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The Management of Fetal Ovarian Cysts

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Background/Purpose: Ovarian torsion causing the loss of an ovary represents the most common complication of fetal ovarian cysts and occurs more frequently before than after birth. Thus, treatment of fetal simple ovarian cysts should be performed antenatally; however, criteria for prenatal decompression still need to be evaluated. Previous experience of the authors showed that large simple cysts have a poor outcome, whereas preliminary attempts of their "in utero" aspiration were all successful and uneventful. The authors evaluated the outcome of fetal simple ovarian cysts after prenatal aspiration and considered criteria for this procedure. The outcome of cysts showing a prenatal ultrasound pattern of torsion also was studied.

Methods: This prospective study includes 73 ovarian cysts (48 simple, 25 showing torsion) diagnosed in 72 fetuses from June 1992 to June 1999, and followed up until spontaneous resolution or surgery. Prenatal aspiration was performed in the case of simple cysts ≥5 cm in diameter. The outcome of these cysts was compared with that of similar cysts not aspirated in the authors' previous study (χ^2).[10] Cysts with an US pattern of torsion persisting at birth were operated on. The outcome of simple cysts less than 5 cm and cysts with a prenatal ultrasound appearance of torsion also was evaluated.

Results: Prenatal decompression was performed without any complications in 14 cases: 12 (86%; 95% CI: 0.68 to 1.00) regressed subsequently; 2 (14%; 95% CI: 0.00 to 0.32) showed torsion postnatally. This outcome is significantly better than that of similar cysts not aspirated in the authors' previous study[10] ($P = .0002$). Among the 34 simple cysts less than 5 cm, 26 (76%; 95% CI: 0.62 to 0.90) resolved spontaneously; 8 (24%; 95% CI: 0.10 to 0.38) had complications, 7 of which showing torsion (diameter at evidence of torsion, 4.4 cm [median]; range, 3.3 to 5.2 cm). Among the 34 cysts showing torsion (25 with initial US pattern of torsion + 9 subsequently complicated simple cysts), 24 (71%; 95% CI: 0.56 to 0.86) required oophorectomy; 9 (26%; 95% CI: 0.11 to 0.41) spontaneously disappeared at ultrasound, one of which required surgery for intestinal obstruction secondary to adhesion of a necrotic ovary; one patient (3%; 95% CI: 0.00 to 0.09) was lost to follow-up.

Conclusions: Prenatal aspiration of ovarian cysts appears effective and safe: a "cutoff" of 4 cm should be investigated. Cysts with ultrasound pattern of torsion persisting postnatally require surgery; options for their management, when sonographically disappearing and asymptomatic, need to be investigated.

INDEX WORDS: Fetus, in utero aspiration, ovarian cysts, prenatal diagnosis, ultrasound scan.

SINCE THE FIRST prenatal observation of an ovarian cyst by Valenti et al in 1975,[1] ultrasound detection of fetal ovarian cysts is increasingly reported in the world literature. The etiology of fetal ovarian cysts has not been entirely clarified. Maturation of the hypothalamus-pituitary-ovary axis occurs from the 29th week of gestation in the presence of elevated fetoplacental estrogens.[2] An immature hypothalamus-pituitary-ovarian feedback is thought to be responsible for gonadal hyperstimulation in severely premature fetuses. Placental insufficiency, in addition to incomplete maturation of the gonadostat, has been suggested to account for ovarian hyperstimulation in full-term infants.[3] Maternal risk factors, reportedly, include diabetes, Rh isoimmunization, and toxemia: luteinized cysts have been described more frequently in these cases, probably because of the excess in gonadotrophin levels associated with these pathologies.[4,5] Fetal hypothyroidism also is reported as a further risk factor.[6] Various complications are described in association with ovarian cysts: compression on other viscera, rupture of the cyst, hemorrhage[7]; but the most common is represented by ovarian torsion with consequent loss of the ovary. Ovarian torsion also may result in adhesion of the necrotic ovary to the bowel or other organs with possible intestinal obstruction or perforation,[8-10] urinary obstruction, and even sudden infant death.[11] Ovarian torsion has been observed to occur more frequently during fetal life than postnatally.[10,12] Therefore, to effectively prevent torsion and other complications, treatment of fetal simple ovarian cysts should be performed antenatally, although criteria for prenatal de-

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cated ovarian cysts, a postnatal diagnosis of hydrometrocolpos (the cystic lesion was prenatally characterised by the presence of a fluid/debris level inside, highly suggestive of an ovarian cyst) and bilateral meconium cysts was made, respectively. In 3 cases, diagnosed as simple ovarian cysts, postnatal evaluation found a hydronephrosis in 2 cases and a megacystis in another. In both cases of hydronephrosis, in utero decompression was performed unsuccessfully—the cystic lesion relapsed—but without any complications. The patient with a megacystis underwent vesicostomy at birth for urethral atresia and currently is under follow-up at the Department of Urology of "Bambino Gesù" Pediatric Hospital.

DISCUSSION

The outcome of fetal ovarian cysts (incidence of torsion) has been related to the length of the cyst pedicle, which has been reported to be more predictive than the cyst dimensions.[15] However, this prognostic factor cannot be helpful at all in prediction of outcome of fetal ovarian cysts, because it may only be evaluated at surgery. Nevertheless, one may reasonably hypothesise that, in the presence or absence of a lax adnexal suspensory ligament, the length of the cyst pedicle is influenced by the size (and therefore the weight) of the cyst itself.

Our experience suggests that the cyst size is an effective prognostic predictor valuable prenatally. In a previous retrospective study, we found that the majority of complicated cysts had a diameter greater than 5 cm, whereas a minority of them had a diameter greater than 4 cm.[9] In a subsequent preliminary prospective study, the outcome of simple cysts ≥5 cm proved to be significantly poorer compared with that of cysts less than 5 cm: 85% (11 cases) versus 31% (4 cases) required oophorectomy because of complications resulting in ovarian loss (torsion in most cases), whereas 15% (2 cases) versus 69% (9 cases) underwent spontaneous resolution, respectively ($P = 0.01$).[10] There is a significant relationship between the cyst size and outcome. Such a relationship is further confirmed by the current study, which shows that "in utero" aspiration of simple cysts equal to or exceeding 5 cm in diameter dramatically changes their outcome. In fact, after prenatal decompression, 86% (95% CI: 0.68 to 1.00) of these cysts underwent resolution, whereas only 14% (95% CI: 0.00 to 0.32) required surgery because of torsion. When compared with the above-mentioned outcome of simple cysts ≥5 cm not decompressed in utero,[10] the outcome of the aspirated cysts proves to be significantly improved ($\chi^2 = 13.35$; $P = .0002$; Fig 4). Although a prospective, randomized study would have been ideal, randomization was not possible in the current study because the results of the previous one[10] made it ethically unacceptable. This is confirmed also by the different outcome observed when prenatal aspiration was refused: 75% of them underwent torsion and surgery, whereas only 25% regressed spontaneously.

Even if no definitive conclusions may be drawn because of the relatively small number of observations, this investigation suggests that "in utero" aspiration of ovarian cysts is a safe procedure. This also might be related to the gestational age at which the decompression of cysts is generally performed. In fact, reportedly, complications of invasive procedures take place in approximately 0.2% of cases when performed at 16 to 19 weeks, but their incidence is much lower when performed at subsequent gestational ages.[16] Diagnosis of ovarian cysts typically is made during the third trimester of pregnancy: the mean gestational age at diagnosis was 33.6 weeks in this study (only 1 case was diagnosed at 23 weeks). In our series, aspiration of cysts was performed at a gestational age of 34.1 ± 2.55 weeks (mean ± SD), ranging from 28 to 39 weeks, and uneventful. In none of our cases of missed prenatal diagnosis (2 cases of hydronephrosis) have any complications been observed after decompression; however, caution is mandatory when deciding a prenatal invasive procedure, if any doubts exist about diagnosis of an ovarian cyst.

The incidence of complications for cysts less than 5 cm was 24% (95% CI: 0.10 to 0.38) in our series; in 7 of these 8 cases (87%) a torsion with consequent loss of the ovary took place. Their diameter at the time of evidence of torsion was 4.4 cm (median [range, 3.3 to 5.2 cm]); therefore, it was increased compared with that at initial diagnosis and greater than 4 cm (Table 1).

Even we had found that complications were more frequent with a cyst diameter ranging between 4 and 5 cm[9]; in the current study we stated a "cutoff" of 5 cm for "in utero" aspiration of simple cysts. Although preliminary attempts had showed that the procedure was successful and safe in all cases, the experience was restricted to a too-small number of observations. The effectiveness of prenatal decompression of cysts in the absence of complications showed by this study raises the question of whether an incidence of complications of 24% (torsion in most cases) is still acceptable. We believe that the risk to benefit ratio related to the procedure and the results of our study strongly suggest a cutoff of 4 cm for in utero aspiration of ovarian cysts. However, the validity of such a criterion needs to be confirmed by a further prospective study. Rapid cyst enlargement greater than 1 cm per week is another proposed criterion for prenatal decompression,[17] which might be valid but must also be confirmed.

In regard to cysts showing an ultrasound pattern of torsion, those persisting at ultrasound after birth have been operated on to prevent the risks related to the

presence of a necrotic ovary within the abdomen of the infant.

Cysts with evidence of torsion that spontaneously disappeared at ultrasound either prenatally or postpartum deserve particular mention: they made up 26% (95% CI: 0.11 to 0.41) in our series. Interestingly, their diameter underwent progressive reduction (most cases) or remained unchanged before disappearance, but it never showed an increase. The occurrence of these events raises the doubt that the prenatal ultrasound image refers to bowel rather than a torsed ovarian cyst: we had such a doubt in one case of our series; nevertheless, one may not exclude this hypothesis for further cases of our series. Alternatively, it may be hypothesised that at least some of these spontaneously disappeared cysts were represented by hemorrhagic cysts that regressed progressively; follicles with luteinizing effects during the third trimester of pregnancy[18] and a corpus luteum cyst have been reported in the fetus.[19] Moreover, Gohar et al.[20] in their report of a similar case of spontaneously disappearing cyst, suggested that it could be represented by a cyst that underwent initial torsion and subsequent spontaneous detorsion. However, the mechanism for ultrasound disappearance may be represented as well by ischemic necrosis and self-amputation of the ovary with its consequent location in an ectopic seat and possible adhesion to other organs; we observed one case in our series and further cases have been described.[21,22]

It must be taken into account that the ultrasound imaging has proven to be nonspecific regarding diagnosis of ovarian torsion.[23] In the adult, the evaluation of clinical signs and symptoms (although nonspecific as well) may lead to a correct preoperative diagnosis in up to 66% of cases.[24] In the neonate, the clinical evaluation, apart from cases with signs of peritonism, is difficult and often unremarkable. In the fetus, it is impossible.

Moreover, in the adult (in whom the transvaginal approach is possible), the color Doppler flow imaging (in addition to conventional ultrasonography and clinical evaluation) has proven to be accurate in preoperative diagnosis of ovarian torsion, when detecting the absence of blood flow in the affected ovary.[25,26] However, the detection of normal flow within the involved ovary does not necessarily exclude an ovarian torsion.[26,27]

In the fetus or neonate, to our knowledge, there is no experience regarding the use of Doppler techniques in diagnosis of ovarian torsion. However, the obvious impossibility of a transvaginal approach and the small size of the affected vessels make Doppler studies problematic. Nevertheless, Doppler studies (especially power Doppler imaging) might represent an interesting field of research regarding prenatal diagnosis of ovarian torsion, ideally in view of correct timing of delivery.

Thus, currently the conventional ultrasound imaging (although nonspecific) appears the most predictive with regard to diagnosis of ovarian torsion in the fetus or neonate. In our experience, in all cases of cysts with an ultrasound pattern of torsion persisting at birth, torsion was confirmed at surgery with the impossibility to save any ovarian viable tissue: the massive ovarian necrosis was confirmed by histology. These data might be correlated to the dimensions of cysts, when considered in relation to the dimensions of the fetus: it may be reasonably speculated that a cyst of 4 to 5 cm or more may result in different consequences in a fetus compared with an adult. A further explanation to such data may be represented by the long interval between the diagnosis of torsion and surgery: this interval was 3.9 ± 1.8 weeks (mean ± SD), but the real interval of time elapsed between the true moment of torsion and surgery might be even longer.

This gives rise to the question of the best option for the timing of delivery in the case of cysts with an ultrasound pattern of torsion. In particular, the question may be debated with regard to the opportunity of an earlier delivery, provided that pulmonary maturation exists, in an attempt to save the ovary. We think that, given the current limits of ultrasound imaging in diagnosis of ovarian torsion and also taking into account that the time of ultrasound evidence of torsion may not be the same as that of torsion, the choice of an earlier delivery in these cases is not currently recommended.

Because ultrasound imaging is nonspecific, interpreting the nature of those fetal ovarian cysts with an ultrasound pattern of torsion spontaneously disappearing at ultrasound is difficult as well, as noted above. Therefore, the management of these cases after birth, in the absence of symptoms, may become a further debated question, because either laparoscopic exploration in all cases or a policy of "wait and see" (our attitude) might be proposed. The former might turn out to be an overtreatment, whereas the latter might not prevent possible complications resulting from adhesion of a necrotic ovary to other viscera. Therefore, this prospective study, regarding (to our knowledge) the largest series published worldwide, provides evidence of the effectiveness of in utero aspiration of fetal ovarian cysts, whose outcome, as a result, is significantly improved. No complications have been seen in our series as a consequence of the procedure. The cutoff of 5 cm in diameter, chosen in this study as a criterion for their prenatal decompression, probably should be lowered to 4 cm. The validity of this criterion, however, must be investigated.

Ovarian cysts with a sonographic appearance of torsion must be submitted to surgery when persisting after

birth. However, in our opinion, an earlier delivery is not currently recommended.

The considerable percentage of cysts with an echo pattern of torsion spontaneously disappearing at ultrasound scan gives rise to the important, difficult question of their both real nature and postnatal management in the absence of symptoms. The opportunity of laparoscopic exploration in all cases versus an expectant management (our choice) needs to be investigated.

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