ENDOMETRIOSIS SYMPOSIUM
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# Surgical management of endometriosis
## Manejo quirúrgico de la endometriosis

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**ABSTRACT**
Endometriosis is a chronic and multifactorial gynecological disease that affects a significant proportion of women of reproductive age, commonly presenting with symptoms such as chronic pelvic pain and infertility. Its management requires an individualized approach and, in many cases, surgical intervention—particularly when medical therapy is ineffective or contraindicated. This article reviews the various surgical approaches to endometriosis based on its clinical and phenotypic presentation: superficial peritoneal endometriosis, endometrioma, and deep infiltrating endometriosis (DIE). Laparoscopy has become the preferred surgical approach due to its lower morbidity, reduced adhesion formation, faster postoperative recovery, and improved fertility outcomes compared to laparotomy. In complex cases such as DIE with intestinal, bladder, or ureteral involvement, multidisciplinary collaboration is required, employing advanced techniques like discoid excision, segmental bowel resection, or partial cystectomy. Although robotic surgery is a promising technology, current evidence does not demonstrate superior clinical outcomes compared to conventional laparoscopy and poses significant economic challenges. Surgical treatment should be planned and outlined in informed consent based on symptoms and the extent of the disease, reproductive goals, and ovarian reserve, while also considering options such as fertility preservation. Informed decision-making, expertise in minimally invasive surgery, and interdisciplinary coordination are essential to optimize clinical and reproductive outcomes in patients with endometriosis. Finally, it should be emphasized that endometriosis surgery is complex and should be performed by gynecologists who are experts in treating the disease.
Keywords: Endometriosis, laparoscopy, surgical treatment, minimally invasive surgery, infertility, deep endometriosis, multidisciplinary surgery.

**RESUMEN**
La endometriosis es una enfermedad inflamatoria crónica estrógeno dependiente y multifactorial que afecta a una proporción significativa de mujeres en edad reproductiva, generando síntomas como dolor pélvico crónico e infertilidad. Su manejo requiere un enfoque individualizado y, en muchos casos, quirúrgico, especialmente cuando la terapia médica resulta ineficaz o está contraindicada. Este artículo revisa los distintos abordajes quirúrgicos de la endometriosis según su presentación clínica y fenotípica: superficial, endometrioma y endometriosis profunda. La laparoscopía se consolida como el tratamiento quirúrgico de elección por su menor tasa de morbilidad, menor formación de adherencias, mejor recuperación posoperatoria y mejores resultados en fertilidad, en comparación con la laparotomía. En casos complejos, como la endometriosis profunda con compromiso intestinal, vesical o ureteral, se requiere la participación de equipos multidisciplinarios y técnicas específicas como la escisión discoide, la resección segmentaria o la cistectomía parcial. La cirugía robótica, aunque prometedora, no ha demostrado beneficios clínicos superiores a la laparoscopía. El tratamiento quirúrgico debe ser planificado y plasmado en el consentimiento informado basandose en los síntomas, la extensión de la enfermedad, el deseo reproductivo y la reserva ovárica, considerando también alternativas como la criopreservación. La toma de decisiones informada, el entrenamiento en cirugía mínimamente invasiva y la coordinación interdisciplinaria son esenciales para optimizar los resultados clínicos y reproductivos en pacientes con endometriosis. Finalmente recalcar que la cirugia de endometriosis es compleja, debe ser realizado por ginecologos expertos en el tratmaiento de la enfermedad.
Palabras clave: Endometriosis, laparoscopía, tratamiento quirúrgico, cirugía mínimamente invasiva, infertilidad, endometriosis profunda, cirugía multidisciplinaria.

## Introduction

Endometriosis is a chronic, estrogen-dependent inflammatory disease characterized by the presence of functional endometrial tissue outside the uterine cavity. It affects approximately 10% of women of childbearing age and is associated with up to 50% of cases of female infertility and chronic pelvic pain. Its etiology is multifactorial and involves genetic, immunological, hormonal, and environmental factors, contributing

to its heterogeneous clinical presentation. From a phenotypic point of view, endometriosis is classified into three main forms: superficial peritoneal endometriosis, ovarian endometrioma, and deep infiltrating endometriosis, the latter being the most surgically complex and symptomatically severe.

Although medical management based on hormone therapy constitutes the first-line approach, a substantial proportion of patients either do not respond adequately, experience adverse effects, or present contraindications to such treatment. In these cases, surgical intervention becomes essential, particularly when symptoms are refractory, infertility is present, malignancy is suspected, or when there is anatomical involvement of pelvic organs such as the intestine, bladder, or ureters. The choice of surgical technique must be individualized, taking into account the disease phenotype, severity of symptoms, reproductive intentions, and ovarian involvement.

Laparoscopy has become the gold standard in the surgical treatment of endometriosis due to its many advantages over laparotomy: lower morbidity, less adhesion formation, faster postoperative recovery, and better reproductive outcomes. In advanced cases, particularly in the presence of deep endometriosis, the participation of multidisciplinary teams is required, including gynecologists, colorectal surgeons, and urologists. The surgical techniques used include discoid excision, segmental bowel resection, partial cystectomy, and ureterolysis, procedures that must be planned with precision, supported by imaging studies such as specialized transvaginal ultrasound and pelvic magnetic resonance imaging.

In recent years, robotic surgery has emerged as a minimally invasive alternative with ergonomic and visual advantages. However, current evidence does not demonstrate significant superiority over conventional laparoscopy, and its high cost represents a barrier in many health systems, especially in developing countries.

This review aims to analyze the different surgical approaches used in the treatment of endometriosis, with an emphasis on their application according to different phenotypes, clinical and reproductive outcomes, as well as the need for an individualized and interdisciplinary approach to optimize the comprehensive management of this complex pathology.

## Surgical approach: Laparoscopy or laparotomy in the treatment of endometriosis?

Firstly, it must be recognized that the treatment of endometriosis must be multidisciplinary. In the study by Pellerin et al. in France, they evaluated the number of urological and intestinal surgeries for endometriosis and concluded that surgeons called “endometriosis surgeons” or “pelvic surgeons” performed a greater number of major surgeries for endometriosis, certifying the resection of the largest number of endometriosis implants compared to gynecologists. Basic training in gynecology does not qualify surgeons to perform this type of surgery; however, certification can be obtained through training at certified centers with high-volume surgeries[1].

The goal of surgical intervention in endometriosis is to remove all endometriotic disease and restore the anatomy of the pelvis, thereby preventing the formation of new postoperative adhesions and relieving pain. Laparoscopic or laparotomy approaches can be used.

Regarding the formation of adhesions according to the surgical approach, there are studies reporting a recurrence rate of adhesions of 40–72% and the formation of new adhesions in more than 50% of cases by laparotomy, in contrast to the laparoscopic approach, where the rate is reported to be between 0–20%. In the study by Darai et al., which compares the two types of approaches for intestinal resections due to endometriosis, they conclude that the laparoscopic approach is safe and has a lower morbidity rate and better quality of life, as well as increasing the pregnancy rate compared to laparotomy[2].

According to various authors, laparoscopy offers a lower morbidity rate compared to laparotomy, with shorter recovery time, less postoperative pain, less blood loss, as well as aesthetic advantages and better visualization of the surgical field. However, the arrival of robotic surgery in Peru has caused controversy as to whether this approach has better results in endometriosis[3, 4, 5].

The LAROSE study is a randomized, multicenter controlled clinical trial involving 35 and 38 patients in the robot-assisted and laparoscopic groups, respectively. There was no significant difference in operating time, intraoperative bleeding, or intraoperative complications, nor was there any difference in quality of life or morbidity at the six-month follow-up. In the study by Camran Nezhat et al., who conducted a retrospective cohort study, the same findings as in the LAROSE study were reported; however, they emphasized the high surgical and maintenance costs of robotic surgery[6, 7].

## Surgical approach to endometriosis according to phenotypes and symptoms

**Indications for surgical treatment:**

Although endometriosis has been classified as superficial, deep, and endometrioma, surgical indications are defined by the patient's clinical presentation and desire for fertility.

**Superficial endometriosis:**

- Pain: All patients with suspected superficial endometriosis with severe pelvic pain that does not respond to medical therapy, or for whom medical therapy is contraindicated, should undergo laparoscopic surgery, bearing in mind that resection of superficial endometriosis improves symptoms in 62–80% of cases after 6 months of therapy[8]. The American College of Obstetricians and Gynecologists (ACOG) recommends that empirical medical therapy for 3 months in patients where it is not contraindicated is more cost-effective than starting with surgery in the first place[9].

  The recommendations given by Dr. Abrão's group suggest that if pain > 7 on the visual analog scale persists or increases after the use of medical therapy, laparoscopy should be performed.

- Infertility: There are no studies with robust designs to determine the efficacy of surgery for superficial endometriosis and fertility outcomes. However, in Opøien's retrospective cohort study, they found a high rate of implantation after surgery to remove superficial endometriosis lesions compared to diagnostic laparoscopy, 30.9% vs. 23.9%, $p$=0.02, pregnancy rate (40.1% vs. 29.4%, $p$ = 0.004), live birth rate (27.7% vs. 20.6%, $p$ = 0.04).

  In terms of fertility, it is suggested that laparoscopy be performed after two failed IVF attempts with the possibility of resection of superficial endometriosis[10, 11].

## Endometrioma:

The decision to perform surgery in this presentation is controversial because the desire for fertility must be taken into account. There are several types of surgery described, such as drainage, stripping, cystectomy, and oophorectomy.

- **Pain**: According to the study by Chapron et al., endometrioma is associated with the presence of deep endometriosis (2.51 +- 1.72 vs. 1.64 +-1.0, $p$<0.05). The ESHRE recommends that, if surgery is to be performed for deep endometriosis, the surgical technique of choice in the context of an endometrioma should be cystectomy[12].

- **Infertility**: ESHRE and ACOG recommend that endometriotic cysts should be excised because this reduces endometriosis-related pain, increases pregnancy rates, and reduces the recurrence of endometriomas. This approach should always be discussed with the patient due to the possibility of reduced ovarian reserve. Another reason why endometriomas should be treated surgically is the need to confirm their benign nature. The Society of Obstetrics and Gynecology of Canada recommends that endometriomas should be treated surgically if they are larger than 3 cm and associated with pelvic pain. Furthermore, laparoscopic excision is associated with a possible improvement in infertility when these endometriomas are larger than 3 cm.

  However, it should be noted that each patient must be evaluated individually, taking into account the patient's age, ovarian reserve, diagnosis of infertility, desire for pregnancy, size of the endometrioma, whether it is unilateral or bilateral, whether she has had previous adnexal surgery, the risk of cancer, and the symptoms presented by our patient[13].

## Deep endometriosis:

Due to the complexity of this presentation, the approach must be multidisciplinary, considering the possibility of intestinal nodules, bladder endometriosis, diaphragmatic endometriosis, etc.

- Pain: The recommendation of the ACOG, ESHRE, and ASMR in cases of pain that does not respond to medical therapy and in patients who do not wish to become pregnant is hysterectomy with resection of the endometriotic foci. In patients who wish to become pregnant, conservative surgery should be offered. However, there are currently no guidelines that specifically address this issue. Considering the multidisciplinary approach, intestinal lesions should be taken into account, observing their location, number, size, and the percentage of circumference affected. Intestinal lesions of the rectosigma measuring up to 3 cm should be treated surgically using techniques such as discoid resection or intestinal shaving. Segment resection should be considered when these lesions are larger than 3 cm and compromise more than 40% of the circumference, as well as the submucosal layer, or if these lesions cause obstruction. If bladder involvement is reported on ultrasound, initiation of medical therapy with GnRH inhibitors or contraceptives in patients with mild symptoms may be an option. However, in cases where symptoms do not respond to medical treatment, surgical options include shaving, partial cystectomy, and bladder reconstruction with or without ureteral reimplantation.

- Infertility: An increase in the pregnancy rate of up to 45% has been reported after deep endometriosis excision surgery. However, ovarian damage must be considered, and therefore a decrease in antral follicle reserve and consequent ovarian failure after the procedure. All surgeons should consider requesting an anti-Müllerian hormone test and ultrasound follicle count prior to any surgery and suggest evaluation by a fertility specialist. Patients under 30 years of age with adequate ovarian reserve and no previous fertility surgeries may be offered surgery before IVF. In contrast, patients over 30 years of age with low ovarian reserve or previous surgeries should be advised to undergo cryopreservation prior to surgery[14].

## Management of deep endometriosis from a colorectal perspective:

Intestinal endometriosis has a global incidence of 3.8–37% and is defined as the infiltration of endometrium-like tissue at least to the subserosal adipose tissue or adjacent to the neurovascular branches of the subserosal plexus[15].

Rectal or rectosigmoid involvement is seen in approximately two-thirds of patients. Endometriosis involving the rectum tends to cause dyschezia, tenesmus, hypogastric pain, a feeling of bloating, and changes in bowel habits. Only 5% of patients with intestinal involvement will experience cyclic rectal bleeding. Due to its varied presentation, the diagnosis of intestinal endometriosis can be confused with irritable bowel syndrome, inflammatory bowel disease, colon adenocarcinoma, diverticular disease, or post-surgical adhesions[16, 17, 18].

The approach to this type of endometriosis involvement involves joint management between the gynecologist and the colorectal surgeon, and the goal is to improve the parameters that influence the patient's quality of life, such as pain and fertility rate. For the surgical approach to this pathology, the patient must have an adequate diagnosis through mapping for the diagnosis of the disease, so that each case can be individualized and the preoperative decision can be prepared in conjunction with the colorectal surgeon. The following parameters must be taken into account when deciding on surgery:

1. Patient factors:
    - Age
    - Fertility
    - Hormonal status
2. Clinical factors:
    - Pain intensity
    - Characteristics of intestinal obstruction
3. Disease-related factors:
    - Number and location of lesions

- Distance from the anal margin
- Nodule size
- Percentage of infiltration
- Percentage of intestinal circumference involvement
- Multifocality

Surgical management of this condition is indicated in patients who have symptoms such as pain, dyspareunia, dyschezia, or intestinal obstruction that interrupt their daily activities and reduce their quality of life[16].

## Preoperative:

Adequate counseling should be considered before performing surgery, and appropriate informed consent should be obtained. Preoperative preparation also includes mechanical bowel preparation, anti-thrombotic stockings, anti-thrombotic prophylaxis such as enoxaparin, and an adequate antibiotic prophylaxis regimen for colorectal surgery.

## Surgery:

The surgical techniques described are:

- Partial excision or "shaving"
- Disc excision
- Segmental resection: Resection of a segment of intestine affected by the disease, followed by anastomosis (T-T or T-L).

## Partial excision or "shaving":

Resection of superficial lesions can be performed by sharp dissection, lifting the lesion with forceps and cutting it with scissors. Excision may leave a defect in the intestinal wall, which must be secured with separate stitches. The integrity of the intestinal wall must be verified by irrigating the pelvis with saline solution and insufflating air transrectally to assess whether there is any leakage.

Obliteration of the posterior sac with rectosigmoid involvement. Obtained from reference 31.

In a study of 500 cases treated with the shaving technique, a high pregnancy rate (84%), low recurrence rate (8%), and low rate of major complications (3.20%) were reported.

## Discoid excision:

This technique is indicated for lesions that infiltrate into or beyond the muscularis propria. Patient selection for this procedure must be very meticulous because it can cause stenosis if not properly indicated. Generally, single lesions smaller than 3 cm and involving less than 40% of the circumference are considered suitable for discoid excision.

## Segmental resection:

The indications for performing a segmental resection are: nodules > 3 cm, lesions involving > 50% of the intestinal circumference, nodules involving upper intestinal segments, or multifocal disease. This technique should be performed laparoscopically because it has been reported to have a lower complication rate and a higher pregnancy rate compared to the conventional approach[20].

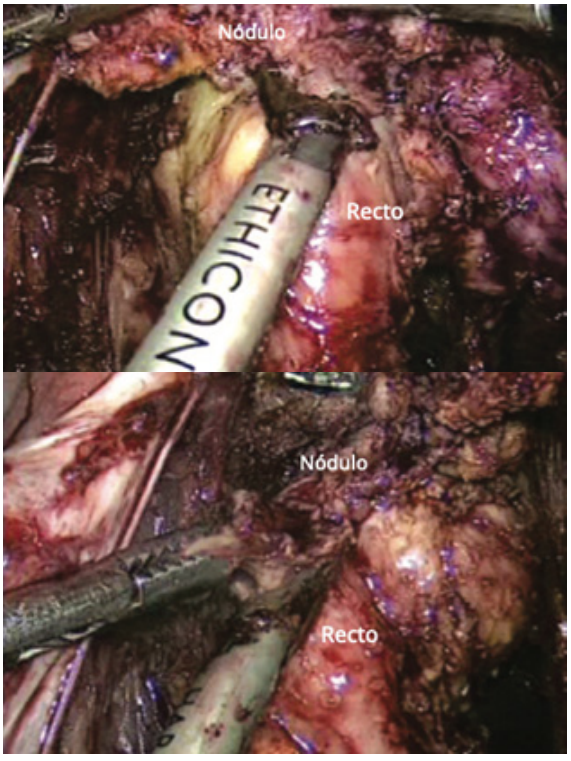
With the help of the uterine manipulator, the uterus is displaced in anteversion, and the ureters are identified. Very often, these are displaced medially due to the fibrosis characteristic of the disease. One way to help identify these structures is by placing ureteral catheters or with the help of indocyanine green. In contrast to surgery for malignant pathology, this procedure allows for the dissection and ligation of vessels

near the intestinal wall. Dissection should begin in an area where the peritoneum is healthy, away from the endometriosis nodule. Anterior dissection of the rectum tends to be the most complicated due to nodules that form adhesions in the cul-de-sac and recto-vaginal space.

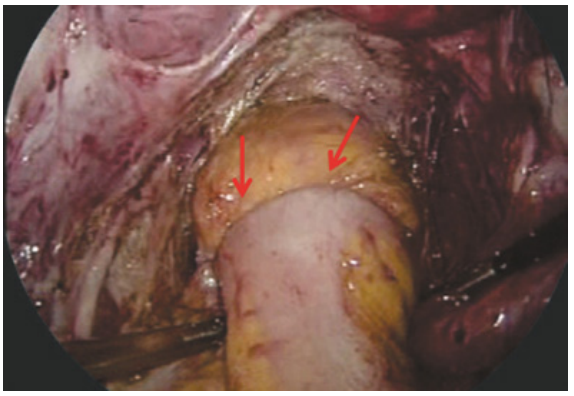
The dissection is performed warmly, from the nodule to the normal rectovaginal septum. The objective of performing the dissection in this direction is to ensure that the remaining intestinal segment is well vascularized. The branches of the inferior mesenteric vessels are clipped with advanced energy. Once the rectum is freed, the section is performed with Endo-GIA. The proximal sigmoid colon is mobilized sufficiently toward the pelvis to perform the anastomosis. The proximal intestine is divided, the anvil of the circular stapler is inserted, and a reinforcement suture is performed.

Lesions involving the lower rectum, i.e., less than 5-8 cm from the anal margin, present a therapeutic challenge because resection at this level involves a low or ultra-low anterior resection, which has been associated with a higher rate of complications, such as anastomotic dehiscence, rectovaginal fistula, and bladder dysfunction[21].

Intestinal nodule resection using the shaving technique. Retrieved from reference 31.




Discoid resection. Retrieved from reference 31.



Excision of deep intestinal lesions is not without complications, the main ones being: fistula (0–14%), hemorrhage (1–11%), infections (1–3%), laparoconversion (>12%), bladder dysfunction (1–71%), and intestinal dysfunction (severe constipation) (1–15%)[22, 23].

## Postoperative management:

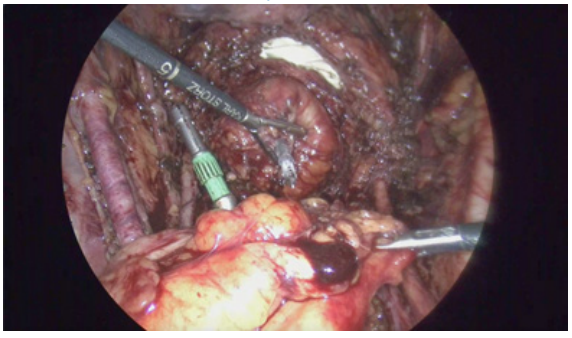
An epidural catheter or intravenous analgesics may be used for pain management. Nasogastric tubes should not be left in place, and oral tolerance should not be initiated on the first postoperative day. A soft diet may be started on day 3 or 4.

## Management of deep endometriosis from a urological perspective:

Urinary symptoms vary widely, with an incidence reported between 2 and 70%. Dysuria occurs in 21-69% of patients with bladder endometriosis, and the clinical presentation depends on the size of the lesion[24, 25].

Due to its symptoms, urological endometriosis can be confused with bacterial cystitis, tuberculosis cystitis, overactive bladder, bladder carci-

Segmental resection, placement of anvil through natural orifice. (Courtesy of Instituto Doyenne, center for endometriosis and advanced gynecological surgery).



noma, or interstitial cystitis. In this chapter, we will discuss the surgical management of endometriosis in the urological tract.

## Bladder endometriosis:

To prevent recurrence, the procedure of choice should be complete excision of the lesion. Unlike transitional cell carcinoma, endometriosis grows from the peritoneum into the bladder wall, making complete excision through transurethral resection impossible and leading to a higher rate of disease recurrence and symptoms. Even when used in conjunction with hormone therapy, a recurrence rate of 25-30% was found[25, 26].

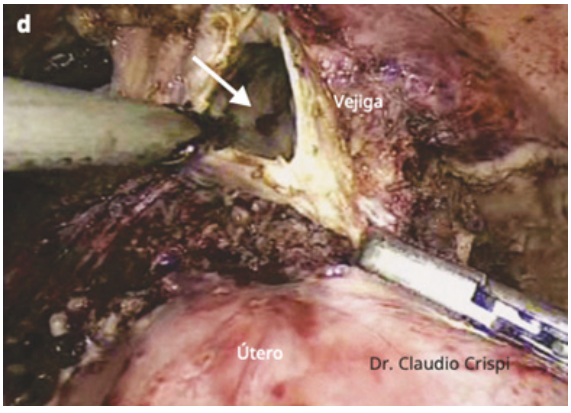
The technique that should be used to manage bladder lesions of endometriosis is partial cystectomy, which involves excision of all layers of the bladder, including removal of a margin of healthy tissue. This is a safe procedure when the lesion is located in the bladder dome and far from the ureteral orifices.

The steps for cystectomy are similar to those for conventional cystectomy, as follows:

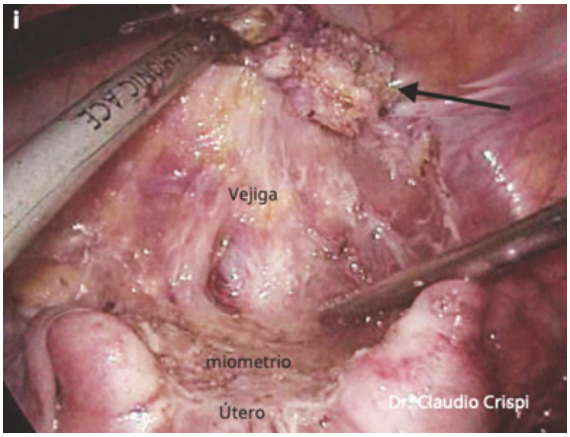
1. Dissection of the vesico-uterine space
2. Cystectomy with complete removal of the endometriotic nodule
3. Hermetic raffia with absorbable suture

The ureteral catheter should be used when the nodule is less than 2 cm from the ureteral orifice or if multiple nodules with fibrosis are evident. Some patients may require ureteral reimplantation when complete excision of the nodule compromises the vesicoureteral junction[27].

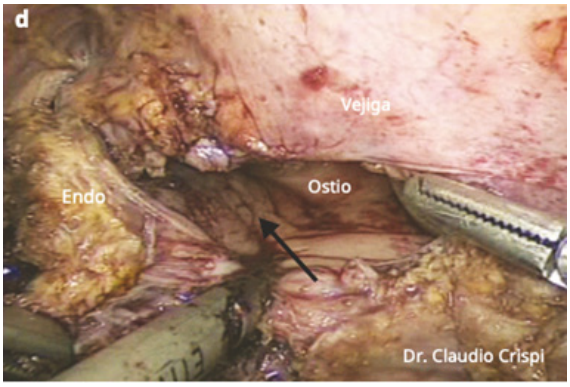
Partial cystectomy. Taken from reference 31.




Dissection of the anterior compartment. Retrieved from reference 31.




Start of cystectomy. The nodule compromising the trigone region and the left ureteral osteum is observed. Obtained from reference 31.




## Ureteral endometriosis:

The goal of surgery for ureteral endometriosis is to relieve symptoms and remove the tissue surrounding the ureters in order to prevent obstruction and thus preserve kidney function. The surgery of choice depends on the severity of the ureteral lesion, as well as how much kidney function is affected. If a ureteral lesion due to endometriosis is diagnosed, it is unlikely that it can be corrected with hormone treatment alone; these lesions usually require surgical treatment. Hormone therapy should not be offered in the presence of hydronephrosis due to the high recurrence rate and risk of kidney damage[28, 29].

The types of surgical techniques are: ureterolysis, ureteral resection with reconstruction, and nephrectomy, depending on the extent and location of the disease, as well as renal function. Ureterolysis is indicated in ureteral endometriosis that is less than 3 cm in extent and should not be associated with dilation of the upper urinary tract[30].

The laparoscopic approach consists of:

1. Placement of the ureteral stent for intraoperative identification.

2. Dissection of the peritoneum over the normal part.

3. Caudal dissection in the direction of the uterosacral ligaments to the ureteral canal.

4. Excision of fibrotic tissue down to the lower part of the normal ureteral tissue.

Ureteral resection is indicated in lesions larger than 3 cm with significant hydronephrosis, failure of ureterolysis, or ureteral injury during ureterolysis. The technique includes ureteroureterostomy and ureteroneocystostomy. Ureteroneocystostomy is the operation of choice in cases of extensive disease where tension-free ureteroureterostomy is not possible or the disease extends close to the vesicoureteral junction. In these cases, the Lich-Greogir or Leadbetter-Politano technique can be used, with or without a psoas hitch[31].

A delay in the diagnosis of ureteral lesions due to endometriosis can lead to eventual renal dysfunction and, consequently, nephrectomy, since ureteral lesions are asymptomatic in up to 50% of cases[32, 33, 34].

## Conclusion

Being a gynecological surgeon with comprehensive training in endometriosis surgery—including proficiency in colorectal and urological procedures—is essential to providing a complete and precise surgical approach to this complex pathology. Deep endometriosis, which affects pelvic and extragenital structures, requires a multidisciplinary strategy that enables complete resection of the disease in a single surgical intervention, thereby minimizing the need for reoperations and optimizing the functional preservation of organs. Such comprehensive technical expertise not only enhances clinical outcomes by reducing pain and improving fertility, but also increases surgical safety, decreases complications, and improves the quality of life of treated patients[35].

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