Asymptomatic Ovarian and Other Adnexal Cysts Imaged US in adolescent/pediatric age

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Learning objectives

Ultrasound has increased the level of understanding regarding the development of ovarian cysts.

The proper management of ovarian cyst and ovarian enlargement depends on knowledge of normal ovarian development throughout the neonatal, childhood, and adolescent periods.

We have to know the ultrasound image of ovarian tumor in childhood.

Background

In newborns, the majority of cysts are unilateral and may be simple or complex with evidence of debris, solid components or internal echoes. Simple ovarian cysts are follicular in origin. Complex ovarian masses may represent in-utero or neonatal ovarian torsion or hemorrhage.

The possibility of ovarian malignancy is extremely remote in children under the age of 2 years. The diagnosis of ovarian tumors must be considered in children, especially in those with solid or complex masses or large masses that fail to show regression. Malignancy was found in the literature in 10-15% of cases in childhood. Templeman et al. [3] found germ-cell tumors to be the most commonly diagnosed malignant tumor, with stromal tumors second most common. Ovarian neoplasms most often are identified in children due to the presence of an abdominal mass or acute abdominal pain. All of these tumors occurred in children who presented with suspicious signs or symptoms and none was found incidentally by ultrasound.

The incidence of ovarian cysts tends to decrease in early childhood, coinciding with low levels of gonadotropins and estradiol production. It is known, however, that significant follicular development and atresia are still occurring.

A child with a complex mass, particularly in combination with acute abdominal pain and nausea and vomiting, may represent torsion of the adnexa. Due to the intraabdominal position of the adnexa in a prepubertal child, the diagnosis may be confused with acute appendicitis or another intraperitoneal or gastrointestinal process. This often leads to diagnostic delay and subsequent ovarian loss. Torsion of the adnexa may be associated with other ovarian cysts or tumors, but may occur with normal adnexa]. Malignant tumors are less likely to be seen in cases of torsion. Ultrasound findings of an ovarian mass...
with solid components and decreased peripheral flow have good diagnostic reliability. If
torsion is entertained, prompt surgical evaluation and management are essential.

Occasionally, ovarian cyst formation may be associated with sexual precocity. The
child may present with signs of estrogenization including breast development or vaginal
bleeding. It is important to distinguish true precocious puberty with gonadotropin-induced
follicular development from autonomous hormonally active cysts. Recurrent gonadotropin
independent ovarian cyst formation may be seen occasionally with McCune-Albright
syndrome or hypothyroidism. The possibility of ovarian stromal or germ cell tumors must
be entertained when gonadotropin hormonally active ovarian cysts are present.

The incidence, histologic distribution, and clinical manifestations of ovarian tumors in
the pediatric population are distinct from those in adults. Although ovarian neoplasms
in childhood and adolescence are rare, the diagnosis should be considered in young
girls with abdominal pain and a palpable mass. Differential diagnosis in children and
adolescents with ovarian tumors should be conducted on the basis of unique clinical
manifestations, elevated serum tumor marker levels, and distinctive imaging findings.
Although the clinical manifestations are nonspecific and may overlap, they may assist in
diagnosis of some types of ovarian tumors

**Findings and procedure details**

In **newborns**, the majority of cysts are unilateral and may be simple or complex with
evidence of debris, solid components or internal echoes. Simple ovarian cysts are
follicular in origin. Complex ovarian masses may represent in-utero or neonatal ovarian
torsion or hemorrhage

The normal ovary in **adolescent** has a varying appearance throughout the menstrual
cycle, which may include multiple developing follicles (fig 1), one or more dominant
follicles, and a corpus luteum. At US the follicles appear as multiple, thin and smooth
walled, round or oval, anechoic spaces with no flow by means of color Doppler US.
The size of the dominant follicle at ovulation averages 2-2.4 cm, with a range of 1.7-2.8
cm. For simplicity, the panel felt that follicles or simple cysts up to 3 cm in maximal
diameter should be considered normal physiologic findings. After ovulation takes place,
the dominant follicle turns into a corpus luteum. The corpus luteum is typically a cyst with
diffusely thick walls and crenulated inner margins, measuring less than 3 cm in maximal
diameter. It usually has internal echoes and a ring of vascularity at the periphery at color
Doppler US.

**Hemorrhagic ovarian cyst (Fig 2).** Hemorrhagic ovarian cysts are generally due to
expanding hemorrhage within a corpus luteum or other functional cyst. Sonographic
features that are considered classic for a hemorrhagic ovarian cyst and that allow a
confident diagnosis are: a complex cystic mass with a reticular pattern of internal echoes
and/or a solid-appearing area with concave margins, no internal flow at color Doppler US, and usually circumferential flow in the wall of the cyst. Wall thickness is variable in hemorrhagic cysts.

While hemorrhagic cysts typically resolve within 8 weeks, the panel recognized that there is little evidence in the literature to guide which ovarian cysts with classic features of a hemorrhagic cyst as described above need follow-up. The panel reached the following consensus recommendations for such cysts.

Thick septations (#3 mm), solid elements with flow at Doppler US, and focal areas of wall thickening (#3 mm) are very worrisome for a malignant neoplasm, particularly when seen in association with omental or peritoneal masses or a moderate or large amount of ascitic fluid in the pelvis. A cyst with a nodule that has internal blood flow has the highest likelihood of being malignant.

Endometrioma. Fig4—Sonographically, many endometriomas demonstrate internal homogeneous ground-glass or low-level echoes, without internal color Doppler flow, wall nodules, or other neoplastic features; in such masses, the additional features of multilocularity and/or tiny echogenic wall foci can help distinguish them from an acute hemorrhagic cyst. When these additional features are not present, an initial short-interval follow-up with US (6-12 weeks) in a woman of menstrual age is helpful to ensure that an acute hemorrhagic cyst has not been mistaken for an endometrioma. Cystic masses with classic features of an endometrioma should be followed with US if they are not removed surgically.

Images for this section:
Fig. 1: Reproductive age follicles. Anechogenic round or oval image, less 3 cm, thin walls
**Fig. 2:** hemorrhagic cyst
Fig. 3: Endometrioma. Internal homogenics echoes with thin wall
Fig. 4: Worriorsome malignancy
Conclusion

Pelvic US remains the primary, and in most cases the preferred, imaging modality to evaluate adnexal cysts. The majority of adnexal masses can be correctly categorized based on grayscale and color or power Doppler US features. Surgical removal is the generally accepted management for cystic adnexal masses with sonographic features suggestive of malignancy (which is the minority of adnexal masses). The vast majority of cystic adnexal masses are benign, and either have typical sonographic features that allow a confident determination of benignity or have indeterminate sonographic features that do not allow a confident diagnosis to be made. From neonatal life, the ovary is now understood to be a dynamic organ hallmarked by follicular development and atresia. Prior to adulthood, ovarian cyst formation is common and the relative risk of malignancy is low. Utilizing knowledge of ultrasound characteristics and clinical correlation, the majority of ovarian diseases can be managed in neonates, children and adolescents with observation or minimal surgical intervention. The goal of management of ovarian cysts in this period is ovarian conservation if possible in order to maximize steroidogenesis and fertility throughout adulthood.

Personal information

References
