometriosis and differentiation from other diseases of similar appearances can be difficult. Although there will be microscopic lesions which will not be seen and large lesions which are more palpable than visual, most patients can have their diagnosis confirmed and can receive adequate care by removing the lesions that are seen. Removing these lesions requires careful observation not only for dark puckered lesions but also for the subtler varieties which have been documented in the literature.

This volume provides, in addition to descriptions of retroperitoneal disease, unique photographs of various atypical presentations of endometriosis as well as of diseases that may masquerade as endometriosis. It is expected that additional atypical and masquerading lesions will be described in the future. The gynecologist will find the text and slides a valuable addition to his or her library. Careful study of the atlas will help the laparoscopist identify lesions he or she may not have appreciated in the past.

John A. Rock, M.D.
April 6, 1990

To
John Albertson Sampson, M.D.
1873 - 1946



"The "red raspberry" appearance of the implant is due to a recent haemorrhage" while those with a "purple raspberry" appearance "are larger lesions". "The pigmented areas with "blueberry" coloring are due to an older haemorrhage". John A. Sampson in *SURGERY, Gynecology and Obstetrics*, March, 1924, Volume XXXVIII, page 287 and 290, by permission of *SURGERY, Gynecology and Obstetrics*.

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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 1921¹ to 1940². 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 implants³ and peritoneal pockets.⁴ He changed his definition of small from 2 to 4 cm in 1921¹ to a few mm in 1924.³ Colorless, amenorrheic lesions were seen by John Fallon⁵ in 1950 while Karl Karnaky⁶ published an age dependent appearance of endometriosis starting with an initial water blister presentation in 1969.

Protean Appearance

The diagnosis of endometriosis has often been made by observation of puckered black or bluish "typical" lesions.⁷⁻¹¹ These type lesions are common in the patient groups studied. Williams documented a 50% incidence in 968 patients who had an average age of 30.¹² Publications since that time have generally had average ages of 28 to 32. In addition, Williams' article excluded patients under 15 and those past the age of menopause. This results in biased data.

- Dark lesions are the easiest to see and document.¹³⁻¹⁶
- Subtle forms are more common.^{16,17}
- Subtle forms may be more active than black lesions.^{18,19}

The subtle hue and color changes make diagnosis by direct visualization difficult¹⁰ and endometriosis has been diagnosed by taking biopsies of areas of normal peritoneum.^{20,21} Lesions can hide in or at the rim of peritoneal pockets.^{4,22}

Goldstein, et al.²³ 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.²⁴ Redwine found black lesions in 60% and other lesions in 66% of 137 patients.¹⁷ These more subtle lesions were found in 36% of 202 patients by Jansen.¹³ 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.¹⁶

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 ,¹⁴
- Clear lesions as small as 180 μ ¹⁶ and,
- Carbon particles as small as 40 μ .

However, Redwine documented an undetected endometriotic lesion of 120 μ .²⁵ At present, resolution appears to be limited to 120 to 180 μ for endometriosis at laparoscopy.

Martin^{16,26} sent specimens of abnormal appearing tissue seen at second look laparoscopy in a search for atypical transformation in the remnant tissue following intra-abdominal CO₂ 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 ¹³	ns	81%	81%	67%	50%	47%	47%
Stripling ¹⁴	97%	91%	75%	ns	ns	33%	ns
Stripling ¹⁵	98%	78%	92%	ns	ns	40%	43%
Martin ¹⁶	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.^{14,16} Furthermore, histologic confirmation of endometriosis increased from 62% in 1982²⁶ to 98% in 1988.¹⁶ 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 CO₂ laser laparoscope.

Table 2. Finding at laparoscopy.^{14,16}

	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 1986.¹⁶ This is in spite of a 47% diagnosis rate associated with a 95% confirmation of submitted tissue in 1985.²⁶ Many of the appearance findings occurred after the histologic confirmation rate was 97% or greater with tissue submitted on all endometriosis patients.^{16,26} (Table 3)

Table 3. Patients with specimens confirmed at laparoscopy.^{16,26}

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

In the same period of time, a separate study²⁷ of 55 physicians showed that endometriosis was not documented in 14% to 59% of all cases. Endometriosis was most commonly missed when it was obscured by adhesions, deep fibrosis, myomata, functional cysts, carbon and psammoma bodies.^{16,27} (Table 4) These data are compatible with Fallon's conclusion that experience creates uncertainty.⁵

Table 4. Histologic confirmation related to physician case load in 1986.²⁷

Case load	No of Physicians	Sensitivity	Predictive Positivity
5 or less	31	41%	57%
6 to 11	14	54%	78%
12 to 26	9	73%	74%
127	1	86%	99%

Scanning Electron Microscopy

Vasquez²⁸ and Cornillie²⁹ documented the scanning electron microscopic appearance of polypoid, intraperitoneal and retroperitoneal associated with subtle appearances at laparoscopy. Murphy¹⁶ 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 epithelium¹¹ 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.^{14,30,31} 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.³²

Infiltrating and deep lesions may be easier to palpate than to see^{26,33,34,35} and attempts to develop visual criteria for distinguishing deep infiltration from superficial disease by surface observation have so far been unsuccessful. These deep lesions are associated with increased tenderness.^{36,37,38} 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.³⁵

Deep infiltrating endometriosis is hard to dissect with its 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.
- 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.³⁹ 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 unrecognized at laparoscopy.³² 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.³³ In addition, other deep infiltrating areas have been noted in the process of excising what appeared to be superficial lesions.

Age Related Changes

Sampson noted a change from a red raspberry appearance to a blueberry appearance as lesions aged.³ Karnaky stated that it required 4 to 10 years for water blister lesions to progress to scarred blue-domed cysts.⁶ Redwine quantitated these changes and demonstrated a change in the observed appearance from clear to red to scarred black lesions over 7 to 10 years.¹⁷ This change was also noted by Koninckx, et al. in documenting an increase from 23% to 63% in the occurrence of scarred black lesions over a 20-year age change.³⁷ Koninckx' study also demonstrated a decreased occurrence of red and polypoid lesions and an increased occurrence of deep infiltration over the same time span.

This age related change in appearance may be due to a uniform progression in individual patients, the result of more than one type of progression of lesions or the result of some other factor. However, as a general rule, the

appearance is different at varying ages. Perhaps more important is that there was significant overlap and age does not appear to be the only factor in appearance.

Age related changes can be modified using medical suppression. Thomas documented a 47% progression without therapy and no progression while on suppressive therapy.⁴⁰

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.⁴¹

Infiltrating and clear fibrotic lesions have a similar appearance and contain both fibrous and muscular components.¹⁴ This may represent a local tissue reaction to an infiltrating process or the end appearance of decidualization, death and metaplasia of the stroma of endometriosis.

Peritoneal Fluid Studies

Peritoneal fluid studies of macrophages,⁴² peritoneal fluid lysozyme activity,⁴³ and endometrial epithelial cells⁴⁴ suggest that these are related to infertility. The appearance of polypoid red lesions shows that these tend to be within the peritoneal cavity and have an increased likelihood of either secreting or desquamating directly into the peritoneal cavity than scarred retroperitoneal lesions. In addition, these polypoid forms appear to be more active than the retroperitoneal forms in the production of the ability to synthesize prostaglandin F.^{18,19} Recent publications demonstrating a decrease in polypoid red areas with age³⁷ and a decrease in cell counts with rAFS scoring⁴⁵ open new areas for further study.

In that much of the published data is based on endometriosis being diagnosed from black or bluish "typical" lesions,⁷⁻¹¹ there may be significant bias in the results of these studies. Many of these "typical" lesions are retroperitoneal as opposed to clear vesicles and red polyps which are more frequently on the surface.^{28,29} Lesions on the surface have a more direct anatomic route to the intraperitoneal environment than those which are retroperitoneal. A lack of differentiation between these various types may be responsible for some of the dissatisfaction with the various staging systems and some of the variation in studies of the intraperitoneal environment. Until

studies are done of the various lesion types, this area has many unanswered questions.

Other Lesions

Other peritoneal lesions have been confused with endometriosis. These include epithelial inclusions, inflammatory 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, granulation tissue, psammoma bodies (dystrophic calcification), old suture remnants, splenosis, Walthard Rests, ovarian cancer, inflammatory cystic inclusions, inflammation associated with psammoma bodies, and hemangiomas.^{13,16,26,33,46}

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.

The appearance and characteristics of lesions change in time. Teenagers are expected to have clear blisters and red polypoid lesions; whereas, women in their 40's are more likely to have scarred black lesions. Although this trend can be useful in anticipating the lesion appearance, there is much overlap and any appearance may occur in women of any age.

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, clinical palpation, surgical visualization, surgical palpation and histologic documentation aid in recognition and patient care.

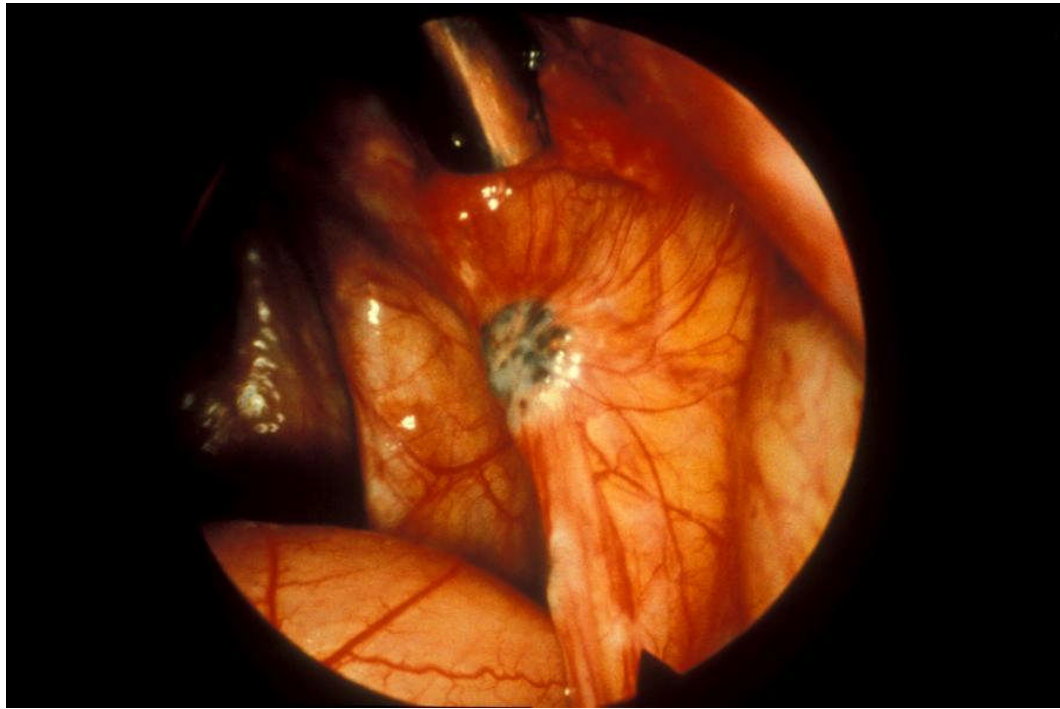
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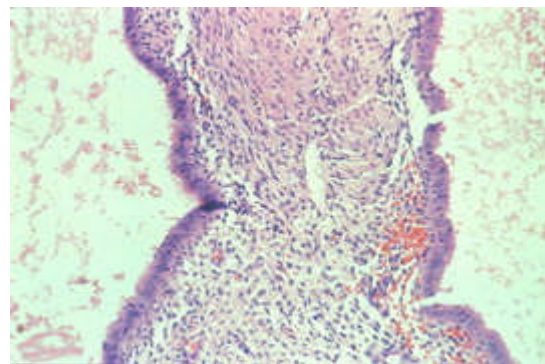
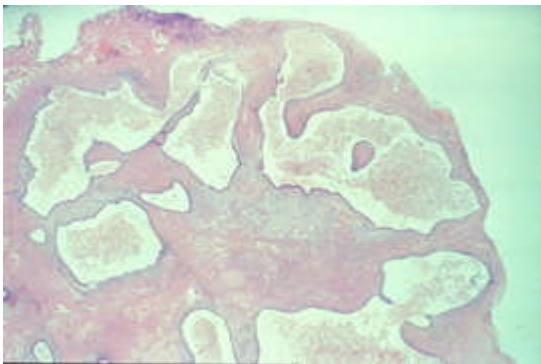
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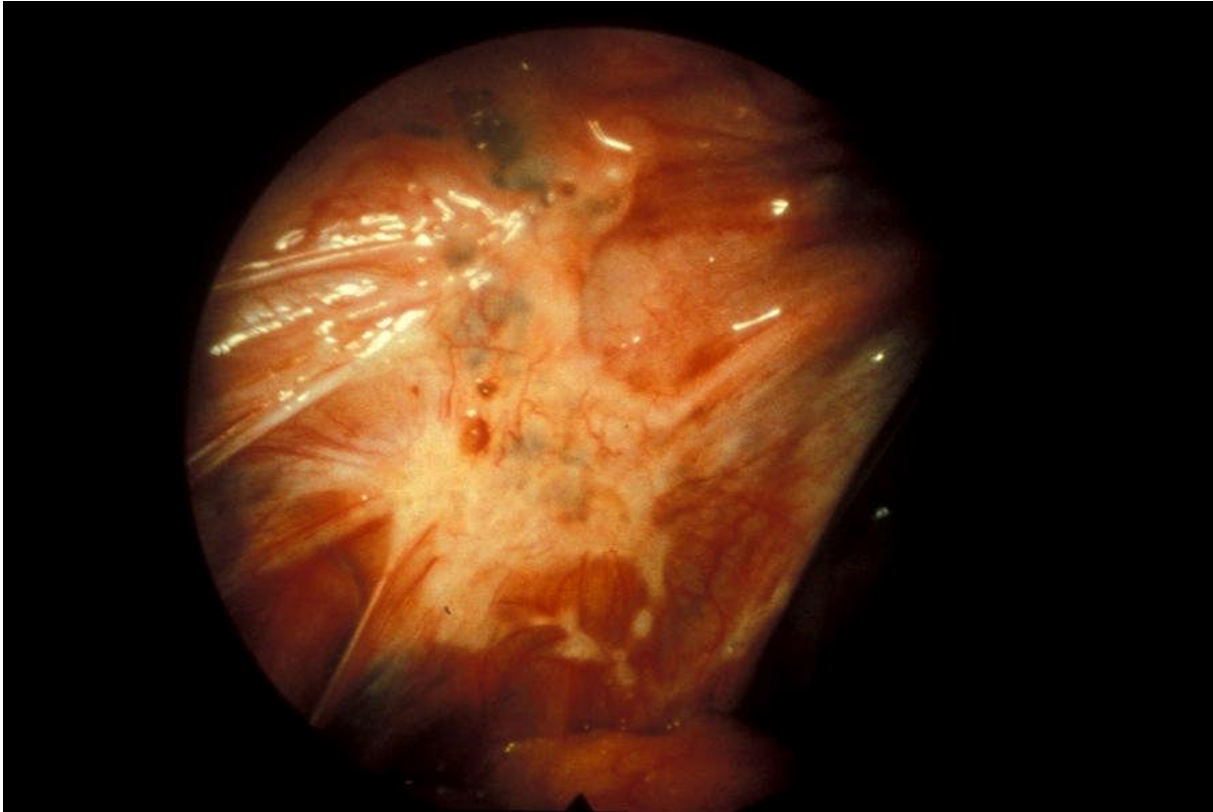
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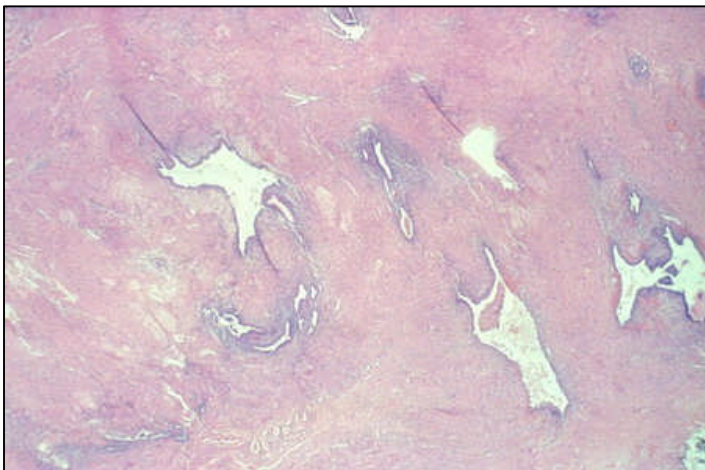
Puckered black lesions have been described as "classical" and "typical". These areas of endometriosis are the easiest to see and the most common to document by biopsy or excision of the dark area.



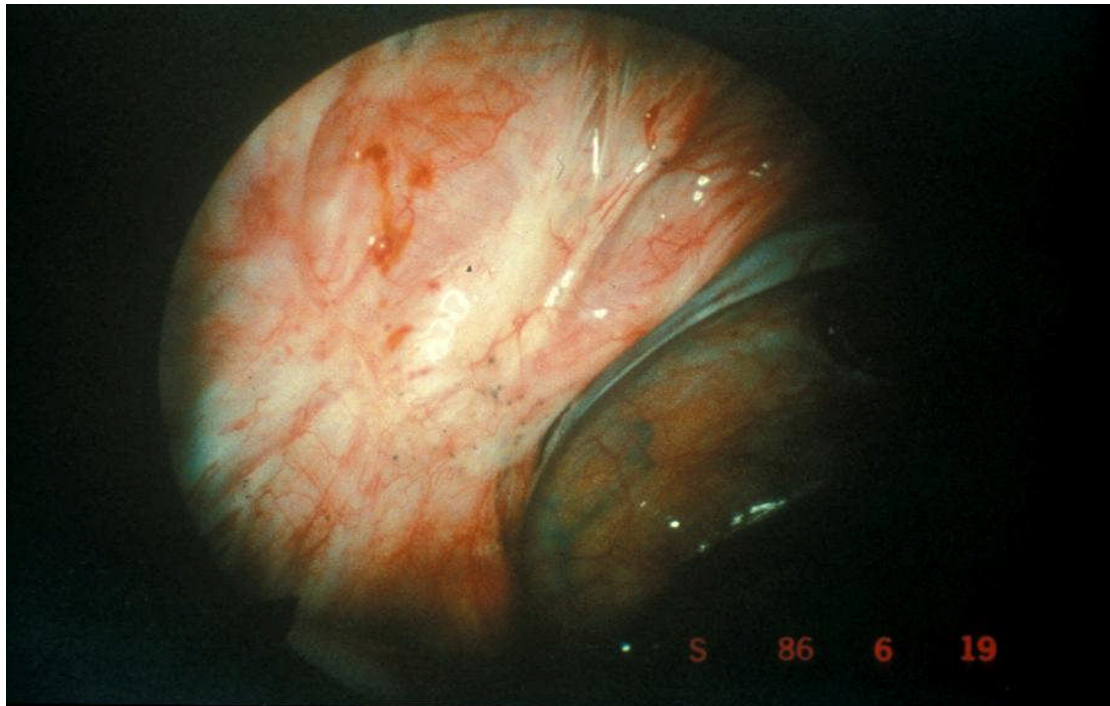
This lesion is a diffuse mixture of fibrosis, stroma, hemorrhage and hemosiderin laden macrophages separating glands and intraluminal debris.



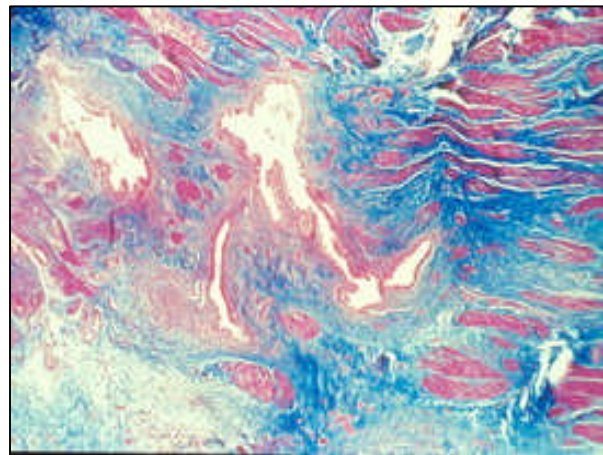
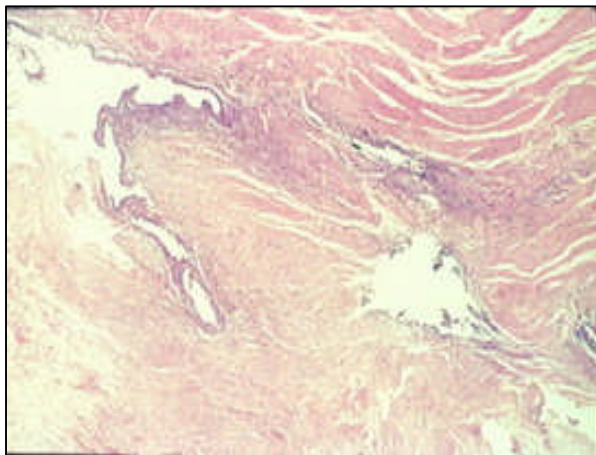
White scarred areas are easier to see when the intraluminal areas of the glands contain debris from bleeding. These areas are brown and black.



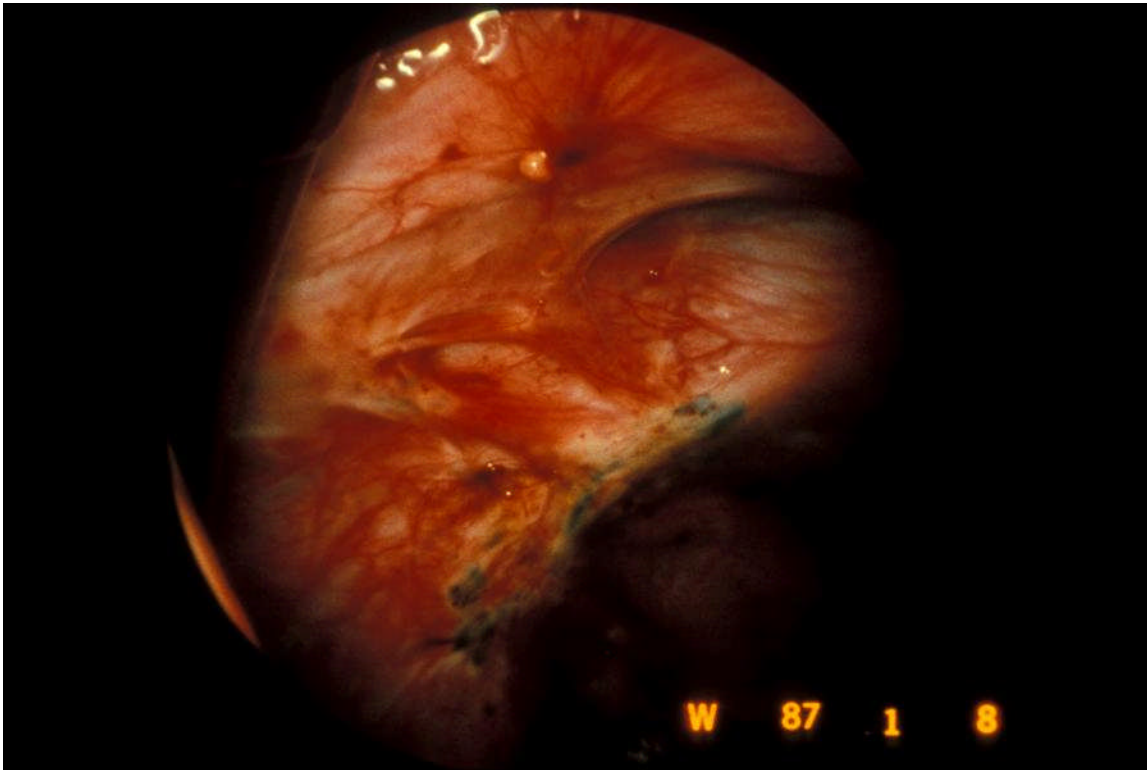
The glands are deep in the fibrotic scar. When hemosiderin and debris are contained within them, this may be seen on the surface.



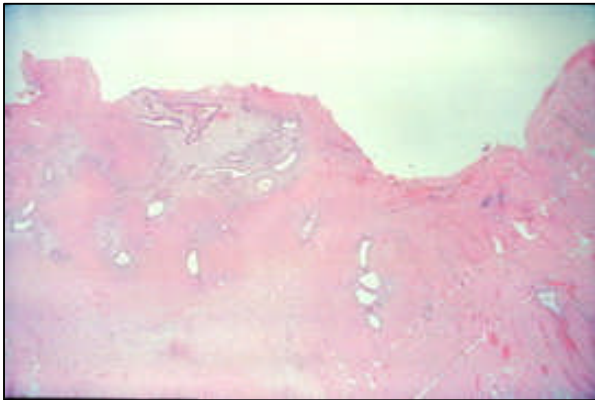
This white lesion involved the left uterosacral. The black particles on the surface are carbon from previous CO₂ laser vaporization



In this area, sparse stroma and glands surrounded by fibrous tissue and muscle is the predominant picture. Trichrome stain was used to demonstrate the fibrous component of the fibromuscular matrix.



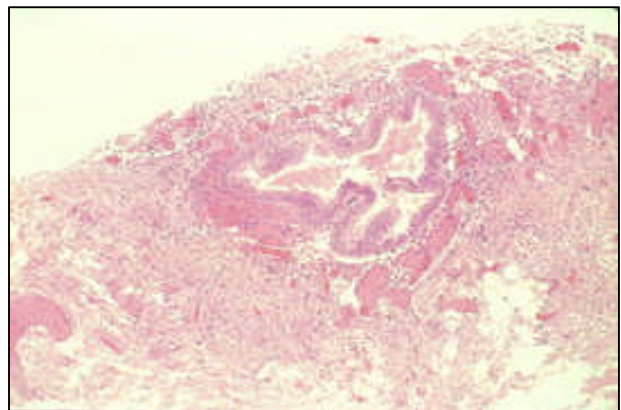
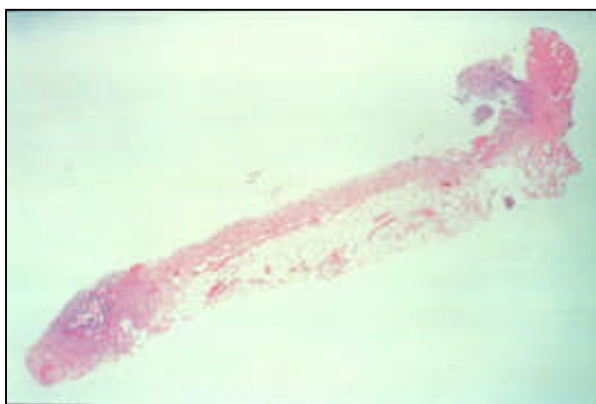
When white scarred areas are associated with red polyps, the red polyps are most commonly endometriosis.



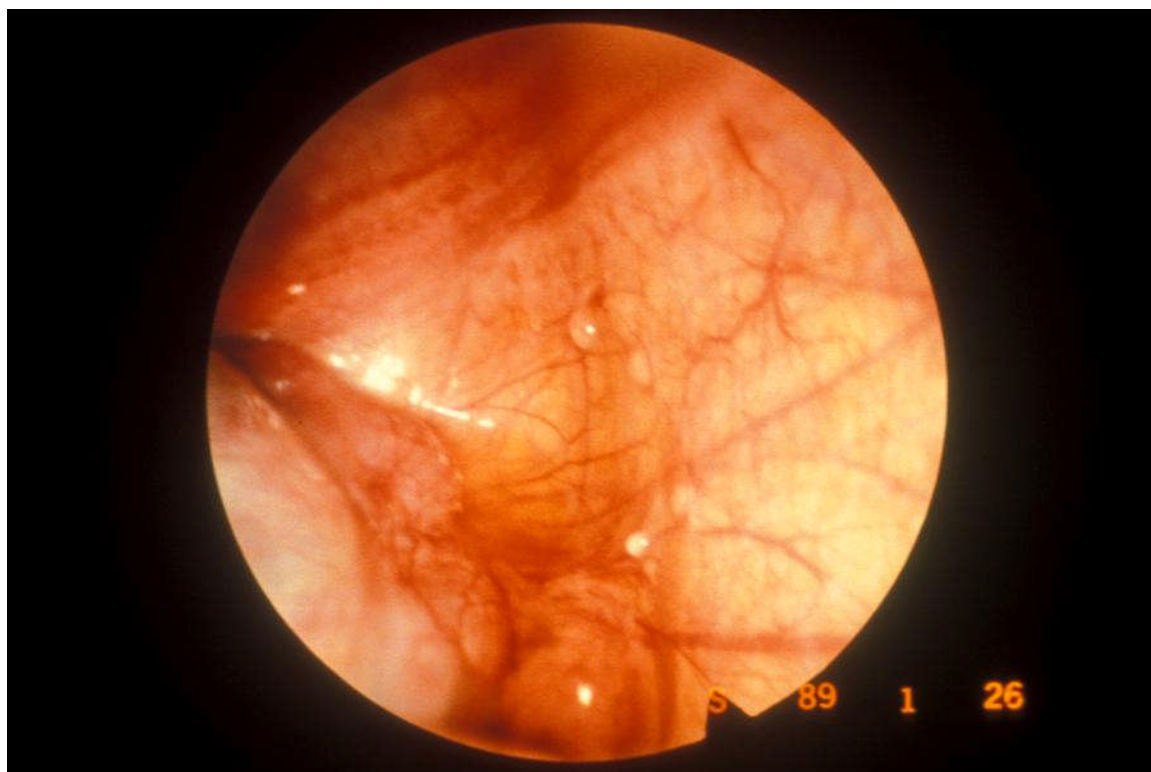
Red polypoid endometriomas can be associated with deep glands and stroma in the white fibrotic scar. The red polyps are endometrial glands and stroma.



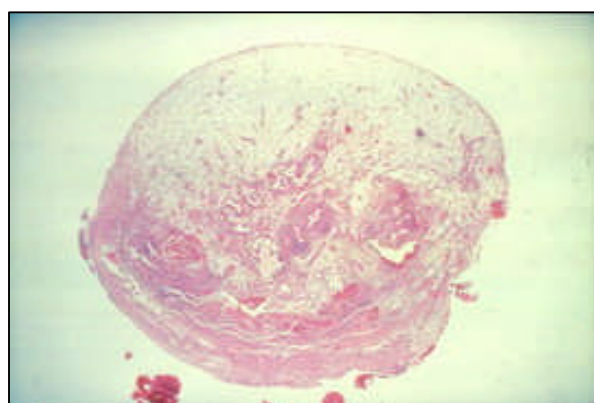
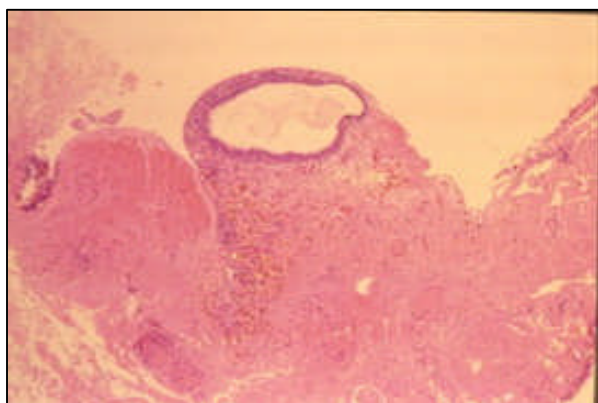
A small developing pocket is in the right lower cul-de-sac. In the rim, immediately above and to the left of the pocket is a small white lesion that is seen by direct visualization, by magnified video on monitors or by magnified photography. Panoramic monitors and photography can easily miss these.



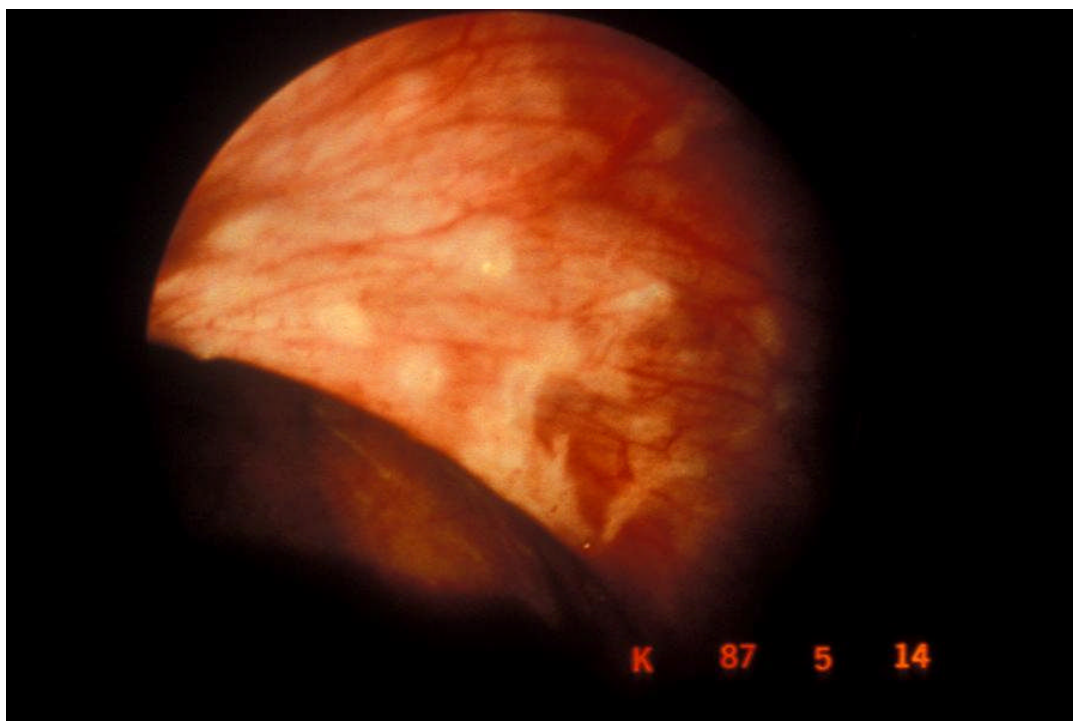
A section across the rim and pocket revealed that the white lesion is a small area of endometriosis and there is stroma at the other margin of the pocket. Secretion into this type of glandular structure is a common feature.



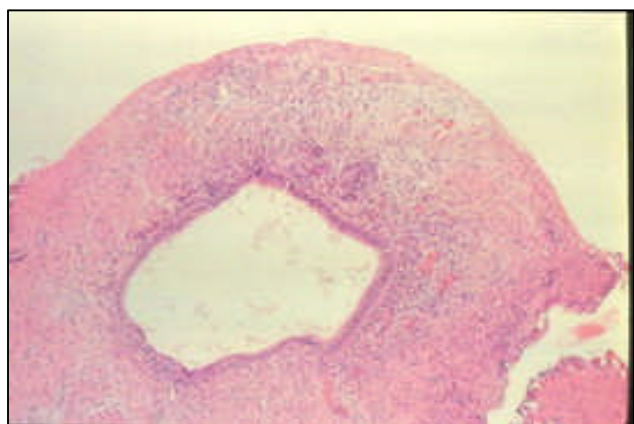
Clear polyps and vesicles may be endometriosis or other pathology. These lesions are noted lateral to the right tube.



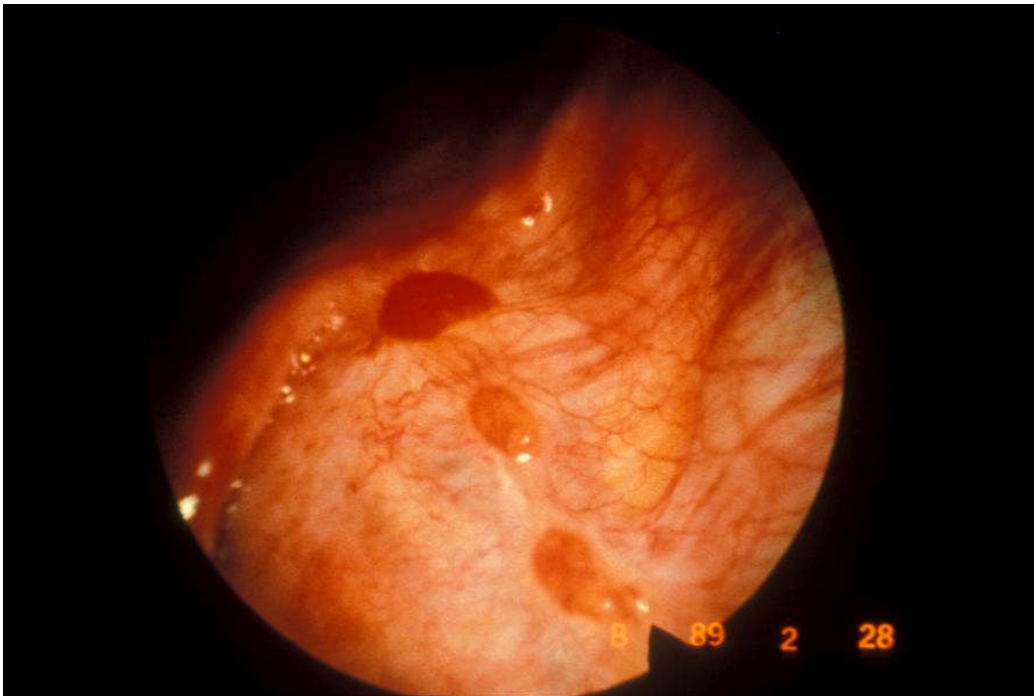
Endometriosis can be seen as a dilated vesicle with scant stroma and little vascularization. Other patients have edematous endometriosis presenting as clear polypoid lesions



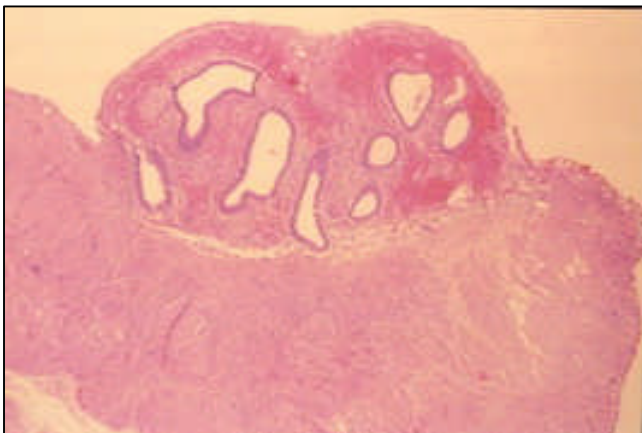
The angle of light reflection was important in noting these clear and white lesions. Although lesions were initially seen at only three or four locations, when the angle of the view changed, more lesions were seen.



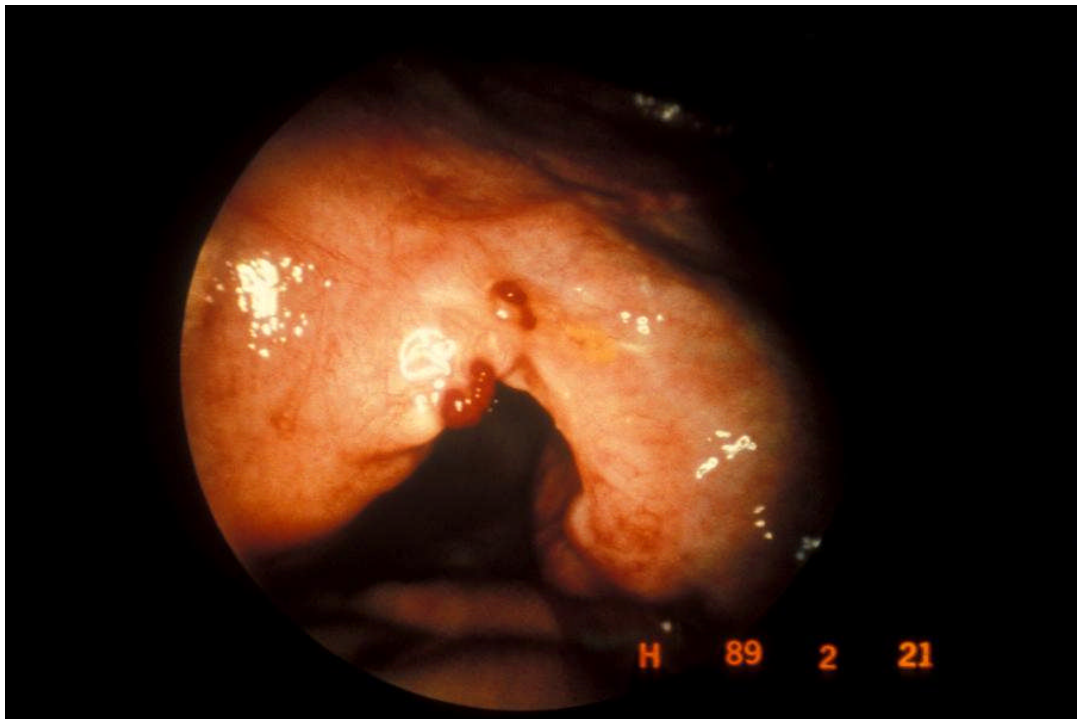
Some clear vesicles were dilated glands within fibrosis while other sections in the same patient showed both glands and stroma.



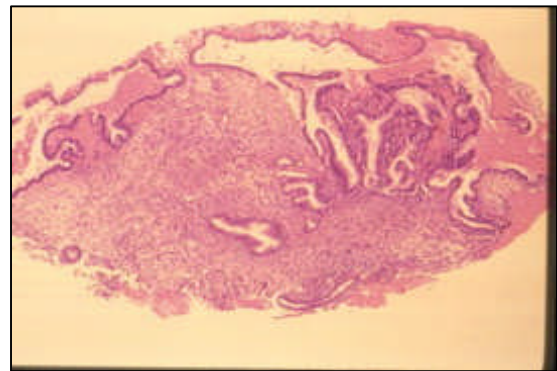
Red polypoid areas have been seen as small as 0.4 mm and as large as 7 mm. These are large lesions lateral to the right tube.



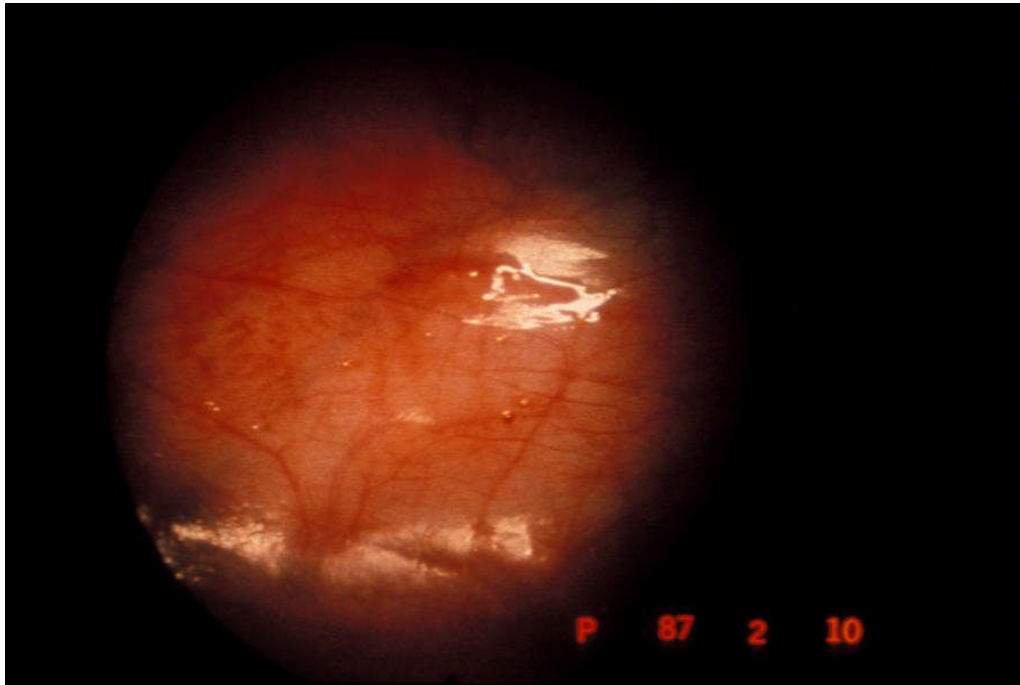
Red polypoid lesions can contain glands and stroma with variable degrees of vascularity and hemorrhage. Scarring is seen at the base.



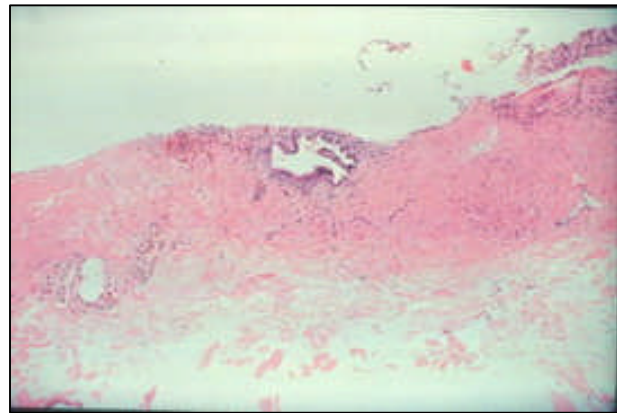
The cluster of red endometriotic lesions at the right tubal cornua demonstrates several histologic types. The most distal lesion is highly vascular glands and stroma.



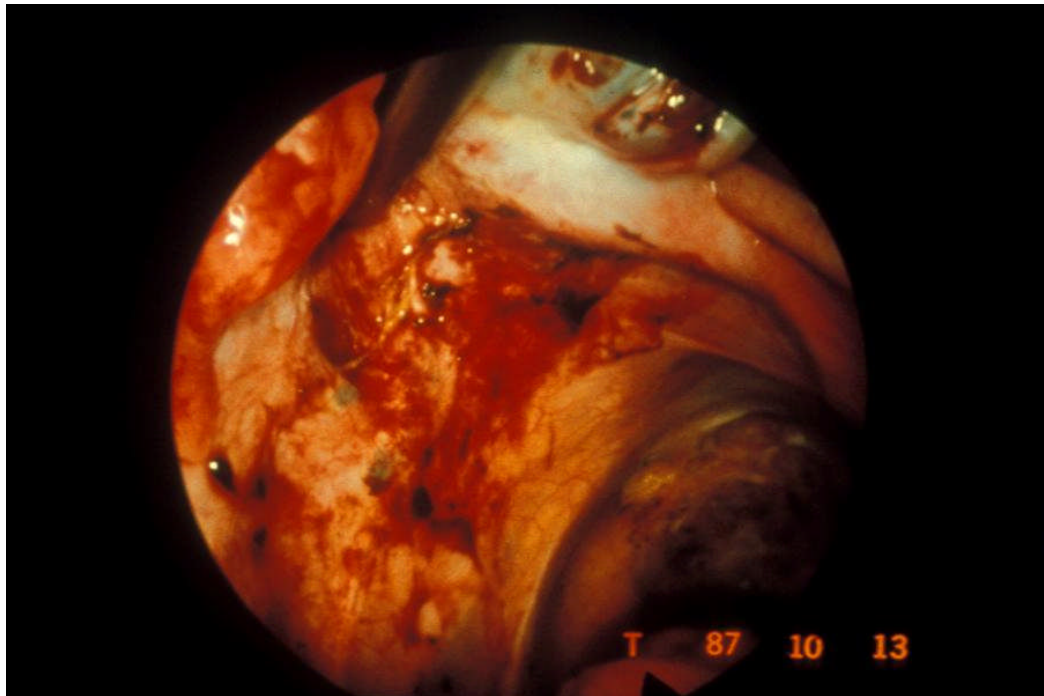
The most proximal lesion is an “early mini-endometrioma” with red blood cells dilating the glandular structures. The collapsed vesicle has stroma and can be contrasted to the nonspecific vesicles on page 29.



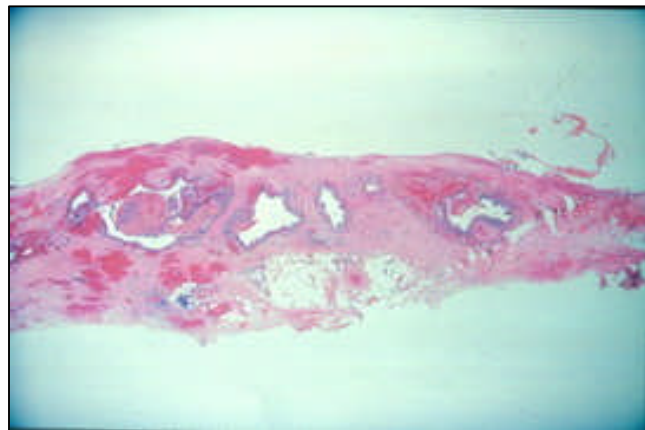
Teenagers commonly have small red or pink polyps and white blebs as isolated findings. In this 19-year-old, the largest lesion was 400 μ in diameter and has a small red polyp near the center of the slide. The white light reflections on the left to the slide are 200 μ epithelial lesions.



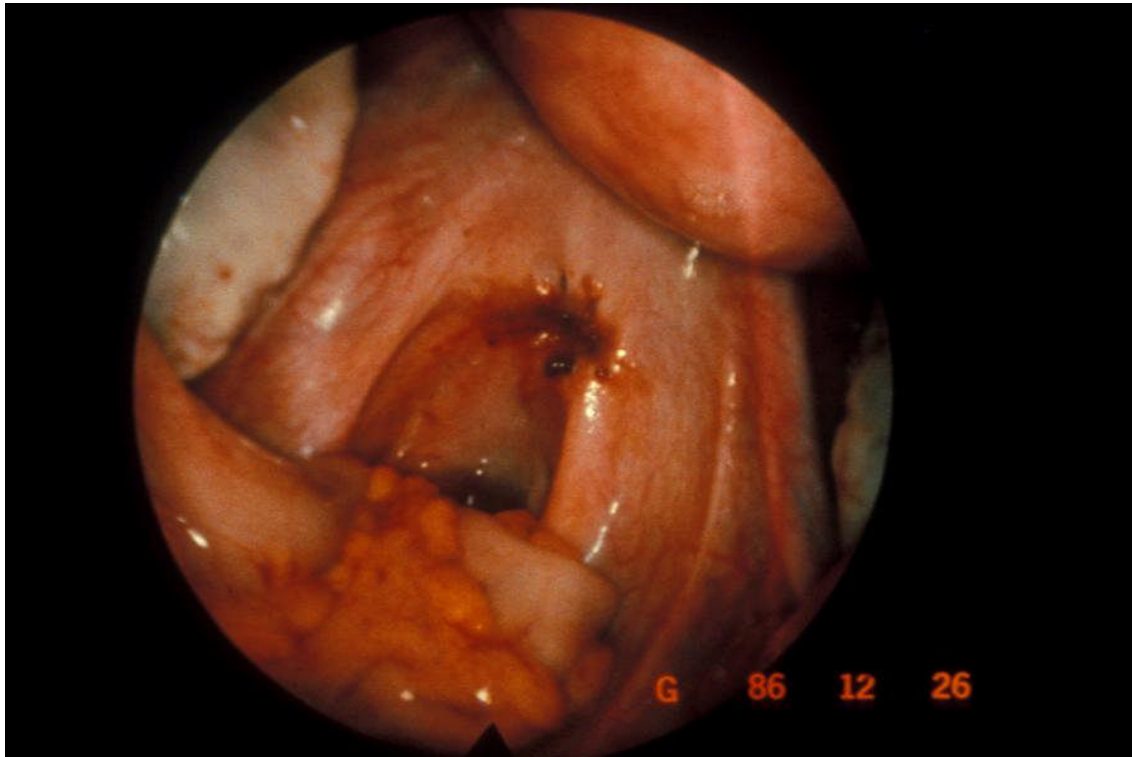
The 400 μ polyp was comprised of endometrial glands and stroma. The small clear areas were epithelial lesions. The epithelial lining of these was compatible with endometriosis.



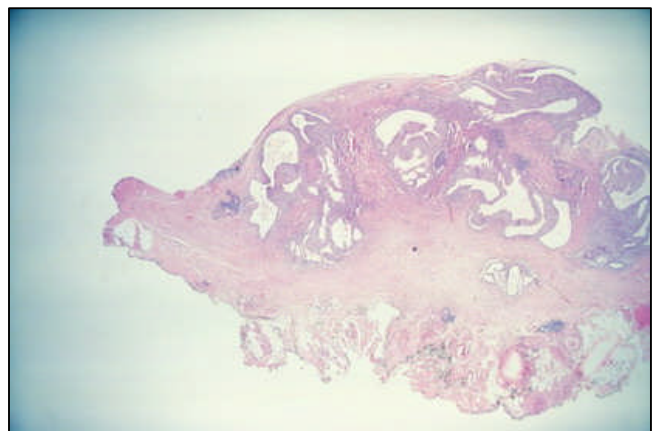
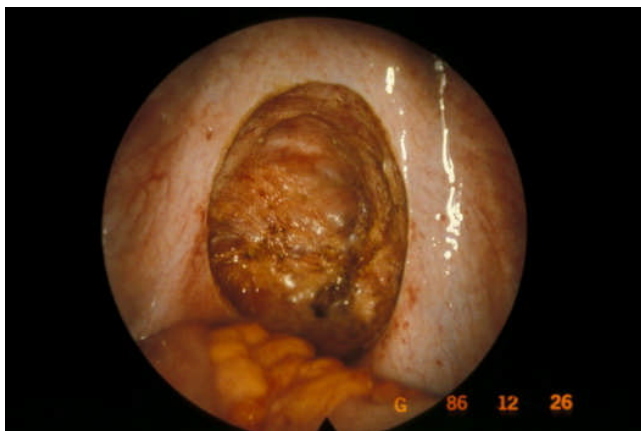
Endometriosis and red adhesions covered the posterior left broad ligament. Black areas of endometriosis are noted to the left. Hemorrhagic adhesions are noted in the center. These adhesions can hide endometriosis.



Endometriosis infiltrates through the entire hemorrhagic adhesed area of the broad ligament.

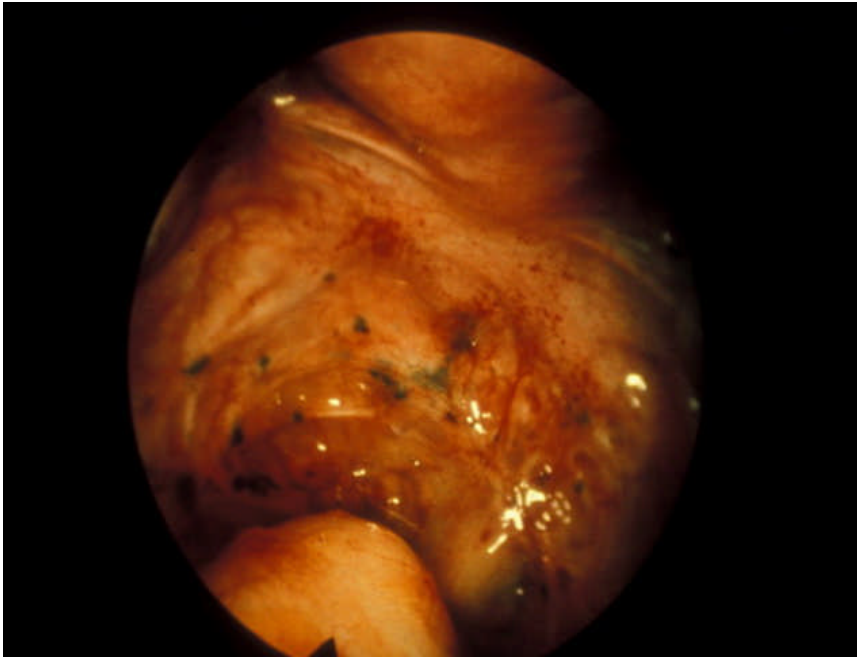


The brown appearance of this right uterosacral ligament may be related to the positive chlamydia cultures from the surface. Patients with endometriosis can also have chlamydia.

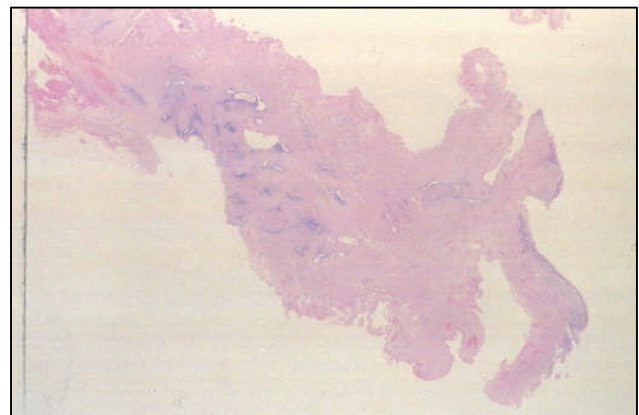
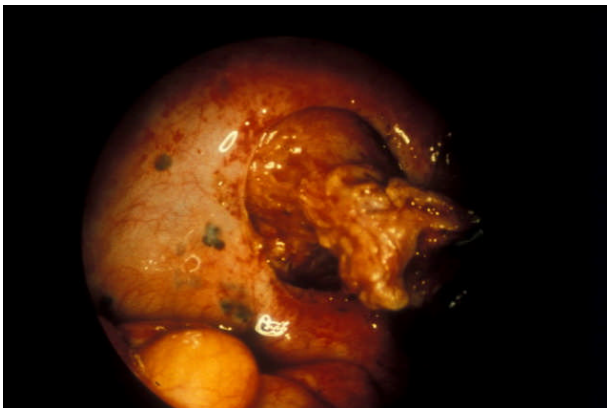


This lesion goes deeper than is apparent and is almost to the level of the rectosigmoid colon and the vaginal apex. The lesion was measured to a depth of 7 mm toward both the rectum and vagina. Bipolar, ~~femoral~~ and laser coagulation are inadequate to coagulate this depth. Destruction of this lesion requires vaporization or excision.

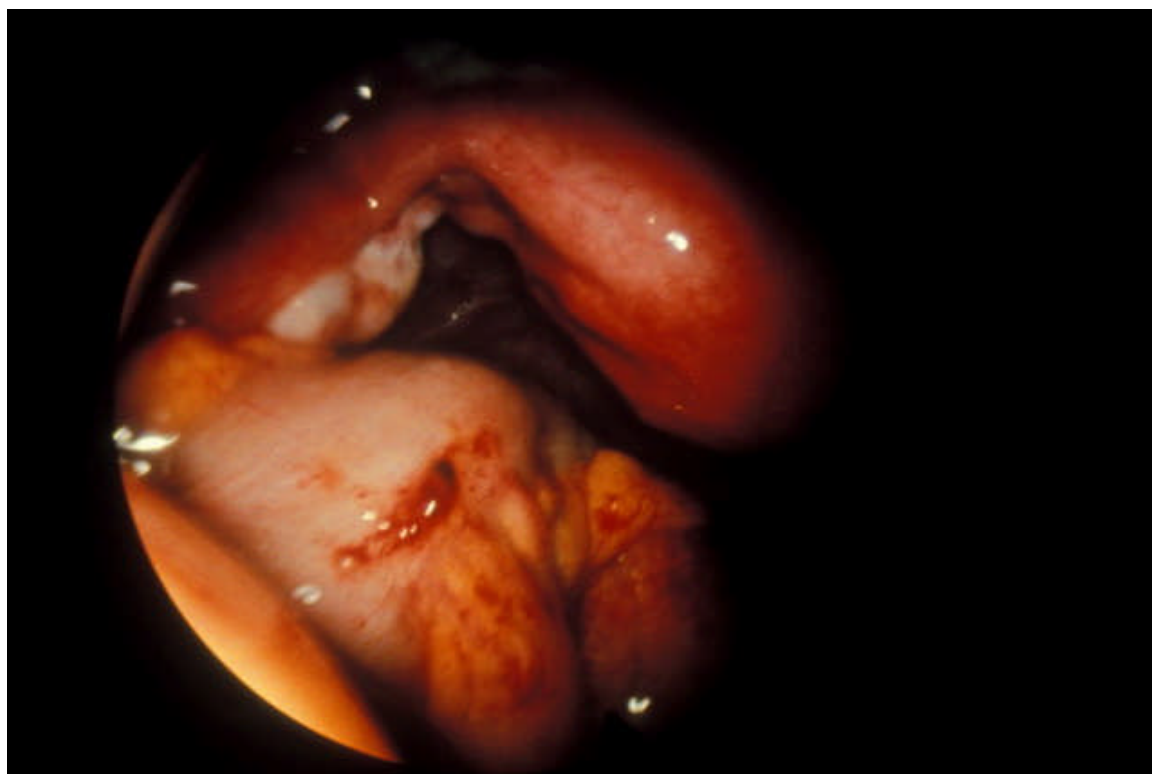
thermal (endocoagulator)



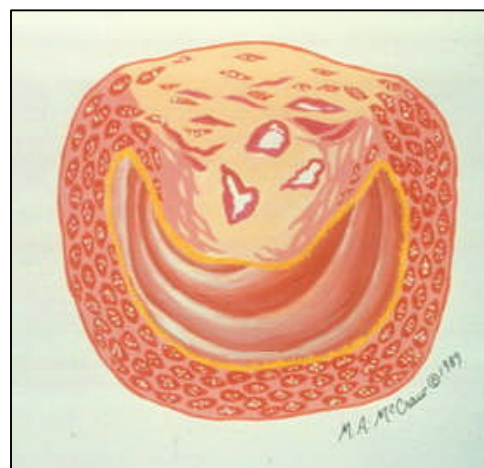
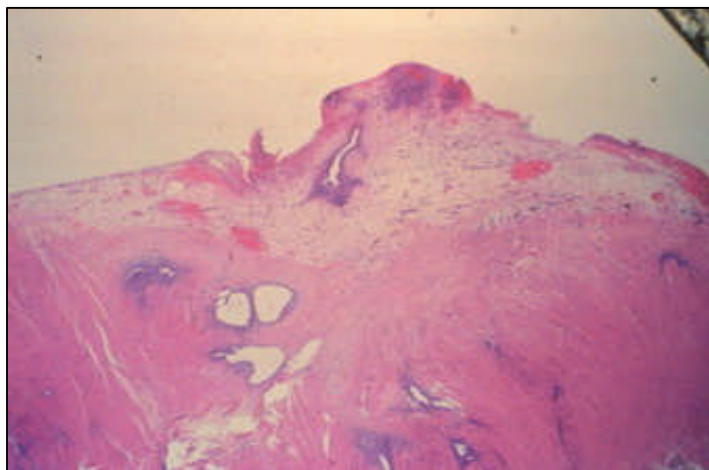
Diffuse endometriosis is seen in the cul-de-sac. However, the fibrotic lesion at the center was palpated on bimanual exam as a 2 cm nodule. The lesion extended from the peritoneum to the vagina and is seen in the posterior vaginal fornix.



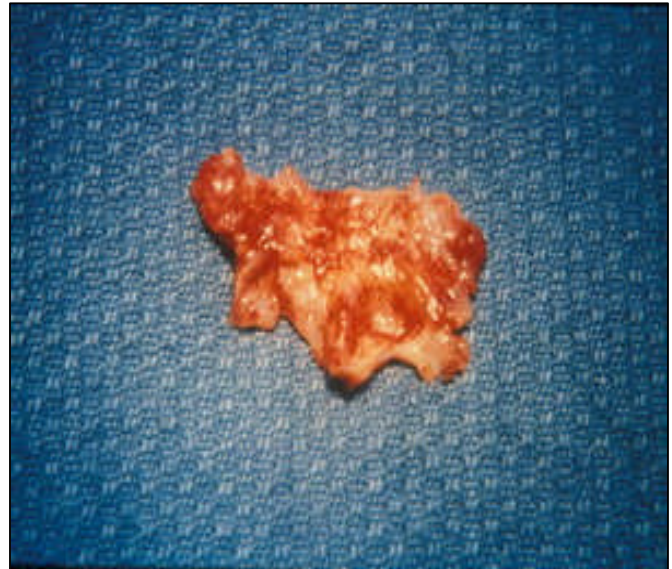
The laparoscopic dissection was taken to the level of the vagina. A probe in both the vagina and the rectum was used for recognition of these areas. An incision was made directly onto a wet backstop sponge in the vagina. The lesion was pulled through the vagina after mobilization. Endometriosis infiltrates through the fibromuscular scar.



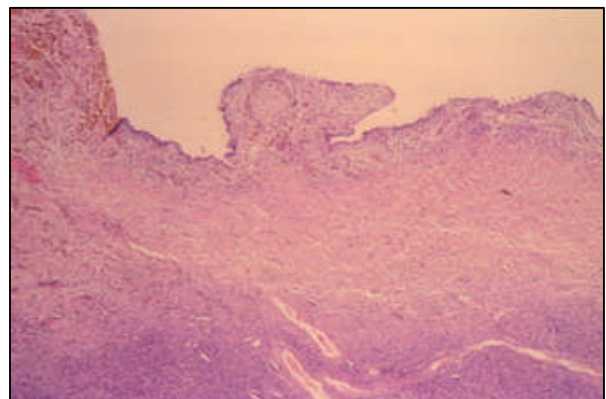
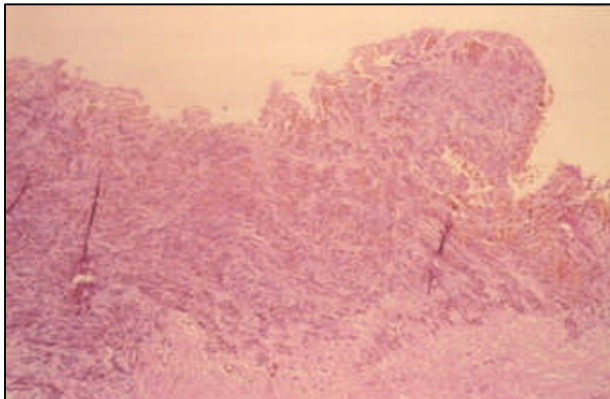
What appears to be a small lesion on the sigmoid colon often represents the "tip of the iceberg." These can be easy to palpate but hard to see.



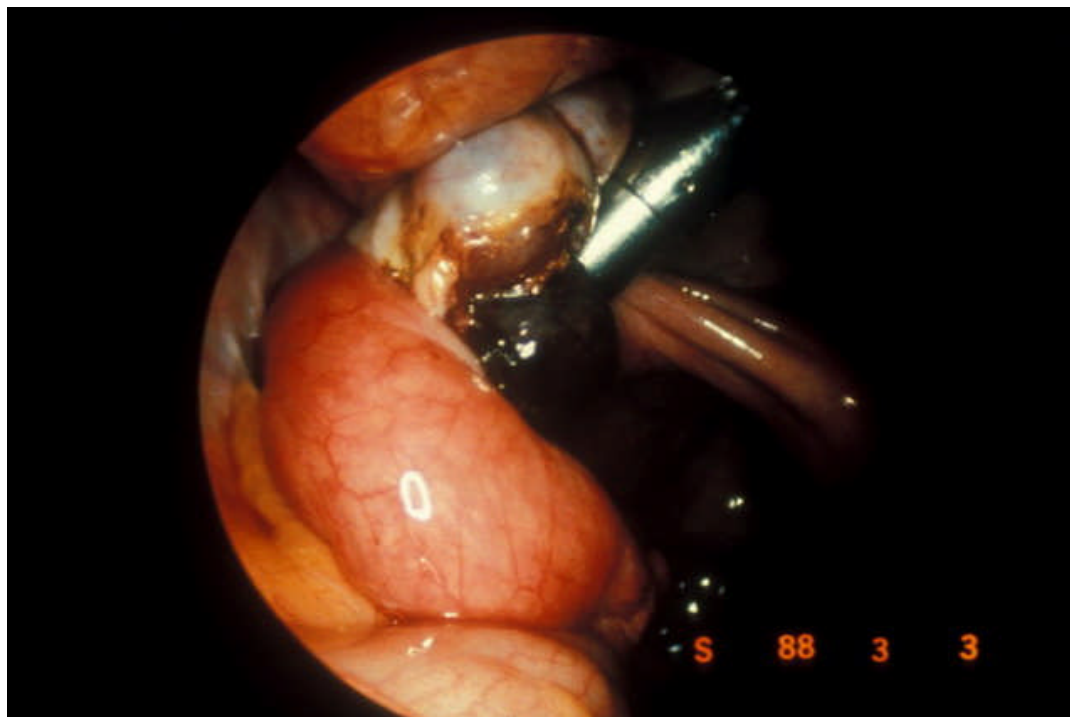
The red area at the top of the bowel is an edematous vascular area of glands and stroma. The muscular infiltration can be seen beneath this. Infiltration extended through 80% of the muscle wall.



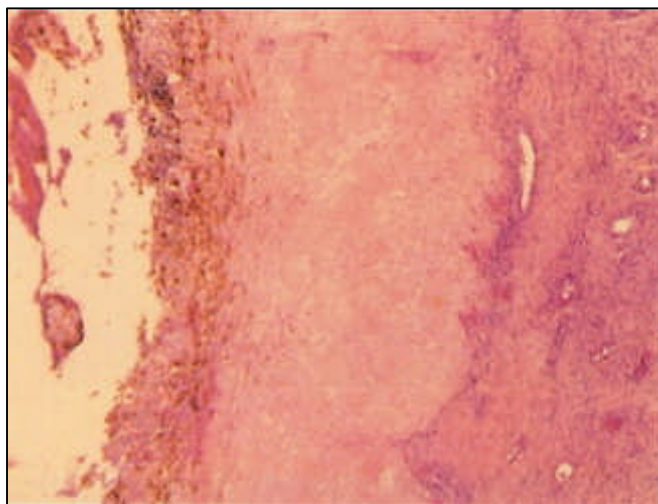
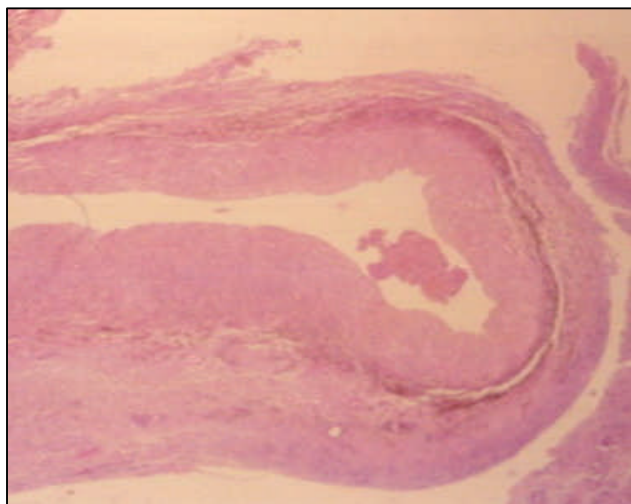
On opening a chocolate cyst, the appearance may be one of irregular brown and red areas on a white pseudocapsule. Other endometriomas have diffuse areas of red patches with no obvious hemosiderin.



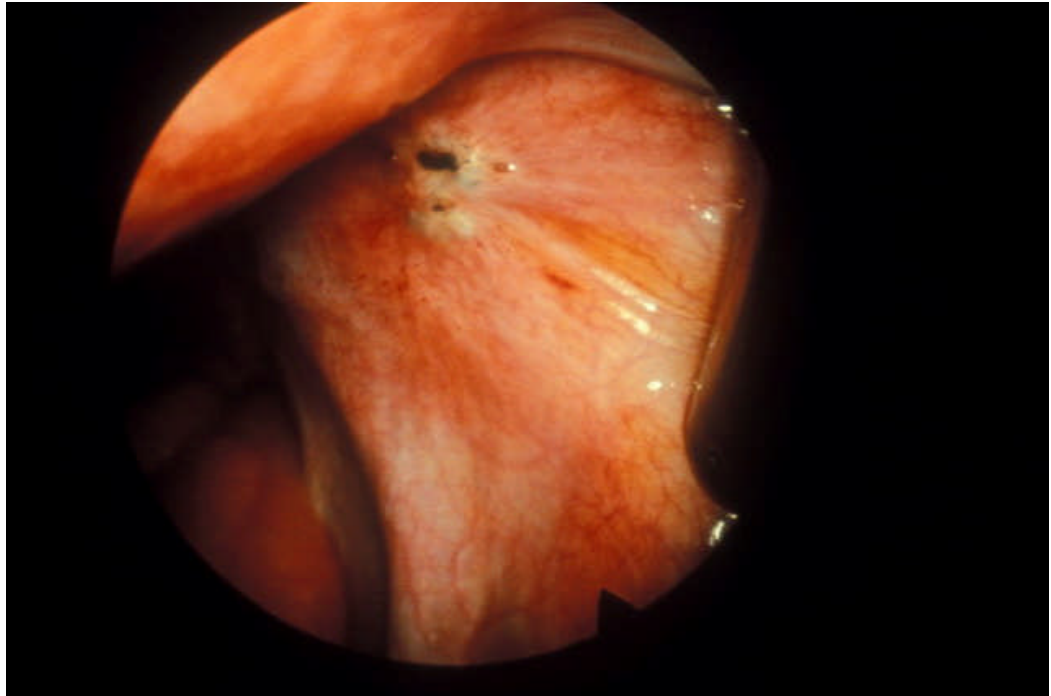
Hemosiderin laden macrophages are seen in the brown area. A polypoid area of glands and stroma is seen in the red areas, immediately adjacent to the hemosiderin.



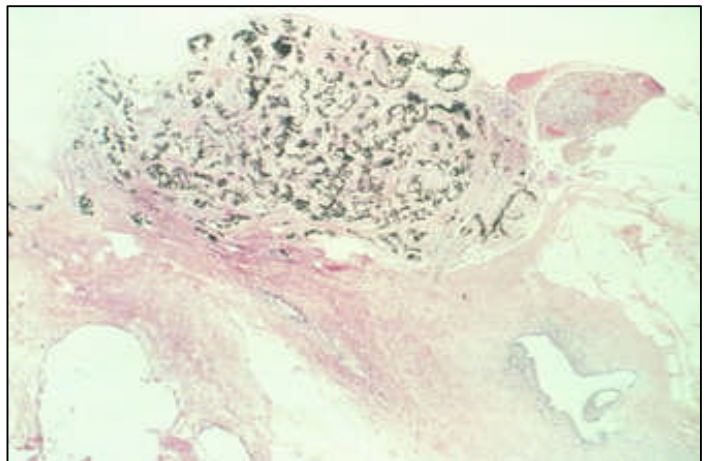
Chocolate cysts may also be corpus lutea or albicans. These frequently have clots within them or may have a yellowish rim. The clot may be firmly attached or may be easy to strip away from the wall of the cyst.



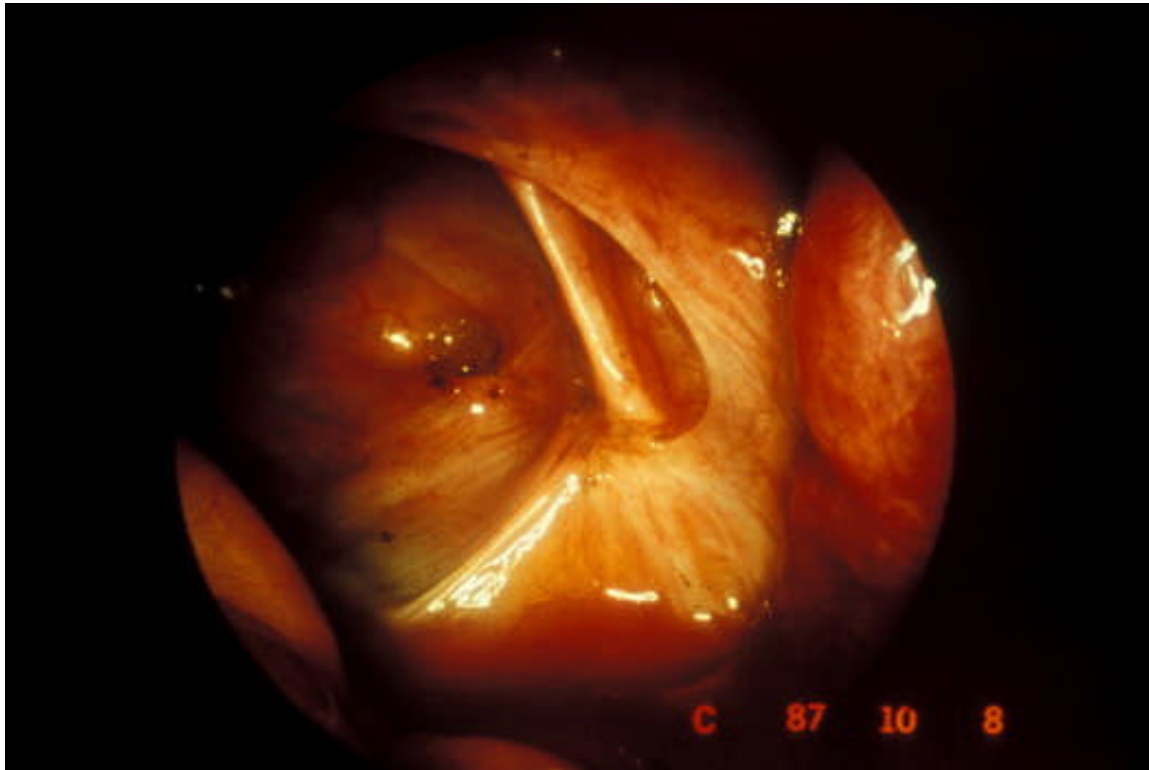
The diffuse hemosiderin laden macrophages associated with an involuting Corpus luteum can scatter throughout the granulosa lining, accumulate at the base of the old granulosa lining or accumulate on the surface.



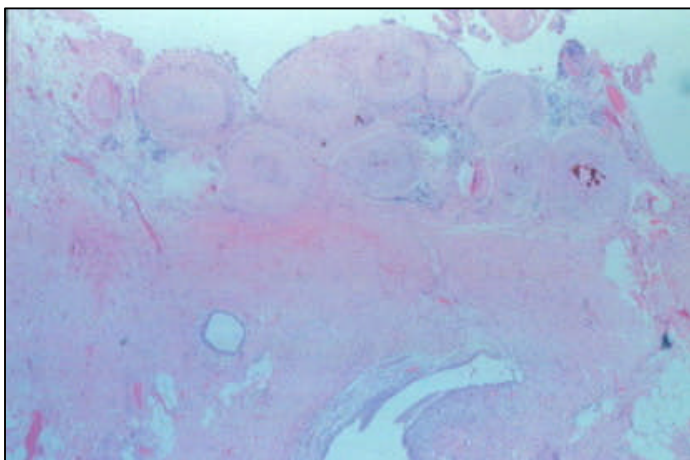
Low power density CO2 laser vaporization can lead carbon on top of residual endometriosis. This is particularly true in areas such as the broad ligaments immediately overlying the ureter.



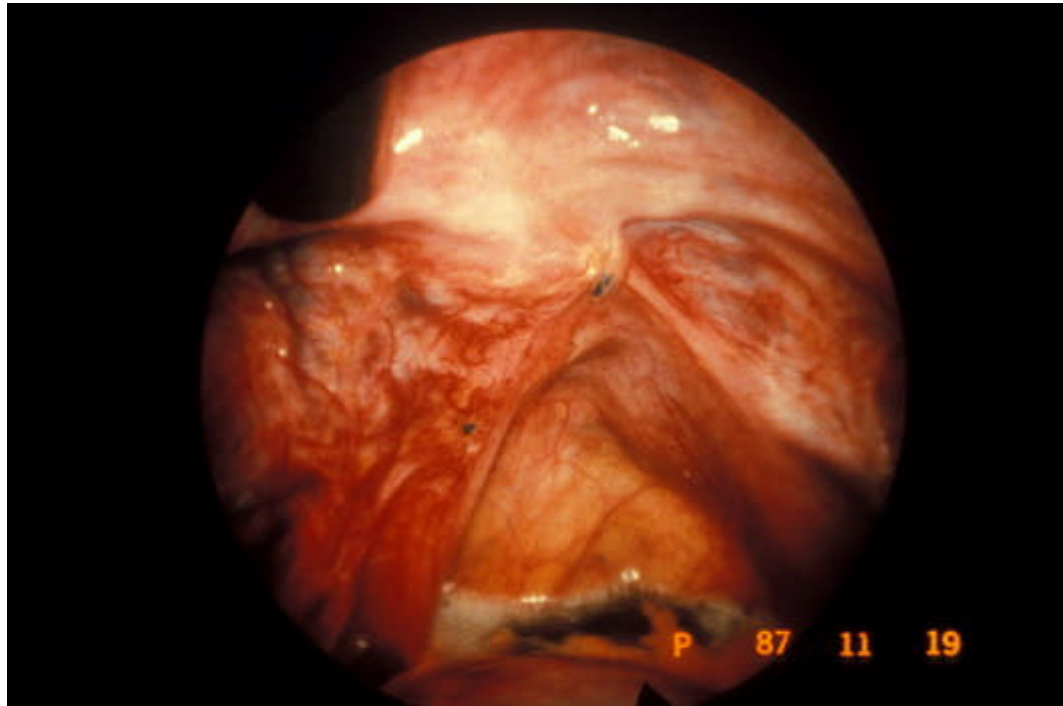
When the area is resected, carbon and granulation tissue is directly above the endometriosis seen and the scarred right lower area of the specimen.



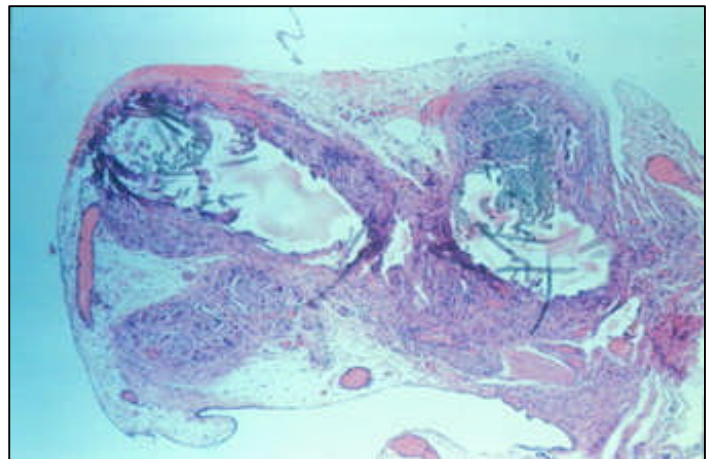
This area was resected at second look laparoscopy for persistent pain following CO₂ laser vaporization. The surface has granulation tissue lying over the residual endometriosis.



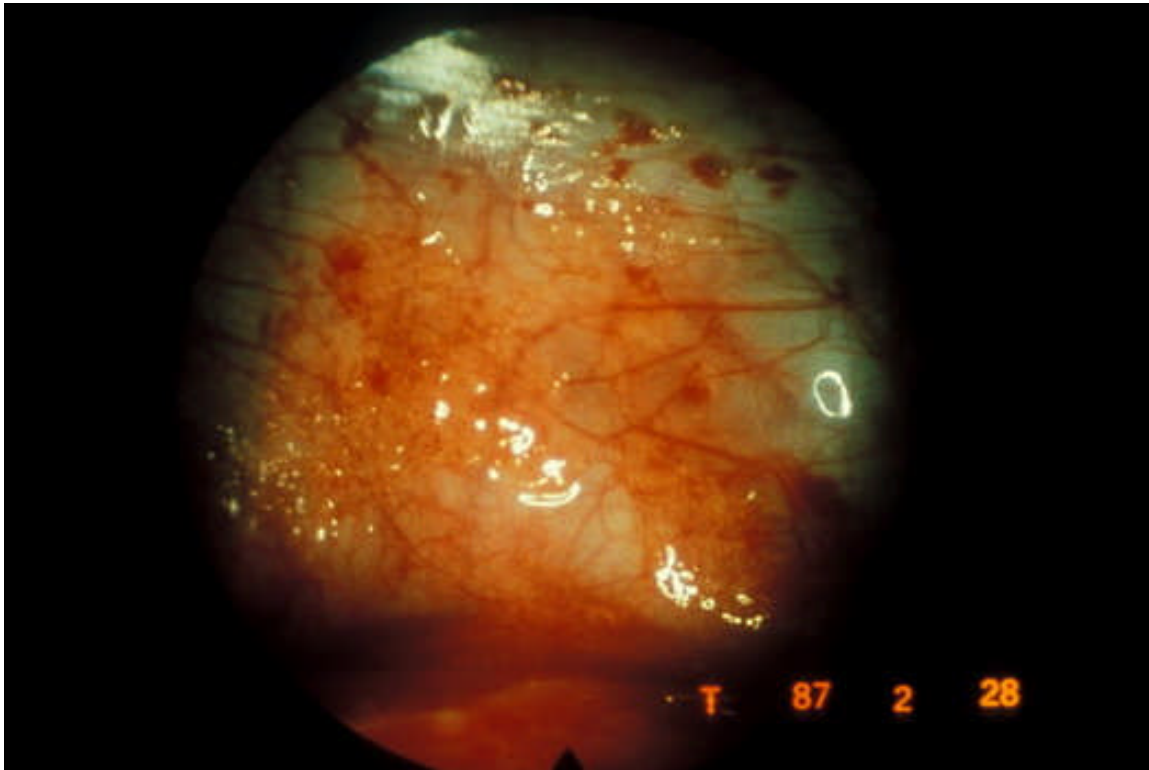
High power density CO₂ laser vaporization can avoid carbonization. However, resection is a more predictable technique.



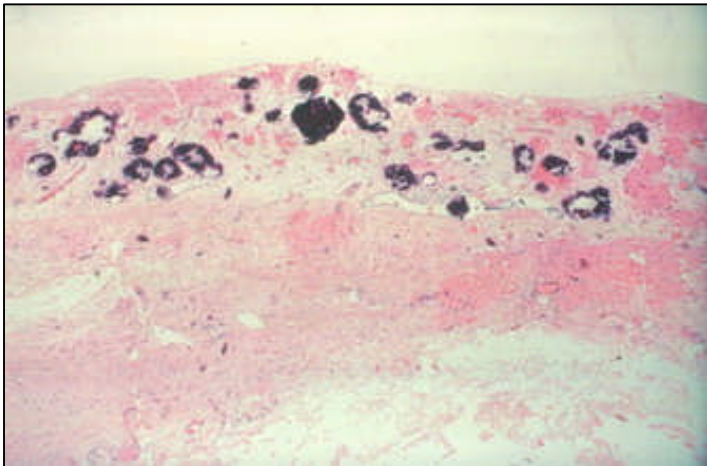
Scarred black areas are not always endometriosis. The right uterosacral ligament is a foreign body and the black lesion in the left uterosacral is endometriosis.



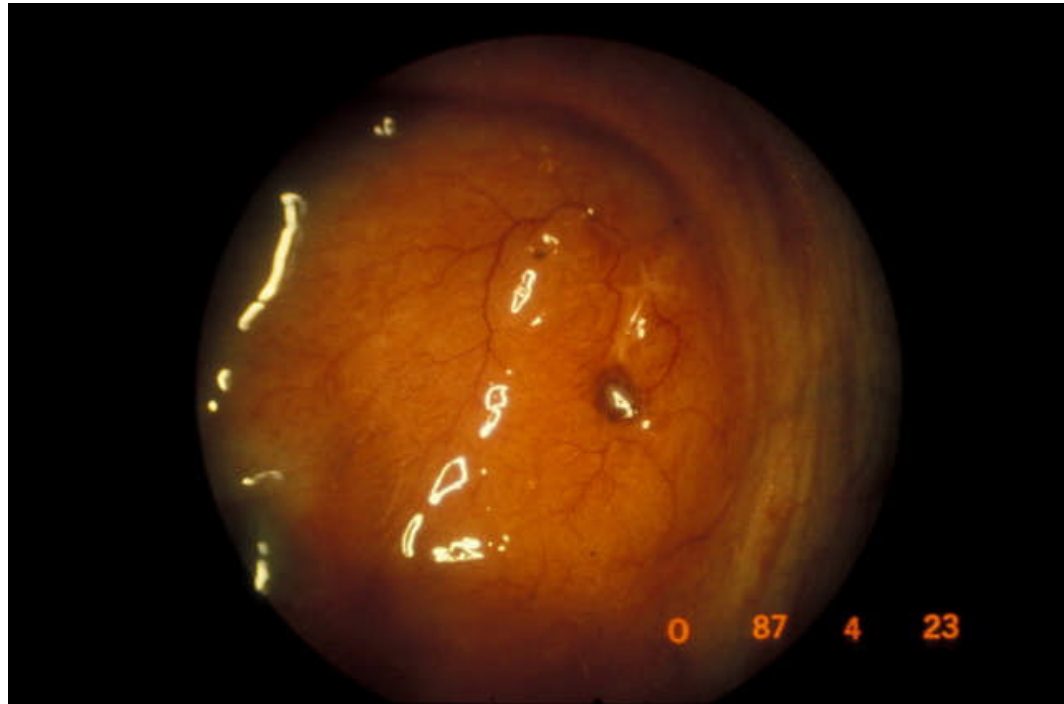
Old suture material was seen in the right uterosacral lesion. This was associated with scarring.



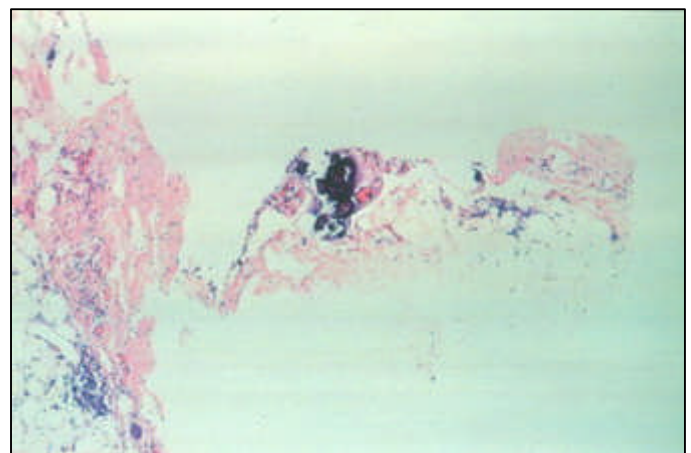
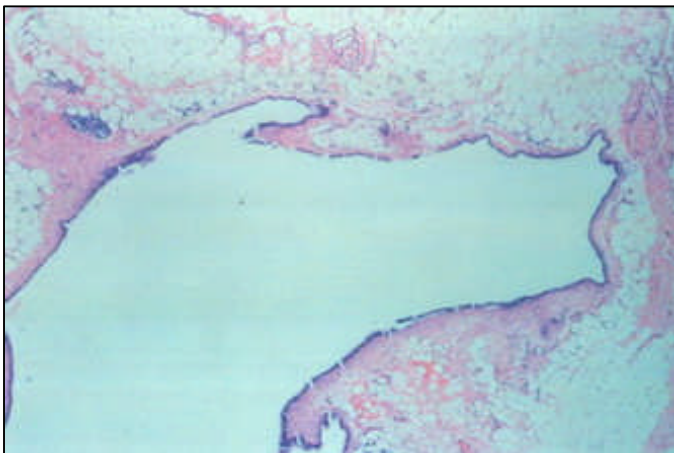
A diffuse red and brown appearance is seen in this patient, who has a high chlamydia IgG titer of 1:128, but no other identified pathology.



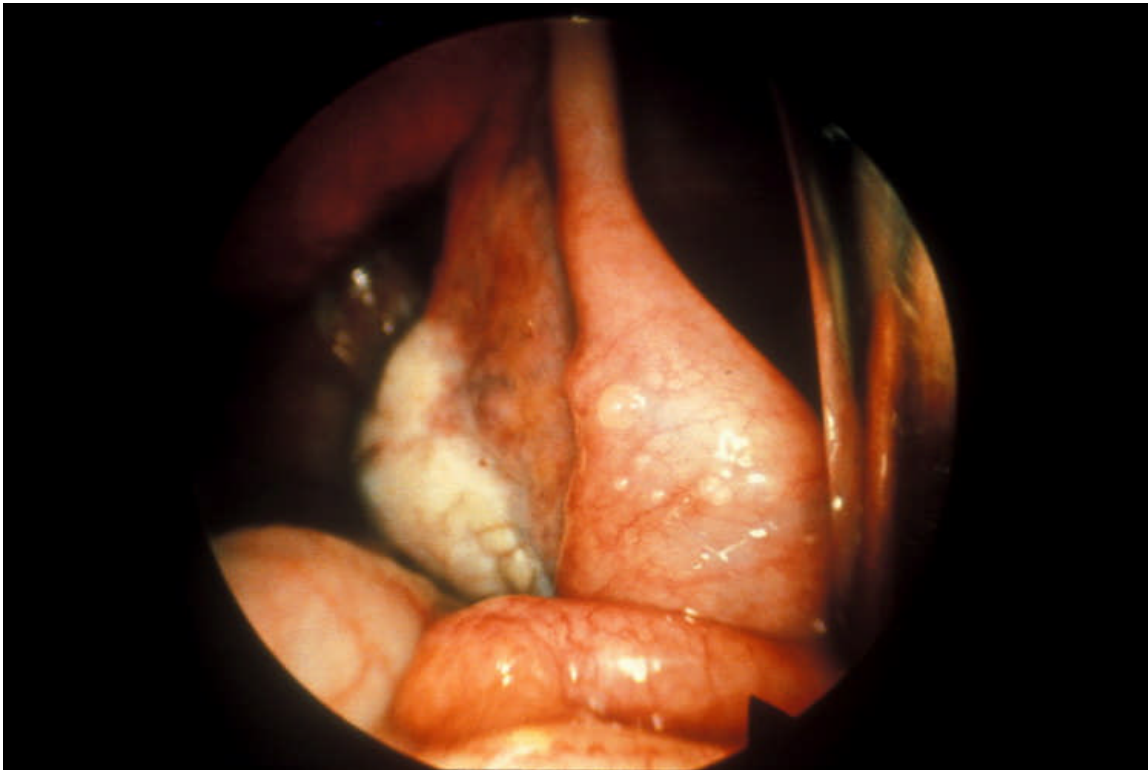
The finding of diffuse dystrophic calcification (psammoma bodies) can occur in patients with high chlamydia IgG titers.



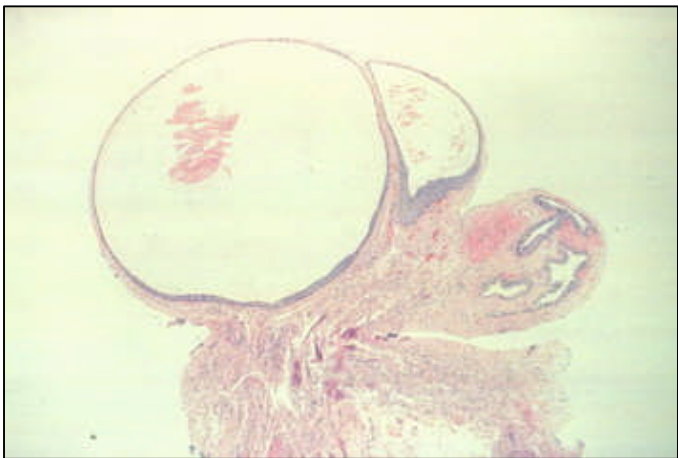
A black vesicle is in the right cul-de-sac. This vesicle is nonspecific and appears to be an old inflammatory epithelial inclusion.



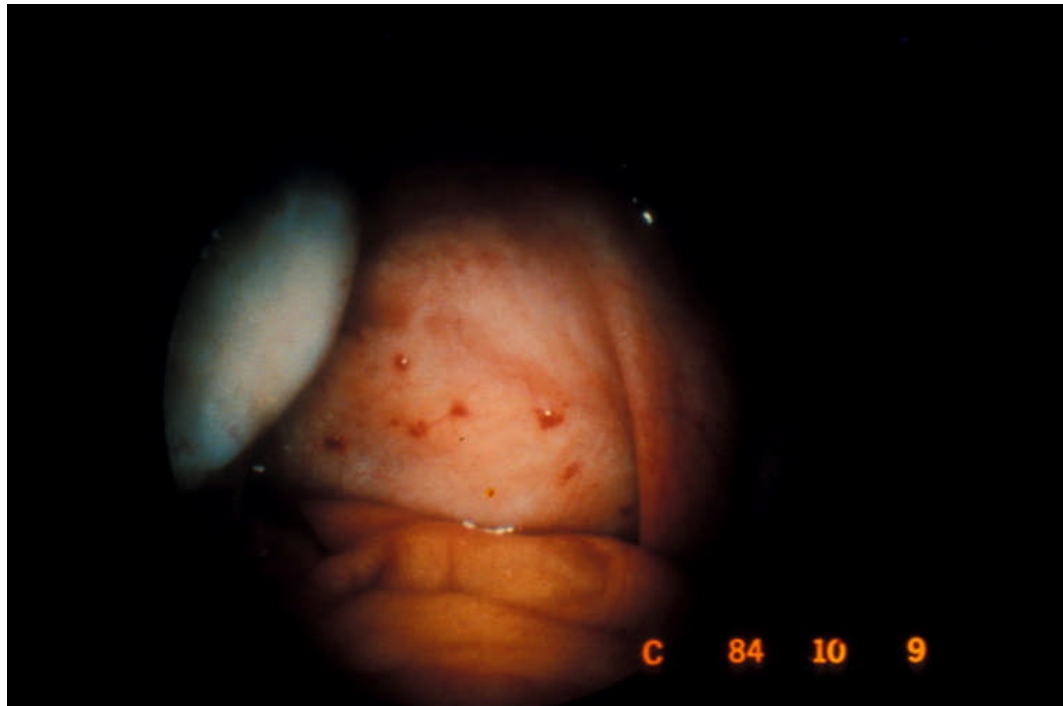
The flat lining is seen at the higher magnification view. Psammoma bodies are associated with this inclusion. This was associated with a borderline positive chlamydia IgG titer of 1:16.



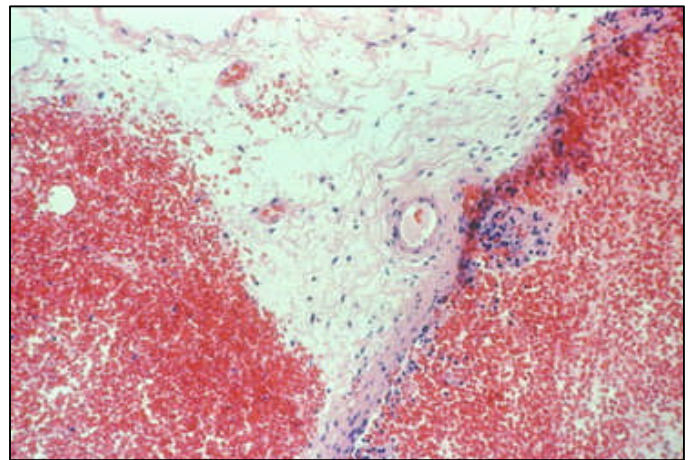
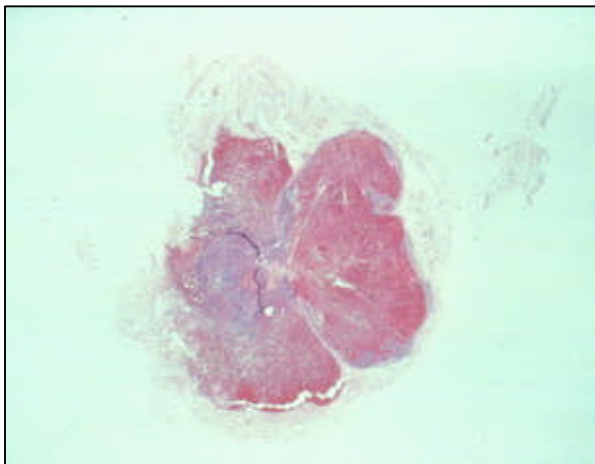
Clear and white vesicles on the tube are rarely endometriosis. However, When the lesions are lateral to the tube, the diagnosis may be endometriosis as is seen on page 14.



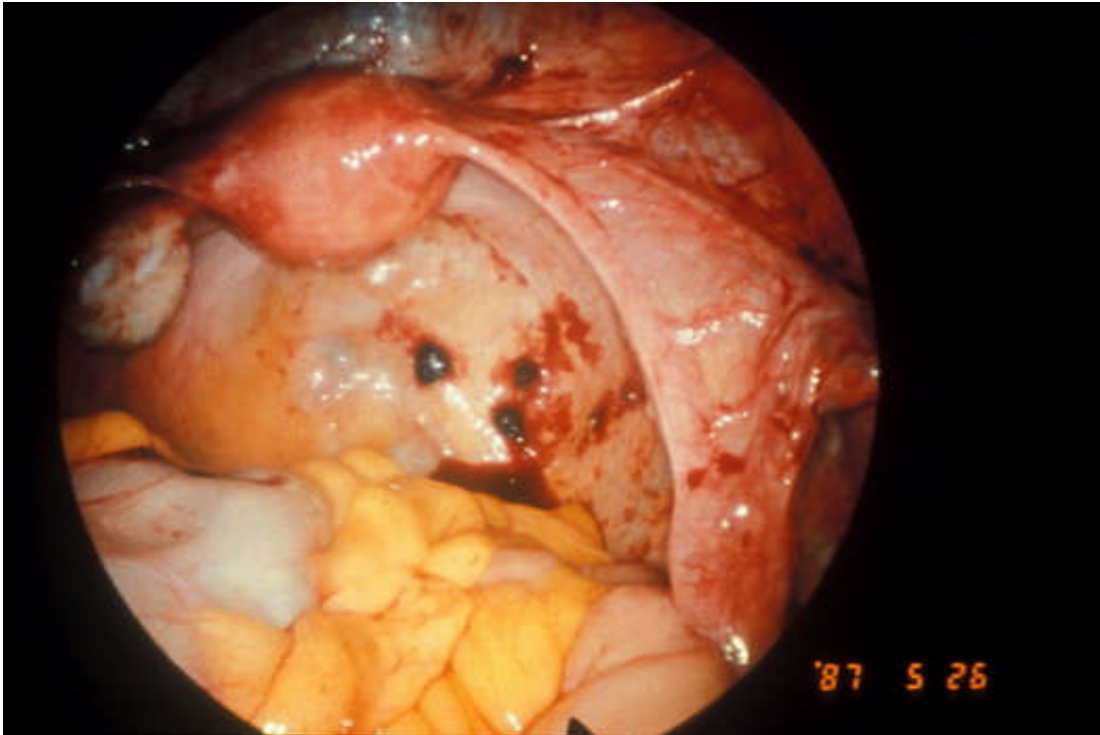
These clear and white inclusions of the tube are almost uniformly Walthard Rests.



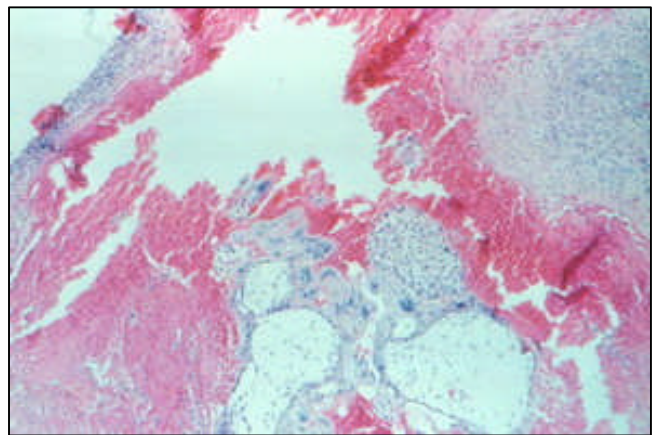
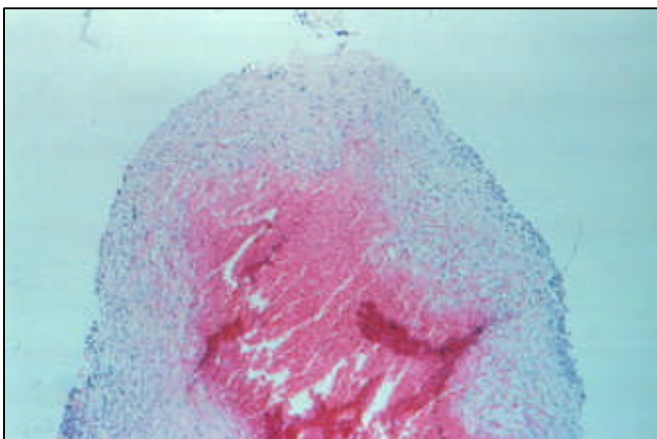
These small red lesions in the deep cul-de-sac appear like endometriosis. However, the appearance is more uniform than usual for endometriosis.



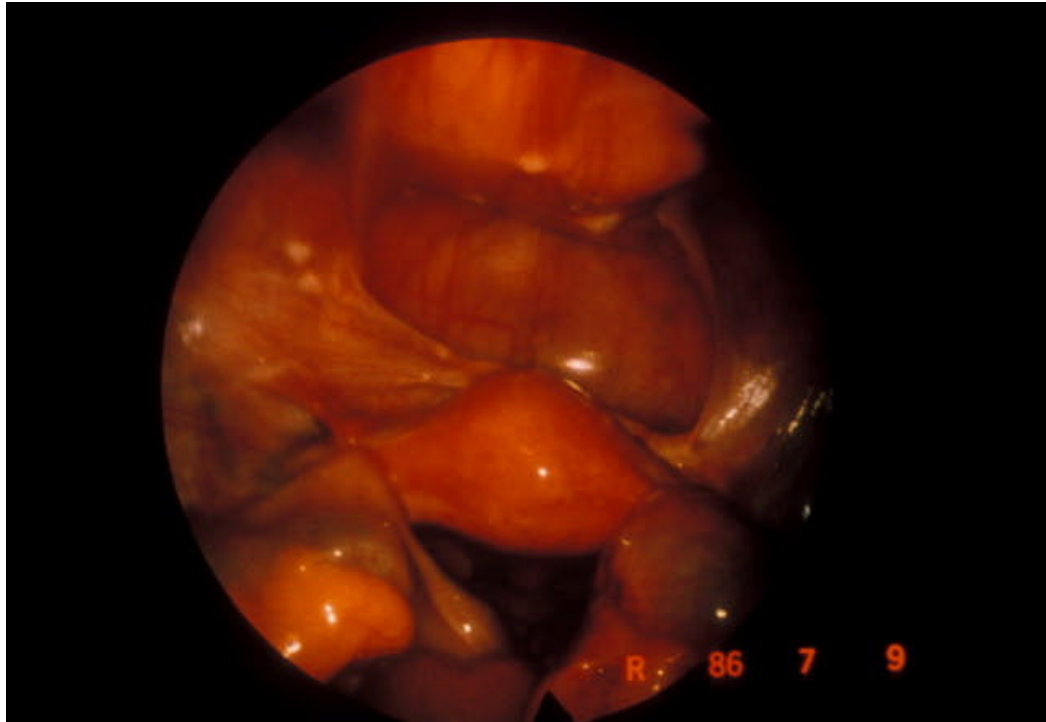
These red lesions are highly vascular structures compatible with hemangiomas and show no signs of endometrial glands, stroma or epithelial lining.



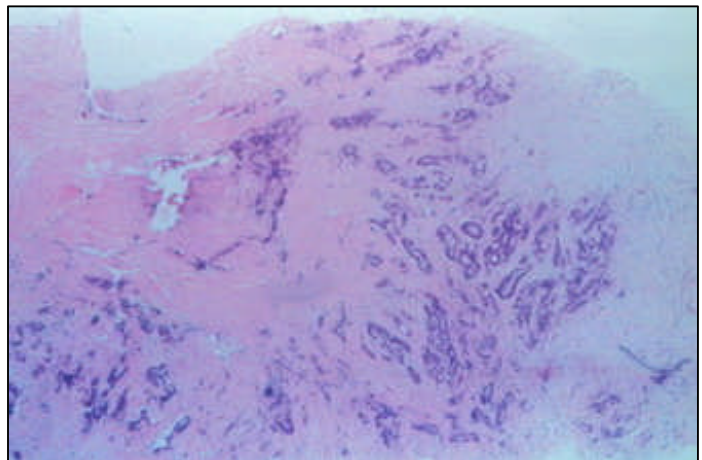
Hemorrhagic red lesions were seen in the patient four weeks following a salpingotomy for the excision of the right tubal pregnancy. At this time, her HCG titer was rising due to her persistent ectopic pregnancy. (From Reich, et al. Fertility and Sterility 52:38, 1989 with permission)



Although some of the lesions were clot and hemorrhage, others contained villi from the reimplanted trophoblastic tissue in this cul-de-sac pregnancy.



Although some white nodules have been endometriosis, these can represent many lesion types. These large nodules were seen in a patient as part of an Interleukin-2 study protocol for recurrent breast cancer.



The metastatic breast cancer was seen in all resected white nodules. On palpation, these had the same feel as fibrotic endometriosis.

