



Contents lists available at ScienceDirect

## Journal of Pediatric Surgery

journal homepage: [www.elsevier.com/locate/jped surg](http://www.elsevier.com/locate/jped surg)

## The utility of magnetic resonance imaging in the diagnosis and management of pediatric benign ovarian lesions<sup>☆</sup>

Sherif Emil<sup>a,\*</sup>, Fouad Youssef<sup>a</sup>, Ghaidaa Arbash<sup>a</sup>, Robert Baird<sup>a</sup>, Jean-Martin Laberge<sup>a</sup>, Pramod Puligandla<sup>a</sup>, Pedro Albuquerque<sup>b</sup>

<sup>a</sup> Division of Pediatric General and Thoracic Surgery, The Montreal Children's Hospital of the McGill University Health Centre, Montreal, Quebec, Canada

<sup>b</sup> Division of Pediatric Radiology, The Montreal Children's Hospital of the McGill University Health Centre, Montreal, Quebec, Canada

## ARTICLE INFO

## Article history:

Received 18 September 2017

Received in revised form 27 December 2017

Accepted 29 December 2017

Available online xxxx

## Key words:

MRI

Ovary

Lesions

Preservation

Pediatrics

Adolescence

Type of study: study of diagnostic test

## ABSTRACT

**Background:** The utility of magnetic resonance imaging (MRI) in the diagnosis and management of pediatric ovarian lesions has not been well defined.

**Methods:** A retrospective review of all girls who underwent MRI evaluation of ovarian masses during the period 2009–2015 was performed. The accuracy of MRI was evaluated by comparing results with surgical findings, pathology reports, and subsequent imaging. The influence of the MRI on the treatment plan was specifically explored.

**Results:** Eighteen girls, 12–17 years of age, underwent 27 MRIs, subsequent to ultrasound identification of ovarian lesions. Of 9 neoplastic lesions diagnosed on MRI, 8 (89%) were confirmed by surgical and pathological findings. Of 18 functional lesions, 17 (94.4%) were confirmed pathologically or by resolution on subsequent imaging. Twenty MRI exams (74%) directly influenced the treatment plan, by leading to appropriate operative intervention in 9 and appropriate observation in 11. The extent of ovarian resection was guided by MRI findings in 8 of 9 (89%) neoplastic lesions. For characterizing lesions as neoplastic, the sensitivity, specificity, negative predictive value, positive predictive value, and accuracy of MRI were 89%, 94%, 94%, 89%, and 93% respectively.

**Conclusions:** MRI can differentiate functional from neoplastic pediatric ovarian masses, and guide ovarian resection in appropriate cases.

**Level of study:** II

© 2018 Elsevier Inc. All rights reserved.

The incidence of adnexal mass in the pediatric population is estimated at 2.6 per 100,000 per year [1]. The majority of lesions are benign, consisting of functional ovarian cysts, tubal or paratubal cysts, or benign ovarian tumors, most of which are germ cell tumors [1,2]. Malignant lesions are rare, with ovarian cancer accounting for 1% of all childhood malignancies [3]. Adnexal lesion symptomatology is diverse and spans the spectrum from acute presentation with adnexal torsion to incidentally discovered ovarian or tubal masses. The two guiding themes in the care of girls with adnexal lesions are the high preponderance of benign masses, and the subsequent need for ovarian preservation.

Ultrasound (US) is still the imaging test of choice to initially assess adnexal masses at any age [4]. However, US is frequently indeterminate and leaves the clinician without a clear impression of the etiology of the

adnexal mass [5]. In addition, surgeons may encounter ovarian pathology at operation that cannot be clearly delineated. In these cases, additional imaging may be needed if unnecessary oophorectomy is to be avoided [6,7].

Cross-sectional imaging of adnexal lesions may be performed using computed tomography (CT) or magnetic resonance imaging (MRI). MRI has demonstrated superiority over CT scan for adnexal imaging [6,7]. It involves no radiation exposure (a more significant issue in pediatric patients) and has a high level of tissue differentiation. Several studies have examined the role of MRI in the diagnosis of adnexal masses in the adult population [6–16]. However, there are very little data on the role of MRI in the management of pediatric adnexal lesions [17–20]. Most of the data come from adult studies, which may include a few children and adolescents [12,14].

Our center has increasingly used MRI to evaluate adnexal masses, both preoperatively and postoperatively, over the past 10 years. The aim of this study was to evaluate the role of MRI in the diagnosis and management of pediatric adnexal masses. We hypothesized that MRI can accurately differentiate functional from neoplastic lesions, and can directly influence the treatment and operative plan in selected cases.

<sup>☆</sup> Oral poster presentation at the 50th annual meeting of the Pacific Association of Pediatric Surgeons, Seattle, Washington, May 28–June 1, 2017.

\* Corresponding author at: Division of Pediatric General and Thoracic Surgery, The Montreal Children's Hospital, 1001 Decarie Boulevard, Room B04.2028, Montreal, Quebec H4A 3J1, Canada. Tel.: +1 514 412 4497; fax: +1 514 412 4289.

E-mail address: [sherif.emil@mcgill.ca](mailto:sherif.emil@mcgill.ca) (S. Emil).

## 1. Methods

After obtaining approval from the McGill University Health Centre Research Ethics Board (#15–213-MUHC), we retrospectively reviewed pediatric patients less than 18 years old who underwent MRI imaging to evaluate adnexal masses during the period, January 1, 2009 to June 30, 2015. Neonates and infants with a prenatal diagnosis of abdominal or pelvic cysts were excluded. The search started by extracting all female patients who underwent MRI studies during that period from a radiology database. We then identified the study cohort by extracting patients who had abdominal and pelvic MRI for assessment of an adnexal mass. The patients' clinical charts were also reviewed to obtain data on patient characteristics, clinical presentation, laboratory evaluation, imaging studies, operative interventions, pathology findings, and final outcome of the lesion in question.

Each MRI study was considered a separate event, and its indications, findings, and consequences analyzed separately. The clinical notes were specifically searched to understand the clinical decision making following each MRI. Clinical decision-making was considered a binary variable, either observation with or without further imaging or operative intervention. The preoperative notes and operative reports were also carefully reviewed to delineate whether MRI influenced the operative plan.

We considered a pathology report of a resected specimen as the gold standard for a diagnosis of neoplasm, and either a pathology report or resolution on follow-up as the gold standard for a functional lesion. This was used to calculate sensitivity, specificity, negative predictive value, positive predictive value, and accuracy of MRI. Descriptive statistics were used to characterize the patient cohort.

## 2. Results

Eighteen patients with adnexal masses underwent a total of 27 MRI exams. The average age of the patients was  $15.2 \pm 2.0$  years (range 12–17 years). Six patients presented with acute symptoms and twelve were seen for chronic symptoms or after results of US obtained by other clinicians. The details of the study cohort are shown in Table 1. Fifteen patients (83%) underwent a single MRI, 2 patients underwent 5 MRIs each, and one patient underwent 2 MRIs. All patients had undergone US imaging in the acute or elective setting prior to MRI. The majority of MRIs, 24 of 27 (89%) were performed to further assess equivocal US findings. One MRI (case 13) was performed to follow up on a previous MRI.

Two MRIs were performed after indeterminate operative findings. In both patients, US imaging preceded the initial operations. The first patient (case 2) was a 17-year old girl with von Hippel Lindau disease who was found to have a solid ovarian mass on routine US performed for adrenal screening. Laparoscopy revealed a mildly enlarged right ovary without an obvious mass. No resection was attempted. MRI subsequently revealed an intraovarian solid mass. Markers were negative. A laparoscopic right oophorectomy was completed, and pathology revealed a lipid/steroid cell tumor. This case is shown in Fig. 1.

The second patient (case 3) was a 14-year old girl who presented with acute pelvic pain and suspicion of right ovarian torsion on US. Laparoscopy showed a mildly enlarged edematous right ovary without torsion or an obvious mass. A biopsy of the ovarian capsule revealed no distinct pathology. The symptoms persisted and an MRI showed an intraovarian cystic teratoma. Markers were negative. An open ovarian-preserving resection was completed, and pathology confirmed a benign mature teratoma. This case is shown in Fig. 2. The patient had multiple recurrent ovarian cysts and chronic pelvic pain and 4 additional MRIs were performed to rule out residual or recurrent teratoma.

Nine neoplasms were identified on MRI. Of the 9 lesions, eight were confirmed on resection and pathologic exam including benign teratoma (5), lipid/steroid cell tumor (1), fibroma (1), and Sertoli/Leydig cell tumor (1). One false positive study (case 10) identified a solid right

complex ovarian tumor on MRI, but resection and final pathology showed severe ovarian endometriosis. Eighteen MRIs identified functional masses. All masses, except one, were confirmed to be functional cysts by resection and pathologic exam or resolution on follow-up. One patient (case 11) had a serous cystadenoma identified on pathologic exam.

One or more tumor markers were sent on 15 patients, including all 8 patients with a final diagnosis of ovarian neoplasm. CA-125 was elevated in the patient with ovarian endometriosis (case 10). Of the neoplastic masses, alpha fetoprotein was elevated in the patient with Sertoli–Leydig cell tumor (case 8). Tumor markers on the remaining 13 patients were all normal. There were no malignant tumors in this patient cohort.

MRI directly influenced management after 21 exams (78%), by leading to operative intervention in 9 and observation in 12. Eight out of 9 (89%) surgical resections were guided by the findings of the MRI, specifically the decision to perform oophorectomy or ovarian-sparing resection. MRI was particularly helpful in guiding resection by delineating the type, extent, and borders of masses within the ovary. Six MRI exams did not add to the US findings or change the management decision that would have been based on US alone. Using the gold standard criteria, the sensitivity, specificity, negative predictive value, positive predictive value, and accuracy of MRI in characterizing adnexal lesions as neoplastic were 89%, 94%, 94%, 89%, and 93% respectively.

All patients were treated at the Montreal Children's Hospital of the McGill University Health Centre, a free-standing university-affiliated children's hospital, by one of six pediatric surgeons.

## 3. Discussion

Adnexal lesions in children and adolescents can present with acute or chronic symptoms. US imaging is the most common imaging modality in both settings. In many cases, the US findings are quite typical and no cross-sectional imaging is required. For example, a simple or hemorrhagic functional ovarian cyst may be identified on US. In the absence of elevated tumor markers, observation and repeat US of such a lesion in 8–12 weeks usually show resolution, confirming the diagnosis. However, in other cases, US findings may be equivocal, most commonly by failing to differentiate neoplastic from functional lesions. In addition, the surgeon may be faced with uncertain pathology on laparoscopic exploration. In such cases, a conservative approach is indicated to optimize ovarian preservation. Deferring ovarian resection until further imaging of such patients is prudent, if there are no clear indications of malignant disease on laparoscopy.

MRI has emerged as the cross-sectional imaging study of choice in the management of adult adnexal disease and ovarian cancer [6–8]. However, similar data validating its accuracy in children and adolescents are scarce. In this study, we performed a retrospective analysis of MRI exams of the adnexa in a pediatric population over a six-year period. We found MRI to be highly accurate in differentiating functional from neoplastic lesions. The majority of studies directly influenced the treatment plan by leading to a decision of surgical intervention or observation. In addition, MRI was helpful in planning the approach for presumed neoplastic lesions. Solid lesions dictated an oophorectomy. Cystic tumors or complex tumors with solid and cystic components within the substance of the ovary were clearly visualized, allowing for enucleation of the tumor and ovarian preservation if tumor markers were negative. Although spillage of ovarian tumors in children has not been shown to influence outcomes, we still advocate avoidance of tumor rupture or spillage whenever possible [21]. We believe surgical planning to avoid rupture can be improved with pre-operative MRI imaging.

Of the 27 MRI exams, only two studies were associated with a wrong impression. In one patient, ovarian endometriosis was interpreted as a solid tumor. During surgery, the ovary was found completely replaced with a hemorrhagic solid mass, and oophorectomy was performed.

Download English Version:

<https://daneshyari.com/en/article/10222071>

Download Persian Version:

<https://daneshyari.com/article/10222071>

[Daneshyari.com](https://daneshyari.com)