

Neonatal Ovarian Cysts: Role of Sonography in Diagnosing Torsion

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Abstract

Introduction: The purpose of this case series was to determine the sonographic features of neonatal ovarian torsion. **Materials and Methods:** Seven surgically proven cases of neonatal ovarian cysts were included in this retrospective study. The patients were divided into 2 groups, torsion and non-torsion. These 7 patients were evaluated for the clinical presentation, sonographic features, surgical and pathological findings. The findings on follow-up sonography after surgery were also noted. **Results:** The sonographic appearance was variable. Of the 4 cases with torsion, 2 lesions had internal echoes with 'fish-net appearance'. The other 2 lesions were predominantly cystic on the sonography with internal echoes and echogenic nodule. A calcific focus was present in 1 of these echogenic nodules. One of the cysts had fluid-fluid level. In the non-torsion group, only 1 lesion had mixed echogenic appearance. The other 2 lesions were cystic with low level internal echoes in 1 of the cysts. The surgical procedure performed in the torsion group was salpingo-oophorectomy in 2 patients and oophorectomy in 1 patient. In 1 patient, cystectomy was attempted without success. In the non-torsion group, only cystectomy was performed with preservation of normal ovaries, which was confirmed on follow-up sonography. **Conclusion:** The sonographic features of cysts with 'fish-net appearance', fluid-debris level and cysts with echogenic nodule favour torsion. The former sign has so far not been described as a sonographic predictor for neonatal ovarian torsion.

Ann Acad Med Singapore 2011;40:291-5

Key words: Ultrasound, Ovary, Doppler, Fish-net appearance, Haemorrhage

Introduction

Simple cysts are commonly seen in neonatal ovaries. Majority of them are small and resolve spontaneously. Complications such as torsion and haemorrhage rarely occur, but when they do, they may cause symptoms due to mass effect such as bowel or urinary obstruction. Sonography plays an important role in diagnosis, treatment and follow-up of these cases. The aim of this study is to review the sonographic features of ovarian torsion in neonates. The outcome of surgery was also assessed on follow-up sonography.

Materials and Methods

Retrospective evaluation of medical records from 2006 to 2009 was done. Seven surgically proven cases of neonatal ovarian cysts were found. They were divided into torsion and non-torsion groups depending upon the findings on surgery and histopathology. All of these patients had undergone

sonography of the abdomen and pelvis with one of the following scanners: 3 patients on HDI 5000 ultrasound system (ATL, Bothell, WA, USA) and 4 patients on iU22 ultrasound system (Philips Ultrasound, Bothell, WA, USA). These patients were evaluated for the clinical presentation, size and sonographic appearance of the mass, other imaging features, and surgical and pathological findings. The volume of the ovary was calculated using the formula, volume (cm³) = length x breadth x height (in cm) x 0.52. The findings on follow-up sonography after surgery were also noted.

Results

There were a total of 7 patients with ovarian cysts. Out of these 7, 4 cases were surgically and pathologically confirmed as ovarian torsion. The other 3 had benign ovarian cysts (Tables 1 and 2).

Out of the 7 patients, 5 patients presented with history of

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Table 1. Torsion group: Patients with Proven Ovarian Torsion on Surgery and Pathology

Patient	Sonographic and other imaging findings	Surgical findings	Pathology	Remarks, follow-up
1	Day 2: 6.6 x 5.3 x 4.5 cm (81.8 cm ³), septations and cystic spaces, (fish net appearance), avascular. Day 3: CT – Well defined homogeneous hypodense mass. Suspected mesenteric or enteric duplication cyst.	Day 6: Large right ovarian cyst, haemorrhagic and fragile. Ovary and cyst torted. Right salpingo-oophorectomy done.	Right ovary: Infarcted ovarian cyst compatible with torsion.	Antenatally diagnosed. Follow-up: Normal left ovary and uterus.
2	Day 2: 4.2 x 4.1 x 2.7 cm (24.2 cm ³), cystic with internal echoes and an echogenic nodule with calcification. Suspected teratoma.	Day 35: Chocolate coloured right ovarian cyst in the left adnexa. Torted and nonviable. Right salpingo-oophorectomy done.	Right ovary: Infarcted cystic fibrous tissue with calcifications.	Antenatally diagnosed. Follow-up: Normal left ovary and uterus.
3	Day 18: 7.1 x 6.6 x 5.4 cm (131.6 cm ³), fish net appearance. Abdomen X ray: Suspected mass on the right side.	Day 19: Right ovary infarcted with torsion 2 times of tube. Multiloculated cyst with haemorrhagic fluid and necrotic tissue. Cystectomy done.	Right ovarian cyst: Infarcted cystic tissue with residual normal ovarian tissue.	Presented with vomiting on Day 18. Follow-up: Right ovary not seen.
4	Day 2: 4.5 x 4.2 x 2.5 cm (24.6 cm ³), complex cystic mass. Suspected ovarian cyst. Day 33: 6.4 x 3.5 x 4.0 cm (46.6 cm ³), suprapubic cyst with fluid level and echogenic nodule.	4th month: Cystic mass with chocolate coloured fluid. Torted and almost autoamputated. Left oophorectomy done.	Left ovary: Haemorrhagic infarcted benign ovarian cyst.	Antenatally diagnosed. Increasing in size. Follow-up: Normal right ovary and uterus.

(CT: computed tomography)

Table 2. Non torsion group: Patients with no Ovarian Torsion on Surgery and Pathology

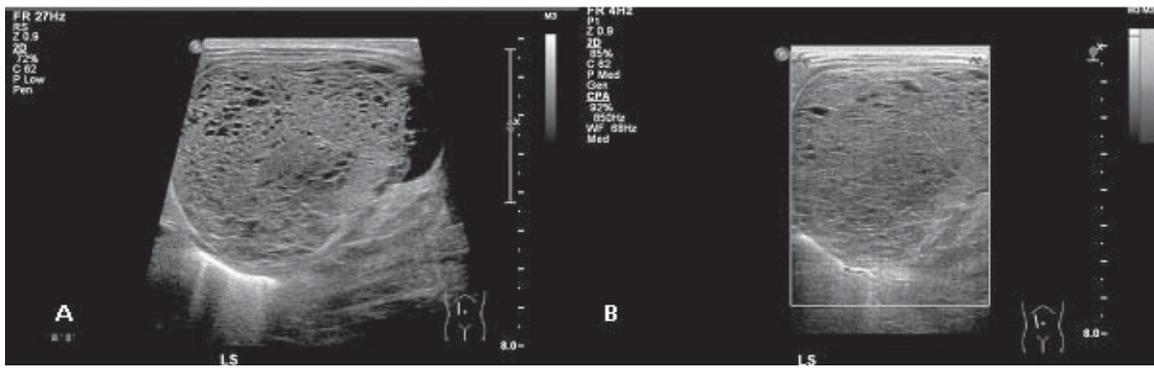
Patient	Sonographic and other imaging findings	Surgical findings	Pathology	Remarks, follow-up
5	Day 3: 3 x 2.6 x 2 cm (8.1 cm ³). Mixed echogenic avascular with cystic area and solid echogenic area. Suspected teratoma.	Day 21: Thin walled cyst, no solid components. Cystectomy done.	Left ovarian cyst: Haemorrhagic benign cyst.	Antenatally diagnosed. Follow-up: Normal left ovary.
6	Day 2: 4.6 x 4.5 x 3.7 cm (39.8 cm ³). Anechoic cyst. No solid components or septations. Suspected mesenteric cyst.	Day 6: Cyst with clear contents. No solid component. Cystectomy done.	Right ovarian cyst: Benign follicular cyst	Detected after birth. Follow-up: Normal right ovary.
7	Day 1: 6.3 x 5.8 x 4.5 cm (85.5 cm ³). Cyst with low level internal echoes. Avascular. Suspected ovarian cyst/mesenteric cyst.	Day 14: Unilocular cyst with serosanguinous fluid. Cystectomy done.	Left ovarian cyst: Haemorrhagic follicular cyst.	Antenatally diagnosed. Follow-up: Normal left ovary.

antenatal detection of an abdominopelvic cystic mass on a routine antenatal sonographic scan. After birth, 3 were proven to have ovarian torsion whereas the other 2 cysts were found to be haemorrhagic ovarian cysts. One neonate presented with vomiting on the eighteenth day after birth and an abdominal radiograph raised the suspicion of a right-sided abdominal mass displacing the bowel loops. The subsequent sonography confirmed the same and this patient was surgically proven to have torsion. In the seventh patient, the cyst was diagnosed postnatally as the neonate had abdominal distension after birth and it was proven to be a benign follicular cyst. The sonography was done on day 2 to 3 of life in 6 patients whereas the neonate with vomiting had the scan at presentation.

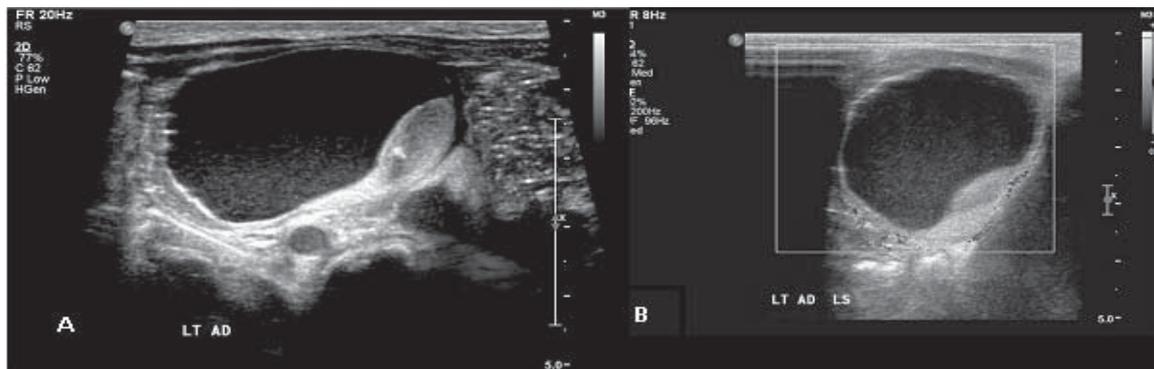
In the torsion group, the volume of cysts ranged from 24.2 cm³ to 131.6 cm³ (mean 65.5 cm³). The sonographic

appearance in this group was variable. Two lesions had internal echoes with a 'fish-net appearance' (Fig. 1). One of these patients underwent computed tomography (CT), but it did not provide additional information (Fig. 2). The other 2 lesions were predominantly cystic on the sonography with internal echoes and echogenic nodule. A calcific focus was present in one of these echogenic nodules (Fig. 2) and a differential diagnosis of teratoma was considered. The calcification was subsequently confirmed pathologically. One of the cysts had a fluid-fluid level (Fig. 3).

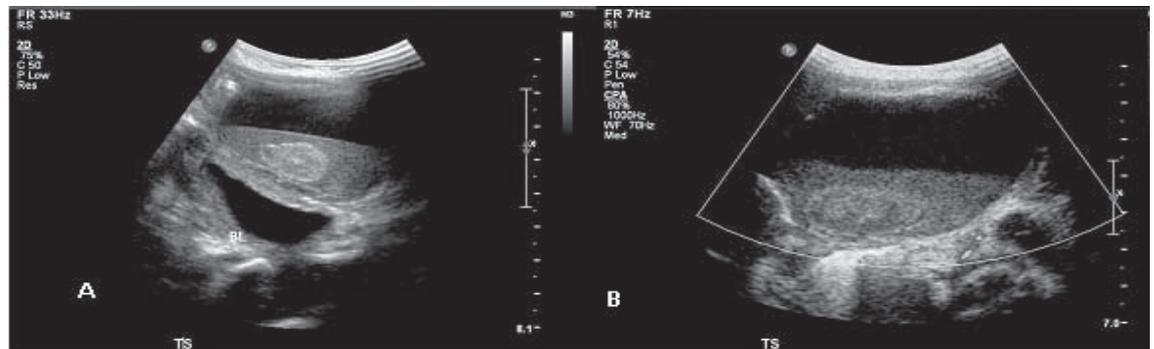
In the non-torsion group, the cysts were smaller, with volumes that ranged from 8.1 cm³ to 85.5 cm³ (mean 44.5 cm³). In this group, one lesion appeared as an isoechoic or mildly echogenic mass with a cystic area (Fig. 4). The second patient had a cyst with uniform low level internal echoes (Fig. 5). These 2 lesions were found to be haemorrhagic



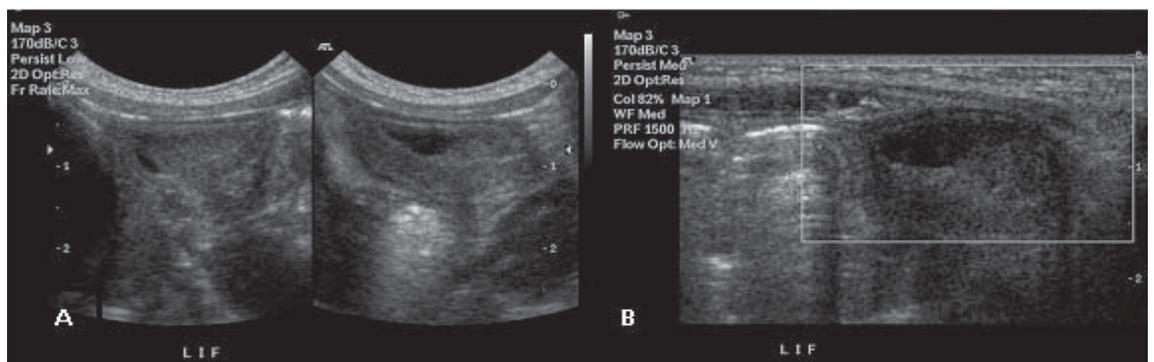
Figs. 1A and B. Patient 3: Heterogeneous mass with 'fish-net appearance'. No internal vascularity on colour Doppler sonography.



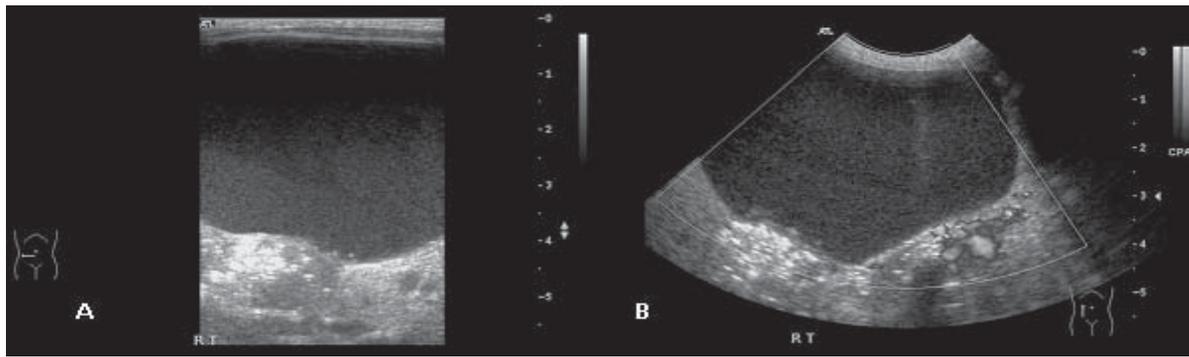
Figs. 2A and B. Patient 2: Cystic mass with internal echoes and an echogenic nodule with calcification. No internal vascularity on colour Doppler sonography.



Figs. 3A and B. Patient 4: Cystic mass anterior to the urinary bladder with fluid level and an echogenic nodule. No internal vascularity on colour Doppler sonography.



Figs. 4A and B. Patient 5: Isoechoic or mildly echogenic mass with a cystic area. No internal vascularity on colour Doppler sonography.



Figs. 5A and B. Patient 7: Cyst with internal echoes. No internal vascularity on colour Doppler sonography.

benign cysts on pathology. The third patient had a clear anechoic cyst which was proven to be a benign follicular cyst pathologically. All the 7 lesions showed no vascularity on colour Doppler sonography.

Surgery was done from day 6 to day 35 of life in 6 cases. In 1 case, the surgery was deferred till fourth month due to low absolute neutrophil count. In 5 patients, the indications of the surgery were clinico-radiological consideration of diagnoses such as teratoma, mesenteric cyst and enteric duplication cyst. One patient underwent surgery due to a large mass presenting clinically with vomiting. In 1 patient with torsion, increasing mass size led to surgery. Ovarian torsion was found on the right side in 3 patients and noted on the left side in 1 patient. In the group with torsion, salpingo-oophorectomy was performed in 2 patients and oophorectomy in 1 patient. In the fourth patient, cystectomy was performed but follow-up scans could not detect the affected ovary, suggesting that the ovarian salvage is difficult with surgical approach. Thus in all 4 patients with torsion, ovarian preservation was not possible at surgery. In the non-torsion group, cystectomy was performed with successful results. Follow-up scans in all 3 patients showed that the affected ovary had returned to the normal appearance.

Discussion

Ovarian cysts are common in neonatal ovaries, typically subcentimetre in diameter.¹ Larger cysts measuring more than 9 mm are usually seen in 20% to 34% of neonates.² Unilateral cysts are more common than bilateral cysts, and unilocular cysts are more common than septated cysts. The cysts are follicular in origin and most resolve over time.^{3,4} Ovarian neoplasms are rare in neonates.

The complications of neonatal ovarian cyst may be primary, secondary and maternal sequel. Common primary complications are torsion and haemorrhage.^{5,6} Embryologically, the human ovary originates in the abdomen in a pararenal location and later descends into the pelvis. Hence it is proposed that the neonatal ovary may have increased propensity to undergo torsion and may be located

in unexpected locations.⁷ Commonly, torsion occurs in ovaries with large cysts, but it has been reported in cysts as small as 2 cm.^{5,8} The mean volume of torsed ovarian cysts in our series was large, measuring 65.5 cm³. Torsion may occur antenatally and may not be always symptomatic.⁵ In our series, 3 cases with torsion were detected antenatally as abdominopelvic cystic mass and were not symptomatic. Symptomatic patients may present with pain, vomiting, fever, abdominal distension, leukocytosis and peritonitis.⁸ One of the 4 cases of torsion in our series presented with vomiting and abdominal radiograph suspected an abdominal mass. The next common complication is haemorrhage, which frequently results from torsion, and associated infarction, which was seen in 1 patient of our series. Secondary complications are due to sheer size of large cysts causing bowel obstruction, pulmonary hypoplasia from thoracic compression or obstructive uropathy.^{4,9,10} Large foetal ovarian cysts might compromise fetal heart function resulting in tricuspid regurgitation and pericardial effusion.¹¹ Some cases may be associated with congenital hypothyroidism.¹²

Neonatal ovarian cysts have varied sonographic appearance. They can be large enough to occupy almost the entire abdomen.^{4,13} The purpose of sonography is to determine if the cyst is complicated or not. An uncomplicated cyst appears as anechoic structure with no perceptible wall. The complicated cysts have varied sonographic features, such as a fluid-debris level, a retracting clot, septa or appear as a solid mass when filled with homogeneous internal echoes. Dystrophic calcification may be associated with infarction. The specific sonographic features suggestive of torsion described in literature are fluid debris level and retracting clot appearing as echogenic nodule.⁵ All the patients with torsion in our case series had complex sonographic appearance. However, 2 cases had a 'fish net appearance', which is a common feature of haemorrhagic ovarian cysts described in adults.¹⁴ This sign has so far not been associated with neonatal torsion. Echogenic nodules were detected within the cysts in 2 cases, 1 of which had

calcification (Fig. 2) correlating with the findings described in literature.⁵ One of these cases also had fluid-debris level. The ovarian cysts without torsion generally have less complex features and the presence of a clear, simple anechoic cyst almost always rules out torsion. Generally, these cysts without torsion have minimally complex features such as low level internal echoes and echogenic areas when haemorrhage occurs. However, mere presence of a complex cyst does not favour torsion as 1 of the patients without torsion also had a complex cyst on sonography (Fig. 4). Antenatally detected uncomplicated cysts may potentially develop internal echoes due to mechanical stress of delivery, causing haemorrhage.⁵

The common differential diagnosis of an uncomplicated ovarian cyst includes neonatal cystic abdominal masses such as mesenteric cyst, lymphangioma or enteric duplication cyst which were considered in 5 cases of our study.^{5,8,15} Some of these, such as the enteric and mesenteric cyst may be indistinguishable from complicated ovarian cysts.^{16,17}

Management is dependent upon the size, clinical presentation and sonographic features. The conservative approach is generally preferred in small cysts of less than 5 cm in diameter.¹⁸ The treatment of larger cysts and complicated cysts remain controversial. Some authors recommend clinical and sonographic follow-up in asymptomatic patients. Others advocate the need for early intervention as torsion may lead to ovarian loss. Sonographic-guided cyst aspiration to confirm its ovarian origin and to reduce the risk of torsion is favoured by several authors.^{19,20} The goal of surgery is to preserve as much gonadal tissue as possible. The chance of salvaging the ovary in cases of torsion with surgical approach is low.²⁰ Cystectomy without oophorectomy was attempted in one of the cases with torsion in our series, but the follow-up sonography could not detect the affected ovary suspicious for ovarian loss, whereas cystectomy was successful all 3 patients without torsion. All these 3 patients showed normal ovaries on follow-up sonography. Recently, some authors propose treating all ovarian cysts, regardless of size and appearance, with sonographic guided percutaneous drainage which allows preservation of ovarian tissue.²¹ Rarely has autoamputation of the cysts been reported to occur prenatally or postnatally during the newborn period.²² The limitation of this study is the small number of patients and that patients who were managed conservatively are not included.

Conclusion

Sonography plays an important role in diagnosis and follow-up of neonatal ovarian cysts. The sonographic features of a cyst containing fluid-debris level, cyst with an echogenic nodule or with 'fish-net appearance' favours torsion. The latter sign has so far been not described as a

sonographic predictor for neonatal ovarian torsion. Doppler sonography is not helpful in diagnosing torsion as all the cysts did not demonstrate flow regardless of whether torsion was present or not.

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