Original Study

Ovarian-Sparing Surgery in Pediatric Benign Ovarian Tumors

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A B S T R A C T

Study Objective: To evaluate outcomes of children after ovarian-sparing surgery (OSS) for non-neoplastic and benign neoplastic ovarian lesions.
Design: Retrospective cohort study from January 2003 to January 2012.
Setting: Single, high-volume, tertiary care hospital.
Participants: Children 18 years of age and younger.
Interventions: None.
Main Outcome Measures: Postoperative complications and tumor recurrence after OSS.
Results: One hundred nine patients underwent OSS with a median age of 13.3 years (interquartile range [IQR], 11.4-15.1 years). Eighty-two patients were treated laparoscopically with 4 conversions to an open procedure. Postoperative complications included surgical site infections in 7 patients (6%). Pathology most commonly revealed functional ovarian cysts (n = 57) and mature teratomas (n = 37). Ninety-four patients (86%) were followed for a median of 10.4 months (IQR, 0.72-30.8 months). Fifty-five patients (60%) had subsequent imaging surveillance a median of 7.6 months postoperatively (IQR, 3.9-13 months). Ten patients (10%) developed a second ipsilateral lesion within a median time of 11 months (IQR, 7.7-24 months), of whom 5 girls had repeated surgery for mass enlargement or persistent abdominal pain at a median time of 10.5 months (IQR, 8.0-12.65 months). Fifty-eight patients (63%) began or resumed menses at their most recent follow-up. Three girls became pregnant after OSS at a median follow-up of 5 years (range, 2.4-6.7 years).
Conclusion: Benign ovarian lesions in children can be treated successfully with OSS with low recurrence and repeat surgery rates.
Key Words: Pediatric ovarian tumors, Ovarian-sparing surgery, Fertility, Adolescent gynecology, Pediatric surgery

Introduction

Ovarian lesions are frequently incidentally identified in pediatric patients during the imaging evaluation for nonovarian etiologies of abdominal pain.[1] Commonly, ultrasonographic characteristics can differentiate ovarian neoplasms from cystic lesions. Although ovarian tumors only comprise 1% of childhood cancers, neoplastic lesions carry a 10% risk of malignancy.[2–7]

Non-neoplastic cystic lesions are benign and generally asymptomatic, thus they are monitored for spontaneous resolution; however, surgery might be warranted for cystic lesions that persist or grow to become symptomatic. Common complications of cystic lesions include rupture, hemorrhage, or torsion with large cysts.[8–10] Alternately, benign neoplastic lesions, such as mature teratomas, require surgical intervention as the primary method of therapy. The approach for the resection of these benign lesions was the focus of this study.

Currently, the conservative and minimally invasive approach of ovarian-sparing surgery (OSS) has gained popularity over oophorectomy for benign ovarian disease, mainly for its purported fertility-sparing benefits.[5,11,12] Among women who seek treatment at infertility clinics, the proportion of women with a single ovary is higher than women with both ovaries, drawing attention to the importance of preservation of the ovary.[13] However, despite growing concerns about future fertility, the adoption of OSS for benign disease in the pediatric patient still lags behind. According to a retrospective review of the Perspective nationwide database in 2012 by Berger-Chen et al, 40% of adolescent patients continue to undergo oophorectomy for benign ovarian lesions.[6] This delay in the incorporation of the ovarian-sparing approach might be partly because of concerns of incomplete resection and potential recurrence of the lesion.[14] In our study we aimed to analyze the clinical outcomes of pediatric patients treated for benign ovarian disease with OSS.

Materials and Methods

Patient Population

After institutional review board approval (H-31281), pediatric patients (18 years of age or younger) with benign ovarian tumors treated with OSS from January 2003 to

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Dr Paulette I. Abbas and Dr Monica E. Lopez conceptualized and designed the study, drafted the initial manuscript, reviewed and revised the manuscript and approved the final manuscript as submitted. Dr Jennifer E. Dietrich, Dr Jessica A. Francis, Dr Mary L. Brandt, and Dr Darrell L. Cass reviewed and revised the manuscript for critical intellectual content and approved the final manuscript as submitted.

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January 2012 were identified using Current Procedure Terminology codes for laparoscopic and open ovarian cystectomy. All surgeries were performed at a single tertiary care children's hospital. Benign etiology was confirmed through pathology reports. Patients treated by pediatric gynecologists or pediatric surgeons were included. Patients with malignant pathology or those who underwent oophorectomy were excluded.

Study Design and Clinical Variables

The study was a retrospective chart review. We collected demographic data such as patient age at the time of surgery and menarchal status. Collection of operative details included surgical technique (open vs laparoscopic), intraoperative spillage of fluid from the mass, and documentation of incomplete resection. Incomplete resection was defined as a remnant of the cyst wall left in situ secondary to difficulty removing the wall without damaging remaining ovarian tissue. Maximum cyst size was collected from standard preoperative sonographic measurements and final pathology was also evaluated. Data on tumor recurrence were also collected. Recurrence was defined as an ipsilateral development of a second lesion with the same pathology. Patients were stratified according to age categories: infants (younger than 1 year), children (1-9 years), and adolescents (9.1-18 years). This differentiation is important because various age groups are susceptible to different ovarian tumor etiologies on the basis of menarche status and hormonal levels.[9] Additionally, patients were stratified according to pathology because underlying etiology for recurrence might differ between functional cyst and benign neoplastic lesions. Lastly, resumption of menses after OSS was evaluated as a marker of ovarian function.

Statistical Analyses

Statistical analysis was performed using SPSS (version 22.0; SPSS Inc, Armonk, NY). Frequency distributions between categorical values were compared using χ^2. Summary statistics were presented as frequency and proportions for categorical variables. Continuous data are presented as median with interquartile range (IQR). Univariate analyses were performed on the overall cohort to evaluate individual characteristics for an association with lesion recurrence. Factors associated with recurrence (age, cyst size, menarchal status, laparoscopic approach, intraoperative spillage, incomplete resection)[5,12,15–18] were included as covariates in a multivariate regression model to evaluate predictive factors of recurrence. Additionally, because recent literature has pointed to increased recurrence with a cyst diameter greater than 8 cm,[19] this threshold was analyzed in our cohort. Patients were then stratified according to age and pathology and further analyzed with similar univariate and multivariate regressions. A P value of $< .05$ was determined to be statistically significant.

Results

Patient Population

During the study period, 143 patients underwent surgery for benign ovarian lesions; 109 patients (76%) underwent OSS and were ultimately included for analysis. Of note, 3 patients who underwent primary OSS for presumed benign disease were ultimately diagnosed with malignant pathology and excluded from analysis. The median age at time of surgery for included patients was 13.3 years (IQR, 11.4-15.1 years). When stratified according to age, there were 5 infants, 8 children, and 96 adolescents. Eighty-two patients were treated laparoscopically with 4 conversions to open technique because of anatomic aberrations or difficulty with safely completing the dissection laparoscopically. Twenty-seven patients underwent an open procedure as their primary procedure. Twelve patients (11%) had documented intraoperative spillage of cyst contents and 10 patients (9%) had incomplete resection. Postoperative complication of superficial and deep/organ surgical site infections, as defined by the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP), occurred in 7 patients (6%). Pathology most commonly revealed functional ovarian cysts (n = 57 patients) and mature teratomas (n = 37 patients). The remaining 15 benign neoplastic lesions included: 8 serous cystadenomas, 4 mucinous cystadenomas, 2 cystadenofibromas, and 1 papillary cystadenoma. Pathology stratified according to age is shown in Figure 1. Ninety-four patients (86%) were followed postoperatively for a median of 10.4 months (IQR, 0.72-30.8 months). Fifty-five patients (60%) had subsequent imaging surveillance at a median time of 7.6 months postoperatively (IQR, 3.9-13 months; Fig. 2). Of the 55 patients with repeat imaging, 25 patients had an initial diagnosis of benign neoplastic lesion and the remaining 30 patients had functional cysts. Ten patients (18%) developed a second ipsilateral lesion detected on follow-up imaging. The median time to presence of a

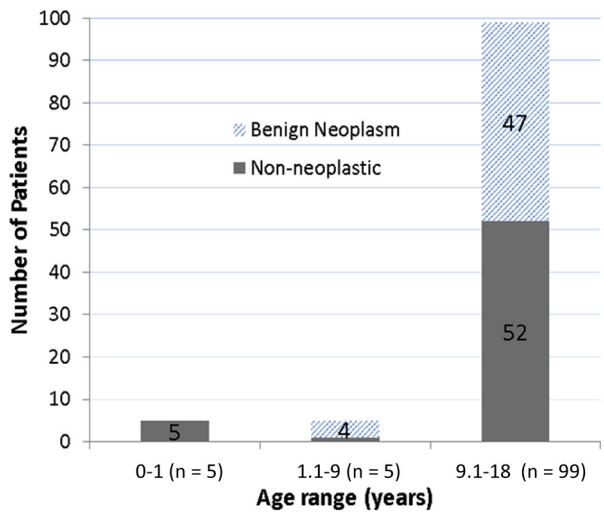

Fig. 1. Distribution of ovarian lesion pathology stratified by age.