

Chapter 35

Surgical Interventions



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Introduction

Endometriosis is defined as the presence of endometrial glands and stroma outside of the uterine cavity. Such unwanted guests trigger inflammation and stimulate peripheral nerves causing pain. Symptoms may vary from minimal to severe.

Endometriotic lesions in the pelvis can be classified as superficial peritoneal, ovarian, or deeply infiltrative. The number of peritoneal regions affected by endometriosis increases during adolescence and through to one's early 20s [1]. Endometriomas occur when ectopic endometrial tissue implants in the ovary and the proceeding cyclic bleeding causes a hematoma in the ovary surrounded by ovarian cells. Deep infiltrative endometriosis (DIE) is defined as a solid endometriosis mass more than 5 mm deep in the peritoneum [2]. Surgeons are faced with DIE ordinarily in the rectovaginal septum, uterosacral ligament, rectum, rectosigmoid colon [3], and urinary tract [4].

Additionally, the exact rate of occurrence is unknown; in a retrospective cohort study of more than 9500 women undergoing laparoscopic or abdominal hysterectomy for benign indications, 15% of women were diagnosed with endometriosis [5]. The youngest endometriosis patient diagnosed in literature was 8.5 years of age [6]. Endometriosis is seen in 40% of adolescents with genital tract anomalies [7], in 50% of women with infertility [8], and in 70% of women and adolescents with pelvic pain [9].

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Clinical Manifestations

Primary dysmenorrhea begins with ovulatory cycles and is not associated with pelvic pathology. Secondary dysmenorrhea is defined as painful menses associated with pelvic pathology or a known medical condition.

Endometriosis is the most common cause of secondary dysmenorrhea; up to 70% of adult endometriosis patients state that their symptoms started before their 20s [10]. Acyclic and cyclic pain as well as bowel and urinary tract symptoms are common in adolescents with endometriosis; conversely, isolated cyclic pain is rare [9].

Vaginal examination for a young lady may cause unease. Abdominal ultrasonography or further investigations can be used instead of gynecologic examination. If endometrioma is detected, clinicians should evaluate the ureter, urinary bladder, and bowel for DIE.

Diagnosis

Secondary causes, especially endometriosis, should be considered for adolescents with cyclic or acyclic pain particularly when the patient's pain does not respond to NSAIDs or ovarian suppression as with oral contraceptives. Further investigation should be vaginal and ultrasonographic evaluation in this instance.

Endometriosis is definitively diagnosed by histological evaluation of a lesion biopsied during surgery, typically laparoscopically, and a negative histology does not rule out the diagnosis. Additionally, about 5% of these patients have Mullerian anomalies which is further discussed in Chap. 11 [11].

Endometriotic lesions in adolescents differ than those commonly seen in adults during laparoscopy. Although powder-burn lesions are common in adults, atypical red and clear lesions are more often seen in adolescents [12].

Delay in Diagnosis

NSAIDs for first-line treatments and atypical appearance of endometriotic lesions in adolescents cause delays in diagnosis. Due to the delay, endometriosis may progress to a more severe stage. Early diagnosis and interventions will contribute to a better quality of life in adolescents, as well as less damage to the ovarian tissue with less invasive ablative surgery. If possible, early diagnosis and treatment of endometriosis will stop the progression of the disease and reduce adverse long-term effects like chronic pain, endometriomas, and infertility [13].

Surgery Indications

Indications of surgery for adolescents are listed below:

- Diagnosis of medical therapy resistant persistent pelvic pain
- Medical treatment contraindications or rejection of medical treatment
- Evaluation of severe complaints that disrupt quality of life
- Exclusion of malignancy
- Treatment of anatomic abnormalities like bowel and bladder lesions

Surgery is almost always laparoscopy with the catchphrase “See and Treat.” Detection of or absence of endometriosis and other adhesive pathologies is another benefit of laparoscopy. If endometriosis is detected during laparoscopy, the surgeon can utilize techniques such as lysis of adhesions, coagulation, ablation, or resection to treat. Risks of surgery include, but are not limited to, venous thromboembolism, bleeding, infection, wound infection, adhesion formation, and injury to surrounding structures. Some families may choose empirical hormonal treatment with suspicion of endometriosis without definitive diagnosis to avoid the risks associated with surgery. Regardless, the adolescent patient, her family, and her physician should discuss all possible means of management before settling on a treatment plan.

Techniques of Diagnostic Laparoscopy for Adolescent Endometriosis

When entering the abdomen of an adolescent, keep in mind the smaller stature and distances to vital organs compared to adult woman. The gynecologist is closer to the great vessels than ever before! A systematic approach will facilitate an uncomplicated access to the pelvis. Following the same steps in every operation will make the surgery safe and fast. Systematic evaluation should include upper abdomen, uterus and adnexa, the peritoneum of ovarian fossae, vesicouterine fold, Douglas and pararectal spaces, the rectum and sigmoid, as well as the appendix and cecum. The ureters, bowel, and bladder should also be evaluated for endometriosis [14].

Endometriotic lesions may present as transparent-clear, yellow-red, or red-black. Blue-black lesions or “powder burns” are typical. In adolescents, transparent, vesicular, or red flame lesions are more common. These lesions are metabolically active, have greater prostaglandin levels than an adult’s lesions, and cause more pain [15]. The accuracy of diagnosis depends on the type of lesion, location, severity of disease, and the experience of the surgeon [16]. Filho et al. reported that laparoscopic findings had 72% positive predictive value, 98% negative predictive value, as well as 79% specificity and 98% sensitivity compared with pathological evaluation [17]. When pathology results are negative but endometriosis is present on laparoscopy,

the patient should still receive endometriosis treatment because this error could be due to inadequate sampling.

Due to the difficulties in diagnosis, several approaches have been defined for the recognition of lesions. One technique utilizes a laparoscopic camera from several millimeters to screen the peritoneum, while another fills the pelvis with saline before inspecting via an optic device [18].

Ideally, biopsies should be taken at the start of surgery followed by the excision or ablation of all suspected endometriotic lesions. Note that if biopsy is not taken at the beginning, ablation of all endometriotic lesions can deprive the clinician from pathological diagnosis. Furthermore, laparoscopic diagnosis is not confirmed by pathological reports but is sufficient for medical treatment of endometriosis after operation. Peritoneal striping is not recommended due to serious concerns such as adhesion, infertility, and intestinal complications, and the short- and long-term results of this method are insufficient [19].

While many young patients diagnosed and treated laparoscopically have American Society for Reproductive Medicine stage I or II endometriosis, studies have reported cases of stage III and IV as well as deep infiltrative endometriosis [21–23]. It should be emphasized that the complaints are independent of the stage when informing the family and patient before and after the operation [20]. Nezhat and colleagues reported that in their laparoscopically diagnosed adolescent endometriosis series, 68% had stage I, 20% had stage II, and 12% had stage III. There were no stage IV patients [21]. Matalliotakis et al. in their cohort found 45.4%, 36.4%, 14.5%, and 3.7% with stage I, II, III, and IV endometriosis, respectively [22]. Audebert et al. in 2015 recorded distribution of stages as follows: 60% stage I-II, 40% stage III-IV, and 10.9% defined as deep infiltrating endometriosis [23].

Treatment

The American Society for Reproductive Medicine (ASRM) Practice Committee affirms that “endometriosis should be viewed as a chronic disease that requires a life-long management plan with the goal of maximizing the use of medical treatment and avoiding repeated surgical procedures” [24]. Treatment of endometriosis should be individualized, and presentation (pain, infertility, mass in the abdomen), disease severity, localization of the disease, desire for fertility, age of the patient, and possible complications should be considered. Analgesics, hormonal treatment, and surgery are available options for treatment and should be combined. Symptomatic analgesics, conservative surgery, and suppressive hormonal treatment after intervention are recommended management instruments [19].

In patients presenting with primary dysmenorrhea, if symptoms disrupt school or social life, medical treatment for 3–6 months should be considered before surgery. For medical treatment, NSAIDs and low-dose estrogen/progestin oral contraceptives or progestin only are good options. Before starting treatment, the patient and

her family should be educated about treatment without definitive diagnosis and the possible side effects. A comprehensive overview of medical treatment is available in Chap. 39. Surgery should be considered for patients who are not responding to empirical treatment for 6 months or who do not want to start treatment without a definitive diagnosis.

Preoperative Preparation

Adolescents and their parents should be informed about the purpose, benefits, possible risks of surgery, and the alternative treatment options available. Written informed consent must be obtained. It should also be emphasized that endometriosis is a chronic disease that can recur and that the patient should undergo routine surveillance and possible additional surgery if recurrence occurs.

The severity of endometriosis symptoms and the stage of disease are not related. Surgery may be considered before simple interventions. To minimize complications with surgery, preoperative mechanical or medical thromboprophylaxis should be considered.

Some surgeons prefer antibiotic prophylaxis especially should a vaginal or intestinal procedure also be planned [19].

Positioning is same as for adult patients and has been comprehensively discussed in Chap. 33. If the adolescent is tall enough, an Allen stirrup can be used; for shorter patients, a frog-leg position may be preferred. The nasogastric and orogastric catheter should be inserted before entering the abdomen. A Foley catheter may be employed to provide bladder decompression during the operation and will also help fill the bladder with saline and assist to determine the cleavage line for possible bladder involvement.

Surgical Treatment

Diagnosis and treatment for endometriosis are intertwined, and the gold standard for both is laparoscopy. For a young lady who does not respond to empirical treatment for 3 or 6 months and experiences disadvantages due to pain in her school or social life, definitive diagnosis and treatment should be considered. Endometriosis has been detected in 70% of patients who were unresponsive to NSAIDs and hormonal treatment [9].

Although open surgery has been used historically for endometriosis, in essence, it has been replaced by laparoscopy. Effectiveness of the two approaches on pain is equal [14]. Less postoperative pain, shorter hospital stays, shorter recovery, and better cosmetic outcomes are the obvious benefits of laparoscopy. Additional advantages of laparoscopy included the magnifying effect of the camera and facilitated

dissection via carbon dioxide [25]. Nowadays, laparoscopy is widely used independent of the stage of the disease.

Staging of disease is determined by performing an orderly sequence of pelvis assessment at the beginning of the operation. Normal anatomy is then restored by removing adhesions followed by excision or ablation of the lesions.

- *Ablation*: Eliminating endometriotic lesions via electrosurgical or ultrasonic coagulation or laser vaporization (Fig. 35.1)
- *Excision*: Removing lesions by cold scissors (Fig. 35.2)

Coagulating all lesions will deprive the patient from definitive pathological diagnosis. Possible thermal damage to other pelvic organs during ablation should also be considered. At Ege University Hospital, we prefer excision of lesions instead of ablation.

Fig. 35.1 Ablation of endometriotic lesion.
(a) Ablation with bipolar instrument.
(b) Ablated lesion

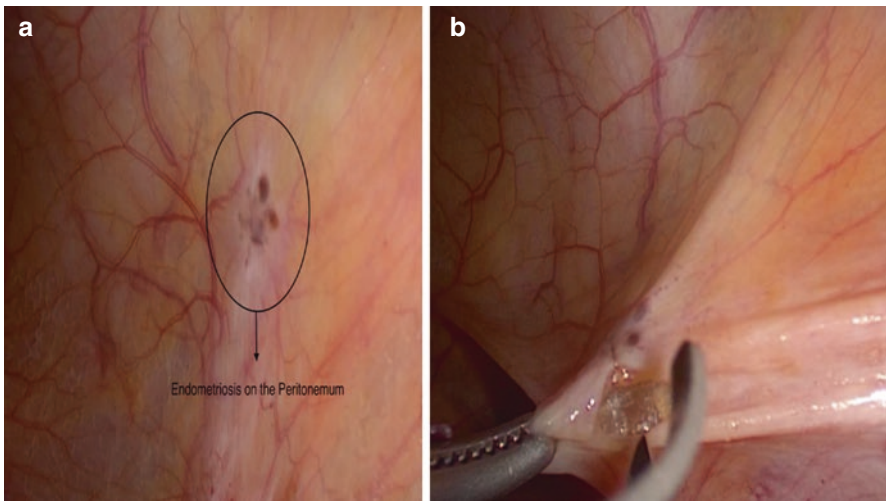
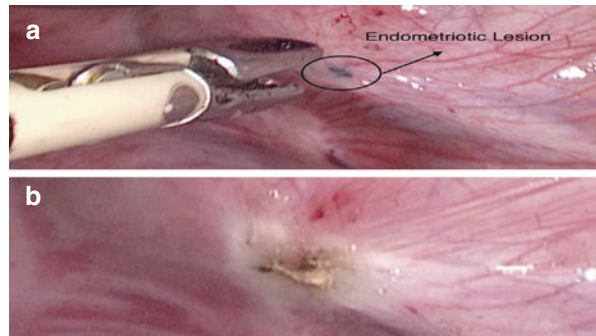


Fig. 35.2 Excision of endometriotic lesion. (a) Lesion of endometriosis on the peritoneum.
(b) Excision of lesion via cold scissors

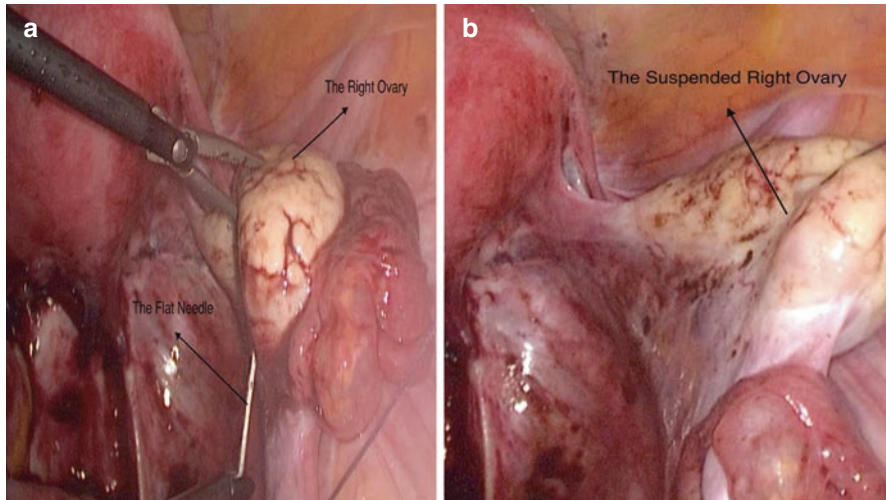


Fig. 35.3 Suspension of the ovary. (a) Passing of the flat needle. (b) The suspended ovary

Resection of Infiltrative Endometriosis

If deep infiltrative endometriosis is determined during dissection, nodules should be removed with maximum care to avoid injury to adjacent organs. These nodules are the origins of pain rather than endometriomas. The surgeon should investigate further the uterosacral ligament, rectovaginal septum, bladder, and rectum for additional nodules of deep infiltrative endometriosis. Before starting surgery for deep infiltrative endometriosis, the surgeon may choose to suspend the ovaries to the abdominal wall with temporary sutures to avoid potential injury (Fig. 35.3). Unless the vaginal route allows for the use and placement of a uterine manipulator, the uterus can be suspended to the abdominal wall as well. Subsequently, if the ureter is thought to be involved, it should be dissected by finding in pelvic brim. Uterosacral ligament and rectovaginal septum with endometriotic nodules or other peritoneal deep infiltrative lesions ought to be excised via cold or ultrasonic scissors.

The retroperitoneal dissection is carried out starting at the pelvic brim just medial to the infundibulopelvic ligament. Once the peritoneum is incised, the carbon dioxide starts to enter the retroperitoneal space and facilitates dissection. After identifying the ureter, dissection proceeds through the uterosacral ligament junction to the uterus. During this dissection, maximum care is taken to avoid injury to the ureter. Ultrasonic scalpel or conventional bipolar or monopolar instruments can be used. Our preference is the ultrasonic scalpel; preference is for use of a harmonic scalpel. Note that the active blade should be kept away from the ureter. While performing the ureterolysis, the ureter is lateralized (Fig. 35.4). Next incise the space between the uterosacral ligament and rectosigmoid colon. It is important that the surgeon remembers that the fatty tissue belongs to the rectum which explains why the dissection avoids this fatty tissue and follows a cranial to caudal direction lateral to the

Fig. 35.4 Lateralization of the ureter

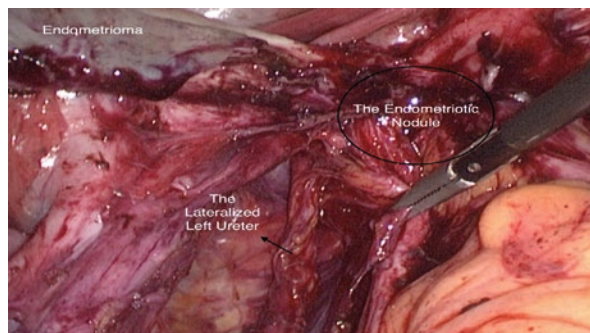
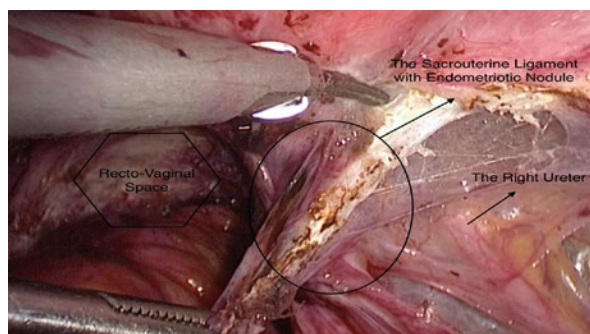


Fig. 35.5 Excision of deep infiltrating nodule



rectum to develop the rectovaginal space laterally. If performing this dissection between the rectum and uterus, great care should be taken to find the correct dissection plan. The underlying reason for this increased vigilance warning is the endometriotic nodule itself. Dissection of the rectovaginal space laterally, to the rectum on both sides, and proceeding with dissection caudally allows clean dissection beyond the rectovaginal nodule caudally. The rectum can then be separated from the vagina in a caudal to cranial direction more safely, and the rectum can be displaced posteriorly while the nodule is left attached to the uterus and vagina anteriorly and excised safely without causing any injury to the adjacent organs (Fig. 35.5). During excision of the nodule, posterior colpotomy has to be performed especially with larger nodules attached to the vagina. In cases of posterior colpotomy, the surgeon should take precautions to maintain the pneumoperitoneum by addressing any vaginal gas leakage. Our routine is to close the vagina with a surgical glove filled with gauze sponge. Colpotomy can be closed laparoscopically or vaginally after removal of all the specimens through colpotomy incision vaginally. In case of the existence of endometriotic lesions on the rectum, surgical options include shaving, discoid, or segmental resection.

Treatment of bladder lesions involves the removal of the nodules and the primary repair of the defect. If the ureter lesion is considered or there is full-thickness involvement, the ureter should be catheterized, excision of nodules or segmental removal performed, and end-to-end anastomosis conducted.

Early stages of disease are more common for adolescents, and bowel involvement is rare. Superficial shaving, discoid, or segmental resections are techniques for bowel endometriosis. When rectal surgery is necessary, intra- and postoperative complication rates have been reported as 2.1% and 13.9%, respectively, by Kondo et al. [26]. Patient's age and symptoms must be reviewed several times before making radical decisions for treatment of the ureter, bladder, or intestinal involvement.

Ovarian Cystectomy

Removal of endometriomas over 3 cm is superior to drainage or coagulation in terms of recurrence [14]. An incision can be made into the cyst on the opposite side of the hilum of the ovary, and a cleavage line should be identified. The cyst is excised by applying traction and countertraction to the ovarian tissue and cyst wall. Both sides, particularly the ovarian tissue, should be grasped gently (Fig. 35.6). After extirpation of cyst wall, hemostatic sutures are preferred to coagulation. In a high-quality randomized controlled trial, Sahin and colleagues showed hemostatic sutures to be superior to bipolar electrocoagulation for hemostasis after cystectomy for ovarian reserve. Ninety patients participated in the trial, and anti-Mullerian hormone levels in the suture group did not change pre- or postoperatively, whereas a statistically significant decrease was seen in the bipolar electrocoagulation group [27]. After hemostasis, the cyst wall may be removed from the abdomen via endo-pouch.

Combined techniques for endometrioma surgery should be considered if concern for decreased ovarian reserve is present [28]. This approach removes the

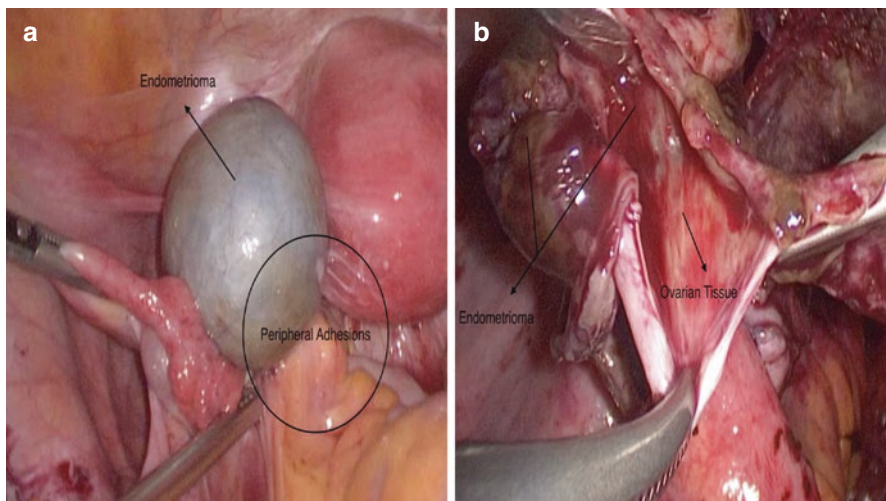


Fig. 35.6 Ovarian cystectomy. (a) Endometrioma. (b) Stripping of cyst wall

endometriotic cyst from the ovary without removing the segment of cyst wall attached to the ovarian hilum. The cyst wall attached to the ovarian hilum is electrocauterized or vaporized by CO₂ laser. By doing the surgery this way, the risk of bleeding from the ovarian hilum and the risk of applying excessive electrocauterization to stop the bleeding are eliminated, and the likelihood of jeopardizing ovarian reserve is diminished. Muzii et al. compared two techniques, conventional stripping and the combined approach, in terms of *recurrence* and *ovarian reserve* in a multicenter randomized controlled study and found there to be no difference between the two outcomes [29].

Endometriosis ought to be staged at the time of surgery; this aids follow-up and determining if additional surgical intervention is indicated. Of course, it is best to video record the laparoscopic findings for medical, scientific, and documentation purposes.

Prevention of Adhesions

Intraperitoneal adhesions can cause pelvic pain, subfertility, dyspareunia, and bowel obstruction. Moreover, this adverse condition(s) will incur further financial burdens. Oxidized regenerated cellulose can be a prevention technique for adhesions after surgery, although its true effectiveness is not certain [14]. Gel agents such as carboxymethylcellulose and polyethylene oxide, hyaluronic acid-based gels, polyethylene glycol gels, 0.5% ferric hyaluronate gels, and sodium hyaluronate spray are all available mediums for preventing adhesions, although the safety and effectiveness of these products is unclear due to lack of evidence. Furthermore, ovarian suspension for 36 hours to 7 days has been hypothesized for adhesion prevention [30]. In a systematic review of eight articles investigating the efficacy of ovarian suspension in preventing postoperative ovarian adhesion formation in women undergoing laparoscopic surgery for stage III-IV endometriosis, researchers concluded this approach to be safe, simple, feasible, and effective [30].

Complications

Complication rates are generally the same as for other laparoscopic procedures. In a large study of 30,000 laparoscopic surgeries for gynecology, proximate organ injury was found to be the most commonly occurring complication with complication rates during endometriosis-related procedures at 0.1% and 3.6% for deep infiltrative endometriosis [31].

Pain Reduction

Many women have reported a decrease in their endometriosis-associated pain following surgery. A 2014 systematic review showed that women who had undergone operative laparoscopy described improved pain relief within 12 months, three times more than those who underwent diagnostic laparoscopy [32]. Surgical treatment will reduce pain; however, approximately 20% of patients will undergo another operation within 2 years due to recurrent symptoms [33]. In a 10-year follow-up, recurrence rates reached 40% [34]. Advanced disease seems to be associated more with recurrence due to lack of complete resolutions in the first surgery. Parazzini et al. published that women with stage III-IV disease had higher recurrence rates than women with stage I-II within 2 years (14% and 6%, respectively) [35].

Postoperative Management

According to literature, if endometriosis is eliminated via surgery in adolescents and compounded with proper medical treatment, the complaint of pain decreases and disease progression is halted [13, 36, 37]. Postoperative hormonal therapy should continue until the patient desires fertility. Combined low-dose oral contraceptives, progestin-only pills, and intrauterine devices with levonorgestrel are all options for suppression. Contrariwise, narcotic analgesics are not suitable for this patient group [19].

Adolescents with endometriosis should be evaluated regularly, and their pain should be questioned. It ought to be explained to the patients in an appropriate way that they may not experience a completely painless period. Support groups for adolescents with endometriosis are available and can be very beneficial (www.young-womenshealth.org, www.endometriosisassn.org, www.endofound.org).

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