LEARNED LESSONS FROM LAPAROSCOPIC MANAGEMENT OF ADNEXAL CYSTS IN ADOLESCENTS: A SERIES OF 100 CONSECUTIVE CASES.

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ABSTRACT

Study objective: To evaluate the clinical, operative and histological characteristics of adnexal cysts in adolescents undergoing operative laparoscopy in a non-referral clinical setting.

Methods: Cohort study on data collected prospectively between 1988 and 2007 in a private hospital. 100 consecutive adolescents, aged between 10 to 19 years, who underwent operative laparoscopy for a presumed benign adnexal cyst are included.

Results: Mean age was 17.1 years (range 10-19). The main symptom was pelvic pain present in 80 (80%) patients, including acute pain in 14 (14%). Incidental findings occurred in 20 (20%) patients. All lesions were classified according to pathological examination. 21 patients (21%) had luteal cysts (including haemorrhagic ones), 15 (15%) follicular cysts, 20 (20%) dermoid cysts, 14 (14%), endometriomas, 17 (17%), serous cysts, 4 (4%) mucinous cysts, and 7 (7%) paraovarian cysts. Bilateral cysts were found in 3 patients. No malignant lesions were identified in this series. There were 3 (3%) mucinous borderline tumors. Cystectomy was performed in 85% of cases. Unilateral adnexectomy in 12 (12%) patients and fenestration in 3 (3%) others. Conversion to laparotomy was deliberately performed in 6 (6%) cases. No serious intra-operative or postoperative complications occurred.

Conclusions: Pain is the most frequent complaint of adolescents presenting with ovarian cysts, but incidental findings are not infrequent. Most of the identified lesions in this population were benign, essentially functional or dermoid cysts. Laparoscopic management of adnexal cysts in adolescents is a safe and effective procedure and represents the preferred method of treatment for identifying rare early malignancies and safeguarding fertility.

Keywords: Adolescent ovarian Cyst, Clinical Presentation, Laparoscopy
Introduction

Adolescence, a transition period between childhood and adulthood, includes patients aged between 10 to 19 years old [1]. Ovarian cyst is a frequent pathology in this population [2]. During childhood and adolescence, the estimated incidence of ovarian tumors is approximately 0.71 per 100000 [3].

In contrast to ovarian masses identified in childhood, ovarian cysts in adolescents are rarely malignant [4, 5]. The most common type of cysts are functional and dermoid [6]. The main objective when managing ovarian cysts in adolescents is to provide symptom relief whilst preserving fertility. The challenge when managing these patients is 2 fold: to avoid unnecessarily operating on a functional cyst which is likely to regress spontaneously [7, 8] whilst at the same time not being too complacent so as to overlook potential early malignant lesions. A laparoscopic approach for the diagnosis and treatment of these conditions appears appropriate and is nowadays considered the gold standard for the management of benign adnexal masses. Most of the published series on adolescent ovarian cysts are provided by specialized centers, which may not necessarily reflect the true clinical presentation of these conditions in routine, everyday practice.

Laparoscopic surgery was first introduced to our hospital in June 1988. Since then, all cases of adolescents presenting non suspicious ovarian cyst were managed laparoscopically. The aim of our study is to analyse retrospectively the first 100 consecutive adolescents with a preoperative diagnosis of presumed benign adnexal mass scheduled for laparoscopic treatment.

Material and methods

Study population

This was a cohort study. Data were collected prospectively between 1988 and 2007 and data analysis were realized at the time of the study retrospectively. Records were reviewed for demographic characteristics, past medical history, use of oral contraceptive pills, presenting complaint, preoperative assessment including physical examination findings and ultrasonographic features of the ovarian mass as well as MRI diagnosis when realized, operative techniques and findings, final pathological examination as well as post-operative follow-up.

Inclusion criteria and patient selection

Inclusion criteria were patients aged from 10 to 19 years old presenting with a presumed benign adnexial mass in pre-operative assessment and benefiting from initial laparoscopic management at the private hospital. Presumed benign adnexial lesions were defined as cysts of less than 10 cm in diameter with thin and regular wall without any septation or vegetations.

This study was approved by the French Data Protection Authority (CNIL) under number 1826888.

Surgical indication

The therapeutic attitude was standardized according to the management procedures set out below:

In case of asymptomatic cysts, laparoscopic management was indicated in case of persitant cysts after a period of follow up varying from 3 to 6 months. In case of painfull adnexal cysts
presumed to be benign, ultrasound-guided aspiration was considered as first line therapy. Laparoscopic management was performed in those patients with subsequent recurrence of symptoms or persistent pelvic pain.

**Surgical technique**

All patients underwent operative laparoscopy under general anesthesia with endotracheal intubation. In all cases a pneumoperitoneum was achieved by means of a Veress needle introduced at Palmer’s point. A 10 mm or 8 mm scope was used. In 1996, however, after which time laparoscopic micro-instrumentation was available, a 2 mm scope (Storz Gbm, Germany) was occasionally used, for younger patients. In patients with a history of laparotomy, a small scope was introduced at Palmer’s point in order to assess the umbilical area before prior to placement of the umbilical trocar placing the main trocar [9].

Complete evaluation of the pelvic and abdominal cavity was performed and peritoneal washings for cytological examination obtained in all cases. Operative laparoscopy was performed solely in cases with no findings suggestive of malignancy [10]. In cases deemed suspicious at laparoscopy based on external aspect presenting vegetations or the presence of distant lesions presumed to be secondary implants, laparotomy with intra-operative frozen section were performed. There were no well defined criteria for conversion to laparotomy. This was dependant of the surgeon judgement.

Cystectomy was selected as the preferred modality, preceded by puncture for very large or symptomatic cysts.

In all cases cysts were tempted to be removed intact, particularly for dermoid cysts, in order to avoid spillage of the fluid cyst content. Haemostasis, where necessary, was achieved with bipolar coagulation. No suture points were performed systematically. The specimens were removed through the main trocar. Following the introduction of specimen retrieval bags and as these became readily available they were incorporated into routine practice.

At the end of the procedure, after verifying haemostasis, copious peritoneal lavage was performed in all cases. In order to preserve fertility, adjuvant methods to reduce adhesions formation were used. Lesions were classified according to final pathological results.

**Results**

For the one hundred patients included in the study, the mean age was 17.1 years (range 10-19). Nineteen patients (19%) were aged 14 or less (Figure 1). Twelve patients (12%) had a previous history of laparotomy: 6 of them for ovarian cyst. Two additional patients had a previous history of ovarian cysts: with one benefiting from ultrasound guided aspiration and the other undergoing concomitant excisional surgery at the time of appendectomy. The main presenting complaint was lower abdominal pain, which occurred in 80 patients (80%). Acute pain was present in 14 patients, including 5 ovarian torsions and 3 ruptured cysts.

Twenty patients (20%) were asymptomatic, with a cyst being incidentally identified in 17 patients undergoing ultrasound investigation for another reason altogether. In 3 other asymptomatic patients, ultrasonography was performed as part of routine follow up in patients who had undergone previous surgery for an ovarian mass (1 dysgerminoma, 1 mucinous cyst and 1 dermoid cyst).

Concerning histological nature of cysts: simple cysts (luteal, follicular, para ovarian and serous cyst) were found in 60 % of patients, 12 among them being hemorrhagic. Four patients (4%) had
a mucinous cyst (3 of them were borderline tumors), 20 a dermoid cyst (20%), all of them being mature pluripotent teratomas, and 14 ovarian endometriomas (14%). The definitive pathological results are shown in table 1. All patients with a final diagnosis of functional cysts presented by marked pelvic or abdominal pain unresponsive to medical treatment consisting in level 1 analgesics and anti-spasmodics administered intravenously. Laparoscopy was performed in case of persistent pain over 6 hours for acute pain or after a period of 14 days in case of persistent chronic pain despite analgesic treatment administered orally according to the patient’s tolerance. Among this group of eight patients, 5 were found to have adnexal torsion, where pathological examination revealed 3 instances of necrosis and 2 follicular cysts. Three cysts were found to have ruptured intra-operatively (one luteal cyst, one serous cyst and one endometrioma). The median diameter of the cysts was 6.76 cm (range 3-25). Lesions were bilateral in 3 patients out of a total of 103 treated cysts. Six conversions to laparotomy were deliberately performed: 3 for tumors presenting suspicious external vegetations. They corresponded to borderline tumors, 2 dermoid cysts of thin wall and difficult cleavage from the ovarian parenchyma “for fear of rupture” and one bilateral endometrioma, microsurgery was judged appropriate in this case in a bid to identify and save normal ovarian tissue. Superficial endometriotic implants were present in 6 patients, excluding those patients with an endometrioma. Cystectomy was performed in 85 patients (85%). A unilateral adnexectomy was the selected treatment option for borderline mucinous cysts (n = 3) after frozen section analysis of the cyst, mucinous cyst (n = 1), serous cysts including one with vegetations (n = 2), and dermoid cysts (n = 6) with a diameter greater than 7 cm. Fenestration was performed for 2 luteal cysts and 1 small 3 cm endometrioma. There were no major intra-operative or postoperative complications in this study.

Discussion

The main strength of this study is that it was realized in a non-referral hospital. To the best of our knowledge there are no other published series concerning management of ovarian masses in adolescents in a general gynecological perspective rather than a specialized tertiary centre. In our study, functional cysts and mature cystic teratomas were the most common aetiologies of ovarian masses with respective rates of 31% and 20% of cases. These findings are consistent with previously published datas [6, 11, 12]. Ovarian endometriomas, were encountered in 14% of cases in our study. This relatively high rate have been reported in other recent studies [12-14] even if endometrioma is historically considered as a rare condition in adolescents. The high rate encountered could be explained by the fact that the study was conducted in a referral center for endometriosis. One of the major concerns in the management of ovarian cyst in adolescents is the high rate of functional cysts being managed surgically, as demonstrated in many series including our study. In fact, functional cysts are frequent in adolescents and expectancy should be considered as the first option. In a series of 129 asymptomatic adolescents, 17 cases (12.2%) of simple cysts presumed to be functional were identified on ultrasound performed during the follicular phase of the menstrual cycle [7]. Within 3 months, all cysts regressed. In our study, marked pain unresponsive to medical treatment was the sole indication of surgery. All cases with a histological diagnosis of functional cyst in our study were operated upon because of pain: 31 cases, among whom 8 presented with acute pain.
It has to be mentioned that regardless the histological variety, pain was the most common presenting symptom in our study: 80% of cases. Other case series have reported the same finding, with up to 60% to 73% of paediatric and adolescent patients diagnosed to have ovarian cyst were presenting with abdominal complaints. [10, 11, 15]. The presence of pain at the onset of diagnosis did not affect in our practice subsequent surgical or expectant management. Although rare, another major concern regarding the management of ovarian masses in adolescents is the risk of missing an early malignancy [16]. Simple cysts are usually the most frequent lesions encountered. In a large series of 1148 unilocular cysts, the malignancy rate following surgical excision was 0.96% in the whole group, and 0.54% in premenopausal women [17]. In our series, there were no cases of malignancy. Three borderline tumors were identified at surgery and were excised by laparotomy after confirmation of the diagnosis at frozen section biopsies. Appropriate staging was performed during the same surgical setting.

Regarding surgery, laparoscopy is actually considered as the gold standard approach for the treatment of benign ovarian masses [18], it has become part of mainstream gynecological practice [15]. Three randomized studies concluded that operative laparoscopy should replace laparotomy [19-21]. Treatment of adnexal masses by operative laparoscopy can be performed safely, and is associated with shorter operating time, less intraoperative blood loss, reduced post-operative morbidity and quicker recovery time [22]. In our study 94% of cases have been completely realized under laparoscopy. In 6 cases we decided to convert to laparotomy: 3 because of signs advocating malignancy at laparoscopic exploration, the cyst was retrieved in a bag and a frozen section biopsy was realized in every case. As the diagnosis was borderline tumor we decided to convert in order to realize at the same time the ovariectomy, the omentectomy, and peritoneal biopsies. Actually due to advances in endoscopy and improved surgical expertise, these lesions could be treated laparoscopically as demonstrated by a multicentric study of 358 cases [23]; in 2 cases because of large dermoid cysts. In fact, laparoscopic ovarian dermoid cystectomy has been associated with a higher incidence of cyst rupture with intra-abdominal spillage and recurrence [24-26], this was our fear while deciding conversion to laparotomy in these cases. Actually, we presume that these cases could have been done laparoscopically. And in one case, because of bilateral endometriomas with kissing ovaries we judged that microsurgery could preserve better ovarian function. This case was realized at the beginning of our experience, but actually, we believe that these cases could be realized laparoscopically especially that it have been shown that the stripping of ovarian endometrial cyst under laparoscopy is as effective as microsurgery with less morbidity and shorter hospitalization [27].

Fertility preservation is one of the most challenging concerns in the management of ovarian cyst in pediatric and adolescent patients. It is mandatory that operator needs to execute vigilance throughout the procedure. Fertility-sparing surgery is guided by all principles established when microsurgery was used for reproductive surgery [28]: preservation of healthy ovarian tissue by means of careful dissection, limiting the formation of postoperative adhesions with meticulous attention to haemostasis, minimal use of sutures, and copious irrigation both intra-operatively and postoperatively. Laparoscopy is believed to be less adhesiogenic compared with laparotomy, however, the debate remains controversial. The comparative risk of adhesion-related complications following open and laparoscopic gynecological surgery is similar for most procedures [29, 30]. Various anti adhesions adjuvant methods have been developed and their use is recommended in young patients despite a limited efficacy, especially in cases of endometrioma [31]. In our study we have realized 15 unilateral adnexectomy. This seems to be high, however higher rates have been reported in the literature: 20.9% for Yolanda A. Kirkham, et al [32].
should be underlined on this matter that women with a single ovary do not necessarily have a reduced fertility potential to conceive, but may have a shorter reproductive life span, as it was shown in large review of the literature [33]. This surgical approach, however, was available in our hospital from June 1988, and for the first 100 operated cases for adolescent ovarian cysts there were no intraoperative or post operative difficulties or complications encountered despite a more difficult learning curve. The retrospective analysis design of this study and the relative small number of cases reported are two clear limitations of this series. Indeed, bigger multicentre prospective cohort data collection will help consolidate the current practice. This unique series provides information from a general. Only one investigator was involved in the preoperative diagnostic process and surgical treatment (AA) thereby reducing the margin for selection bias.

Conclusion

Pain is the most common presenting complaint of adolescents with ovarian cysts, and incidental findings are not infrequent. The majority of identified lesions in this cohort were benign. Irrespective of management, both functional and dermoid cysts were the most commonly diagnosed ovarian masses. Laparoscopic management of adnexal cysts in adolescents is a safe and effective procedure and is the preferred method of treatment and for identifying rare early malignancies and safeguarding fertility.

Competing Interests section

The authors declare that they have no competing interests.

Authors’ Contributions

CA participated in the design of the study, performed the statistical analysis and drafted the manuscript
LL participated in the design of the study, performed the statistical analysis and drafted the manuscript
Michel Colle conceived of the study, and participated in its design and coordination and helped to draft the manuscript
KA helped to draft the manuscript
TB performed the statistical analysis
EF participated in the design of the study and performed the statistical analysis
AP performed the statistical analysis
RO participated in the sequence alignment
AW conceived of the study, and participated in its design and coordination and helped to draft the manuscript
AA participated in the design of the study, performed the statistical analysis and drafted the manuscript
All authors read and approved the final manuscript
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*Figure 1. Age distribution of patients*
Table 1. Pathological diagnosis of ovarian cysts and mean age for each lesion.

<table>
<thead>
<tr>
<th>Lesions</th>
<th>n.</th>
<th>Rate</th>
<th>Mean Age (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple cyst</td>
<td>60</td>
<td>60 %</td>
<td></td>
</tr>
<tr>
<td>Luteal Cyst</td>
<td>21</td>
<td>21 %</td>
<td>17.1 (13-19)</td>
</tr>
<tr>
<td>Follicular Cyst</td>
<td>15</td>
<td>15 %</td>
<td>15.2 (12-19)</td>
</tr>
<tr>
<td>Paraovarian Cyst</td>
<td>7</td>
<td>7 %</td>
<td>16.7 (16-18)</td>
</tr>
<tr>
<td>Serous Cyst</td>
<td>17</td>
<td>17 %</td>
<td>16.4 (11-19)</td>
</tr>
<tr>
<td>Mucinous Cyst</td>
<td>4</td>
<td>4 %</td>
<td>17.0 (15-18)</td>
</tr>
<tr>
<td>Dermoid Cyst</td>
<td>20</td>
<td>20 %</td>
<td>16.5 (11-19)</td>
</tr>
<tr>
<td>Endometrioma</td>
<td>14</td>
<td>14 %</td>
<td>17.8 (14-19)</td>
</tr>
<tr>
<td>Torsion</td>
<td>5</td>
<td>5 %</td>
<td>12.8 (10-15)</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>1 %</td>
<td>14.0</td>
</tr>
</tbody>
</table>
**Figure 1.** Age distribution of patients.