Feasibility of Percutaneous Ultrasound Guided Drainage as a Primary Treatment of Large Functional Ovarian Cysts in Neonates: A Retrospective Analysis

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Background/Purpose: Functional ovarian cysts are commonly detected in neonates. When cysts exceed 5 cm in diameter, there is an increased risk of complications, such as ovarian torsion, intra-cystic hemorrhage and rupture. The standard treatment approach has been surgical often resulting in oophorectomy. Recently, percutaneous ultrasound (US)-guided aspiration has emerged as a therapeutic alternative. This study aims to evaluate its efficacy as a reliable treatment for large functional cysts.

Patients and methods: This retrospective study included 15 cases of congenital functional ovarian cysts. Each cyst was punctured trans-abdominally under general anesthesia. All patients were followed up clinically and by abdomino-pelvic ultrasound after one week. In case of reaccumulating to a diameter more than 50 mm, repeated aspiration was attempted. Data were analyzed for demographics, lesion characteristics, technical complications, recurrence, ultrasound examination findings on follow up.

Results: The average cyst diameter was 65 mm (SD = 1.49 mm) and a range of 50-100 mm. Within two weeks post-procedure, 13.3% (n = 2) of cases resolved completely, while 86.7% (n = 13) experienced reaccumulating but below 50 mm in diameter. Only one case needed respiration. By six months of age, all cases (100%) were fully resolved without any surgical intervention.

Conclusion: Percutaneous ultrasound-guided drainage is an effective minimally invasive treatment for large neonatal functional ovarian cysts, demonstrating a high rate of cure and obviating the need for surgical intervention.

Key words: Neonate, ovary, Cyst aspiration, torsion prevention, minimally invasive procedure.

Introduction

Ovarian cysts are the most frequently encountered abdominal swellings in neonates, with an estimated incidence of approximately 1 in 2,650 fetuses.[1] The origin of these cysts is multifactorial, encompassing hormonal imbalances, genetic predispositions, and environmental factors.[2,3] Ovarian cysts are categorized as either simple or complex. Simple cysts, often referred to as follicular cysts, are primarily functional and typically unilocular. In contrast, complex cysts have thick walls, septations, and solid components, raising concerns about malignancy.[5,6] Simple ovarian cysts are frequently the result of hormonal stimulation and are sometimes associated with conditions such as maternal diabetes and fetal hypothyroidism. Most simple cysts are small, measuring up to 4-5 mm, and tend to involute naturally within a few months postpartum as maternal hormone levels decrease.[6-8] However, cysts larger than 4-5 cm may result in complications such as rupture with hemoperitoneum, ovarian torsion, intra-cystic hemorrhage, or intestinal obstruction.[4] For such cysts, intervention is recommended to prevent ovarian loss.[9]

The management of simple ovarian cysts primarily aims to preserve ovarian function. Surgical options include cyst aspiration, resection, and marsupialization, although these procedures carry risks associated with surgery and anesthesia. Recently, percutaneous ultrasound-guided cyst aspiration has emerged as a less invasive alternative.[4,13] For prenatally diagnosed simple cysts, ultrasound-guided aspiration is recommended for those larger than 40 mm. However, this method presents a high risk of recurrence and potential complications such as cyst rupture, peritonitis, preterm labor, chorioamnionitis, and fetal injury.[11,14] Compared to surgical intervention, ultrasound-guided aspiration offers several advantages: it can be performed either bedside or under general anesthesia, preserves ovarian tissue, and is generally safe. Additionally, the procedure can be repeated if the cyst refills.[13,15]

There is no consensus on the optimal approach or timing for treatment and monitoring, with most recommendations based on clinical experience and case reports. Surgical intervention is typically reserved for cases where complications arise.[4,7-12]

Patients and methods

This retrospective longitudinal study includes cases of congenital simple ovarian cysts treated by ultrasound-guided aspiration over a 5-year period from January 2019 to December 2023. The inclusion criteria were neonatal simple ovarian cysts with a diameter greater than 50 mm. Exclusion criteria

DOI: 10.21608/ASJS.2024.321203.1161

included cysts with turbid content or echogenic soft tissue content, bleeding tendency, or parental refusal of the technique.

Ovarian cysts were punctured trans-abdominally using a 21-gauge spinal needle under direct US guidance, provided via a convex 3.5-MHz probe in a freehand technique. Maximum fluid aspiration was achieved in each procedure, all of which were performed under general anesthesia in the operating room. Aspirated fluid samples were subjected to cytological and hormonal analysis in all cases. Fluid Estrogen Levels was examined to confirm the diagnosis of a functional cyst. All patients were followed up clinically and by abdomino-pelvic ultrasound after one week. In case of reaccumulating to a diameter more than 50mm, repeated aspiration was attempted. A monthly clinical and radiologic follow up was repeated till complete resolution. Data were analyzed for demographics, lesion characteristics, technical complications, recurrence, and ultrasound examination findings on follow up.

Data Analysis: Descriptive statistics will be used to summarize the demographic characteristics of the patients. Quantitative data will be expressed as mean ± standard deviation (SD). Qualitative data will be expressed as frequency and percentage and appropriate statistical tests will be used for comparison. The difference will be considered significant at $P \leq 0.05$.

Results

Between January 2019 and December 2023, 82 girls were diagnosed with ovarian cysts. Among them, 32 neonates presented with varying ovarian lesions. Neonates with simple ovarian cysts larger than 50 mm in diameter were managed via aspiration. The cohort included 15 females, aged between 6 and 14 days, with a mean age of 10.5 ± 2.7 days. Their body weights ranged from 2.8 to 3.5 kg, with a mean of 3.2 kg **(Table 1).** In all cases, the aspiration aimed to completely remove the cyst fluid, and the procedure was successful in all patients. Within two weeks post-procedure, 13.3% (N = 2) of the cases resolved completely, while 86.7% (N = 13) experienced cyst reaccumulation, though the cysts remained below 50 mm in diameter. The average cyst diameter decreased progressively during follow-up, measuring 34 mm at the first month, 26 mm at the second month, 20 mm at the third month, 14 mm at the fourth month, and 10 mm at the fifth month. **(Fig. 1)** illustrates the rate of cyst size reduction as observed on radiologic follow-up. Only one case required a second aspiration. This patient had an initial cyst measuring 10 cm, which was fully aspirated in the first session. However, by six months of age, all cases (100%) had fully resolved without the need for surgical intervention **(Table 2).**

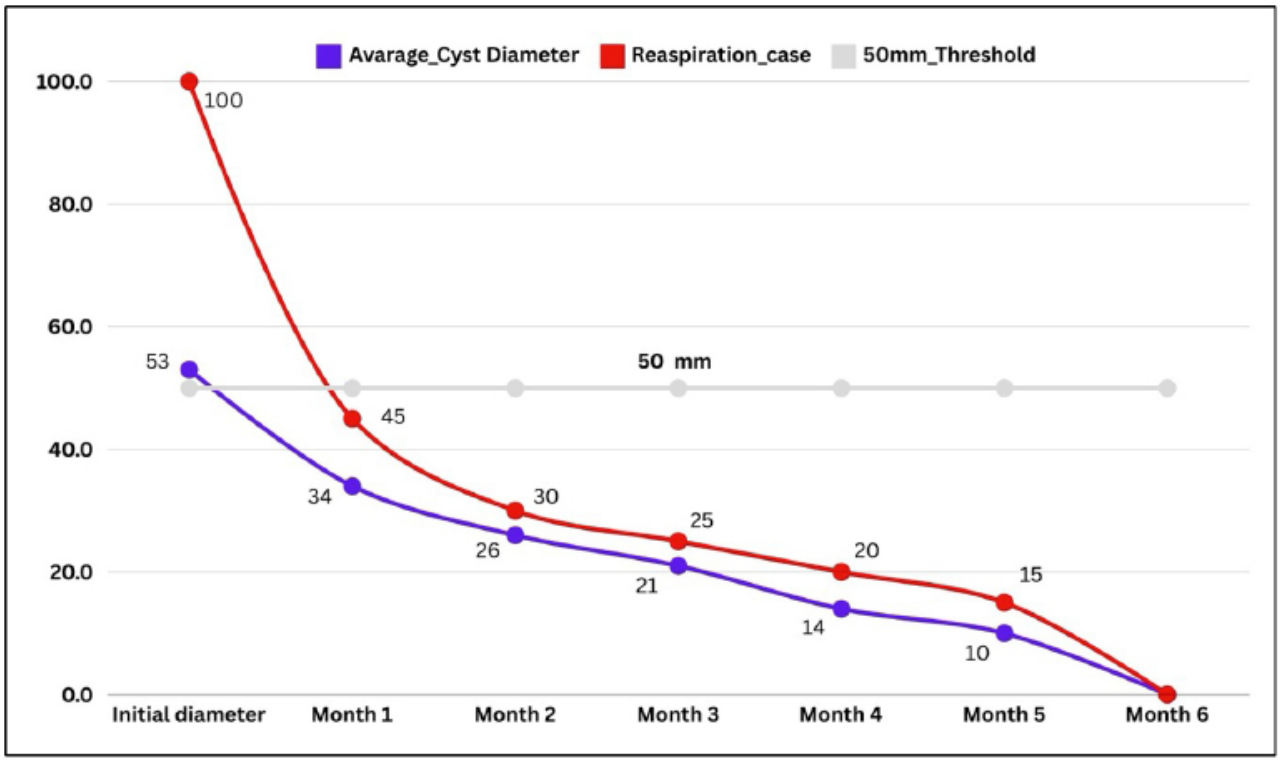

Fig 1: Line chart representing the reduction in cyst diameter over time: This graph illustrates the change in cyst size over the follow-up period. The blue line represents the average cyst diameter, which decreases from 53 mm to 10 mm over six months. The solid red line indicates a re-aspiration case, where the cyst size starts at 100 mm and decreases more rapidly, reaching 0 mm by the sixth month. A gray line marks the 50 mm threshold.

Table 1: Cohort demographics and radiologic Finding of Cyst Diameter

Variable	Number
Age	10.5 ± 2.7 (6-14)
Body Weight	3 ±.2 (2.8-3.5)
Cyst Diameter	5.3 ±.7 (4-6)
Age of diagnosis	Antenatal N = 14 (93.3%) Postnatal N = 1 (6.7 %)

Table 2: Outcome of US guided aspiration in neonates with simple ovarian cyst > 50mm

Variable	Number	Percentage
Successful aspiration	15/15	100%
No re-accumulation	2/15	13.3%
Re-accumulation	13/15	86.7%
Repeated Aspiration	1/15	6.7%
Cyst complications	0	0%
Time to Resolution	5.3 month	

Discussion

Neonatal functional ovarian cysts are mostly benign and often resolve spontaneously without intervention. However, there is no clear consensus on the optimal method or timing for managing or monitoring these cysts, as most guidelines are based on clinical experience and case series. Surgical intervention is generally reserved for cysts larger than 5 cm or when complications such as ovarian torsion, hemorrhage, or ovarian rupture occur.[4,7,12,16,17] A strong correlation exists between cyst size and the risk of ovarian torsions to occur, underscoring the importance of timely cyst decompression both prenatally and postnatally.[10,18] Early detection and consistent monitoring are crucial in preventing adverse outcomes and guiding appropriate treatment.[16,17]

The primary goal of any management is the preservation of ovarian function.[4,11] Small ovarian cysts are typically monitored only, while larger cysts are more prone to complications.[16,17] Traditional surgical approaches to simple ovarian cysts, such as laparoscopic aspiration or complete resection, carry the risks of major surgery hazards and anesthesia, often resulting in oophorectomy.[1] Recently, percutaneous ultrasound (US)-guided aspiration has emerged as a minimally invasive alternative for managing large cysts.[18] In our study, all simple ovarian cysts larger than 5 cm were treated with US-guided aspiration, and no patients required surgery. Furthermore, most of the cysts (93.3%) were diagnosed antenatally, aligning with the literature, where the majority of neonatal cysts are identified antenatally, particularly during the third trimester.[4,12]

Our findings confirm the efficacy of percutaneous US-guided aspiration in treating large functional ovarian cysts. A key result is the 100% resolution rate by six months without the need for surgery. This contrasts favorably with traditional surgical approaches like cystectomy or fenestration, which carry risks such as ovarian torsion and hemorrhage.[11] Notably, Kessler et al. and Akın et al. found that surgical intervention for large cysts often led to oophorectomy, whereas percutaneous drainage minimized these risks and preserved ovarian tissue.[4,19] Similarly, Cho et al. demonstrated successful outcomes with minimally invasive cyst aspiration, further supporting its role in managing neonatal ovarian cysts effectively.[18] In contrast, Nadia et al. reported that while 62% of cysts resolved spontaneously, 32% required surgical intervention, with 74% of those cases resulting in oophorectomy.[1] These findings underscore the superior ovarian preservation rates achieved through minimally invasive drainage compared to traditional surgical approaches.

Although 86.7% of the cases in our study experienced partial reaccumulation of cyst fluid, all resolved without the need for surgical intervention by six months. This outcome is significant compared to the findings of Bascietto et al., who suggested that conservative management can yield favorable results but may still require surgery in some cases.[8] The ability of percutaneous drainage to achieve full resolution without invasive procedures highlights its potential for preserving ovarian function and fertility in neonates.

Despite its advantages, US-guided aspiration carries certain risks, including potential interference from adjacent organs and the possibility of requiring repeated aspirations, which can increase the risk of bleeding and infection.[15,20,21] Cyst recurrence is a known complication, with fluid reaccumulation in the ovary post-aspiration. Additional risks include infection, inadvertent injury to adjacent structures, hemorrhage, or leakage of cyst contents into

the peritoneal cavity. However, in our series, no complications related to the aspiration procedure were reported.

Limitations

Although our results are promising, a larger cohort could provide more robust data. Additionally, the inherent operator dependency of ultrasound-guided procedures may impact the reproducibility of this treatment modality.

Conclusion

The findings of this study support percutaneous ultrasound-guided aspiration as an effective and minimally invasive treatment for large neonatal ovarian cysts, demonstrating a high rate of resolution and preservation of ovarian function. Although there are risks associated with this approach, it offers a safer alternative to surgery, significantly reducing the likelihood of oophorectomy and minimizing the complications typically associated with more invasive procedures.

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