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SURGICAL TREATMENT OF NEONATAL OVARIAN CYSTS

HIRURŠKO LEČENJE NEONATALNIH OVARIJALNIH CISTA

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Summary – Medical experts are still at issue over the most suitable management of simple neonatal ovarian cysts exceeding 40mm and complex cysts of any size. The authors present surgical treatment of these cysts by classical laparotomy and laparoscopy. The study included 13 newborn babies surgically treated for 6 simple and 7 complex ovarian cysts. The diameter of the cysts ranged from 29 to 102mm. The age of children was from 2 days to 10 months. The open classical laparotomic approach was performed in 8 babies. In the laparotomy group, cystectomy was done in 3 infants with simple cysts. The other 5, presented with ovarian torsion, required salpingo-oophorectomy. Video – assisted cystectomy was the procedure for 3 simplex and one complex cyst with torsion. Laparoscopic adnexectomy was applied in one case with auto-amputated cyst. Our small study demonstrates that laparoscopy is as safe and effective as classical laparotomy in managing neonatal ovarian cysts, but with better cosmetic results.

Key words: Ovarian Cysts; Infant, Newborn; Infant; Laparoscopy; Laparotomy; Prenatal Diagnosis; Ultrasonography, Prenatal; Infant, Newborn, Diseases + surgery; Female

Introduction

Routine antenatal ultrasonography has increased the rate of detection of neonatal ovarian cysts. The first antenatal description of an ovarian cyst was made by Valenti in 1975 [1]. Ovarian cysts are the most frequent among intra-abdominal cysts in newborns [2]. The etiology of fetal ovarian cysts is not entirely clear. It seems that ovarian cysts arise from mature follicles [3,4]. The distinction between mature follicles and ovarian cysts is based on their size: those larger than 20 mm are considered pathological [5]. They could be usually diagnosed after the 28th gestation week (GW) [6]. Various complications of ovarian cysts may happen in perinatal period, such as adnexal torsion, intra-cystic hemorrhage and rupture. That could result in ovarian loss [2,7,8]. When a cystic abdominal mass is diagnosed in a female fetus and newborn, the differential diagnosis should be made for intestinal duplications, hydronephrosis, mesenteric-, omental- and urachal-cysts, cystic teratoma, intestinal obstruction, choledochal cysts or only bladder distension [9].

Nussbaum classified ultrasonographic (US) patterns of ovarian cyst masses into simple (S) cysts, which are anechoic, and complex (C) cysts, which have echogenic wall, with the presence of fluid, debris, septae, or solid particles [2,10,11].

Symptomatic neonatal ovarian cysts and complex cysts should be removed regardless of their size [12]. There is still a controversy regarding treatment of asymptomatic simple cysts and no consensus has been reached so far. However, the majority of authors agree that cysts exceeding 40 mm should be surgically treated [2,8,10-12].

Until recently, the method of choice in management of infantile ovarian lesions was the conventional surgical approach. First laparoscopic procedures for gonad problems in pediatric patients were reported by Gans in 1973 [13]. This series and other reports have demonstrated that laparoscopic surgery is a safe and effective method to manage emergency and elective adnexal conditions in infancy [2,7,12].

This study, aimed at assessing the morphologic nature of these cysts and opting for the best surgical treatment, included 13 newborns and infants with antenatally diagnosed ovarian cysts.

Materials and Methods

The study was designed as a retrospective analysis of 13 baby girls with ovarian cysts, who had been treated surgically in the period from 2007 to 2009 at our institution (**Table 1**). All ovarian cysts were diagnosed ultrasonographically in the prenatal period after the 30th

Table 1. Patients operated for ovarian cysts

Tabela 1. Operisani pacijenti sa ovarijalnim cistama

Ovarian cyst/Ovarijalna cista	No of patients/Broj pacijenata	US*- size/US-veličina (mm)	Age (days)/Uzrast (dani)	Laparotomy/Laparotomija	Laparoscopy/Laparoskopija
Simplex (S)	6	76.5 (55-102)	6 (2-14)	3	3
Complex (C)	7	53.4 (29-80)	56 (3-10 months/meseći)	5	2
Total/Ukupno	13	64.1 (29-102)	38 (2-10 months/meseći)	8	5

* US – ultrasonography/ultrasonografija

Abbreviations

US	– ultrasonography
GW	– gestation week
RDS	– respiratory distress syndrome

GW. There were 6 simple and 7 complex cysts. The median size of simple cysts on the preoperative US scan was 76.5 mm (range: 55-102 mm) while the median size of complex cysts was 53.4 mm (range: 29-80 mm). The mean diameter of all 13 cysts was 64.1 mm (range: 29-102 mm). Clinical symptoms, such as abdominal distension, syndrome of respiratory distress (RDS) and/or intestinal obstruction, were recorded in 6 infants.

The surgery was performed at the average age of 38 days (the age ranging from 2 days to 10 months). There were 4 cysts on the right and 9 on the left side.

After the postnatal confirmation of ovarian cysts, all patients with complicated cysts as well as with simple cysts exceeding 40mm were treated operatively. The traditional surgery was applied in 8 babies and video laparoscopy or any other type of video-assisted surgery was performed in the other 5. Our way of doing laparoscopy consisted of the open technique with 5-mm umbilical trocar into which a laparoscope of similar diameter was introduced. Two 5-mm trocars were usually introduced into the left and right lower quadrants. The first step was the exploration of the abdominal cavity followed by an inventory of the lesions in order to assess the nature of the cyst (necrotic or non-necrotic), the state of the ovarian parenchyma and the state of fallopian tube. The opposite ovary was carefully examined as well.

Results

The surgery was performed through a transverse supra-pubic incision in 8 cases (**Table 2**). Three of them had simple cysts (S) with diameters 57 mm, 60 mm and 85 mm. Abdominal distension was present in two infants. These uncomplicated cysts allowed total or subto-

tal excision and conservation of most of the laminated ovarian parenchyma. The histological examination of all specimens showed ovarian cysts of functional origin. The operation revealed the absence of contra lateral ovary in one baby. Another 5 cases had complex (C) cysts, coloured dark brown, with diameter from 40 to 80mm. Only one patient had signs of abdominal distension, intestinal obstruction and signs of RDS. They were operated on at the age of 3 days to 3 months. The surgery in one patient was done at the age of 10 months because the parents' consent had not been obtained before; during that period there were no complications nor a decrease in the diameter of cyst. Ovarian torsion by 720° was found in two newborns. Detorsion and cyst extirpation and ooforectomy with salpingectomy together with intramural excision of the intramural part of the oviduct were done. Auto amputation was verified in three cases. One cyst, set behind the bladder, was found to be free. The other was connected to the opposite adnexa. In both cases, residues of fallopian tubes were present after torsion and auto amputation. During the surgery, the cysts were removed, with complete resection of the tubal stump, which was done in order to reduce the risk of ectopic pregnancy in the future. In the third infant we found auto amputation, cyst of the right ovary was fixed to the mesentery and the terminal ileum, leading to the complete ischemia of intestinal length of 15 mm. Therefore, in addition to removing the cyst, we made resection of ischemic bowel and anastomosis as well. Anastomotic and wound dehiscence, peritonitis and sepsis complicated the postoperative recovery significantly in this patient. Histological expertise of all five complex cysts indicated the hemorrhagic ovarian infarction, with more or less present calcification, without distinguishing the presence of ovarian tissue. Clinical and ultrasonographic follow up of these patients over the next 3 years, at the most, showed no additional complications, but with the presence of a visible scar.

Table 2. Ovarian cysts treated by surgery - laparotomy**Tabela 2.** Ovarijalne ciste lečene hirurški - laparotomijom

No <i>Broj</i>	US*-appearance <i>US-slika</i>	US-size (mm) <i>US-veličina (mm)</i>	Clinical signs <i>Klinički simptomi</i>	Age (days) <i>Uzrast (dani)</i>	Operative finding – Procedure <i>Operativni nalaz – Procedura</i>
1.	Simple	85	Abdominal distension <i>Distenzija abdomena</i>	2	Cystectomy right and left ovary undeveloped <i>Cistektomija desno i agenezija jajnika levo</i>
2.	Simple	57	No/Ne	11	Cystectomy left/ <i>Cistektomija levo</i>
3.	Simple	60	Abdominal distension/ <i>Distenzija abdomena</i>	2	Cystectomy left/ <i>Cistektomija levo</i>
4.	Complex	80	Abdominal distension. Intestinal obstruction, RDS**/ <i>Distenzija abdomena, Intestinalna opstrukcija, RDS</i>	3	Auto amputation right, extirpation, ileum resection, anastomosis/ <i>Autoamputacija desno, ekstirpacija, resekcija ileuma, anastomoza</i>
5.	Complex	55	No <i>Ne</i>	6	Torsion left, Salpingo-oophorectomy <i>Torzija levo, Salpingo-ooforektomija</i>
6.	Complex	40	No <i>Ne</i>	10 months <i>10 meseci</i>	Auto amputation left, retrovesical, extirpation <i>Autoamputacija levo, retrovezikalno, ekstirpacija</i>
7.	Complex	55	No <i>Ne</i>	3 months <i>3 meseca</i>	Auto amputation left, connected with right adnexa, extirpation/ <i>Autoamputacija levo, vezana za desni jajovod, ekstirpacija</i>
8.	Complex	55	No <i>Ne</i>	30	Torsion left, Salpingo-oophorectomy <i>Torzija levo, Salpingo-ooforektomija</i>

* US – Ultrasonography/*ultrasonografija*; **RDS – Respiratory distress syndrome/*respiratorni distres sindrom*

Table 3. Laparoscopic management of ovarian cyst in five neonates**Tabela 3.** Laparoskopsko lečenje ovarijalnih cista kod petoro novorođenčadi

No Broj	US*-appearance US – slika	US – size(mm) US – veličina (mm)	Clinical signs Klinički simptomi	Age (days) Uzrast (dani)	Operative finding – Procedure Operativni nalaz – Procedura
1.	Simple	55	No/Ne	14	”Deroofing”, VAE** of cyst, left/VAE ciste levo
2.	Simple	100	Abdominal distension/Distenzija abdomena	3	”Deroofing”, VAE** of cyst, right/VAE ciste desno
3.	Simple	102	Abdominal distension/Distenzija abdomena	5	”Deroofing”, VAE** of cyst, left/VAE ciste levo
4.	Complex	29	No Ne	17	Auto-amputation left, VA*** adnexectomy Autoamputacija levo, VA adneksotomija
5.	Complex	60	Abdominal distension/Distenzija abdomena	4	Torsion left, VAE of cyst/Torzija levo, VAE ciste

* US – ultrasonography/ ultrasonografija; ** VAE – video assisted excision /video asistirana ekscizija; *** VA – video assisted/ video asistirana

Laparoscopic approach was performed in five patients (**Table 3**). There were three simple cysts (S), 55, 100 and 102 mm. All were operated during the first days of life. Aspiration, fenestration or deroofing and video-assisted, transparietal total or subtotal excision of the cyst with maximum preservation of ovarian tissue were performed in all these patients. All simple cysts belonged to the group of follicular cysts.

Video-assisted adnexectomy was performed in one patient, because of auto amputation of the fallopian tubes and cyst of the left ovary. A brown cyst was found in the right lower quadrant, connected to the coecum with the adhesions. After adhesiolysis and removal of cysts, the tubal abutment was completely resected. In another patient, who had a complex cyst, we found a cyst torsion of the left ovary, the presence of small amounts of greenish content in the abdominal cavity and adhesions to the surrounding organs. Detorsion and video-assisted cystectomy was done. Histological findings in these two children spoke in favour of hemorrhagic infarction, with no ovarian tissue present. The postoperative course in all laparoscopically operated patients was normal and their hospitalization was relatively short, uncomplicated. We followed them up for two years. The scars on the skin are practically invisible.

Discussion

Prenatal ultrasound scans now show many fetal ovarian cysts, with an incidence of 34% found in stillbirths. The etiology of these cysts is thought to be the consequence of maternal gonadotropin stimulation delivered through the placenta to the fetus. Due to a decrease in hormonal stimulation that occurs after birth, regression of simple cysts can be seen. Therefore, some authors use this conservative method in treating even larger cysts [2,14,15]. Simple ovarian cysts smaller than 40mm can be safely observed, their resolution can be followed by US examinations and the policy ‘wait and see’ can be applied. However, this was not the case presented in this study.

Complications of prenatal and postnatal ovarian cysts are rather frequent and their incidence ranges between 36% and 71% [16,17]. In our study, this incidence is a little higher than 50%, which corresponds to the data found in literature. A complication such as an auto amputation of ovarian cysts in infants under 1 year of age is extremely rare [18,19], although in our

series of 13 patients, auto amputation happened in 4 cases. Torsion is the most common complication because the newborn ovary has a long pedicle. Torsion is more common in larger cysts, exceeding 40 mm, when surgical treatment is indicated [12]. The outcome of torsion may appear as adhesion of necrotic ovary to the bowel or other organs, with possible intestinal obstruction, which was found in one of our patients. These and other complications, such as intestinal perforation, peritonitis or urinary obstruction, not only justify but require surgical treatment for all complex ovarian cysts, of all sizes, which was and still is our current protocol. Torsion has been observed to occur more frequently during fetal life than postnatally. For this reason, prenatal aspiration of these cysts has been used as a prevention by some authors [11]. However, as hormonal effect is still present during the antenatal life, the efficacy of these aspirations as a treatment has not been proved yet [20,21]. Therefore, our patients were not treated antenatally by cyst aspiration.

The most suitable management of ovarian cysts during the neonatal life is still an issue widely debated. Some surgeons still do echo-guided transparietal cyst puncturing as an alternative to surgery, without any complications [8,15,22]. According to others, these punctures should not be done because of a higher possibility of cyst refilling, leaking of its content and the resulting peritonitis, and also due to the danger of wrong or „blind” puncture which can have fatal outcome [23]. In addition, since echography cannot establish whether the lesion is benign or malignant, it is never advisable to puncture a cyst prior to the visual examination; therefore, we have not done that [17].

Until recently, most authors recommended the traditional surgery via an open lower abdominal laparotomy in patients with ovarian cysts, which is also presented in results section of our study. Some works have been published showing a safe and definite treatment of ovarian cysts larger than 40mm by minimal invasive laparotomy and principle “catch and suck” [24,25]. We did not use this technique in treating our patients in this study.

More recent studies have described the use of laparoscopy in treatment of ovarian cysts [9,15,17,19,26], and this method is mentioned in the second part of our study. The major advantage of laparoscopy is the possibility to examine the cyst much better, which is crucial for the evaluation of lesion. Furthermore, this method also enables the examination of the entire ab-

dominal cavity and all its organs. Owing to the technological development which has resulted in a very small size of instruments, a really minimally invasive surgery can be done using trocar and instruments with diameter of only 1.7 mm, 3 mm and 5 mm, at the most. Intraperitoneal cystectomy is a method of choice, whenever it is possible with preservation of the ovarian tissue. In cases when dissection is difficult, transperitoneal cystectomy or excision of cyst can be done. We often used this method as the so called "video assisted" procedure after aspiration and fenestration ("deroofting"). Contrary to open surgical procedures, laparoscopic treatment of ovarian cysts ends in only three punctiform scars, which give a satisfactory cosmetic appearance for the entire life. Formation of adhesions and a danger of developing life threatening complications, which can result from a conservative treatment, do not occur when minimally invasive surgical techniques, such as laparoscopy or classical laparotomy, are performed [11,27-29]. The postoperative follow up for

three years, at the most, did not show complications of any kind.

Conclusion

The choice of the method of treatment depends on the size and ultrasonographic appearance of the cyst. In order to achieve the optimal ovarian preservation and prevention of complications, surgery is justified in cases of simple cysts larger than 40 mm, and all complex cysts, because it allows a definitive diagnosis, evaluation of the condition of the ovary, the separation of inflammatory adhesions, removal of ovarian cysts and ovarian detorsion, as it has been confirmed by our study.

We conclude that laparoscopic technique, contrary to the traditional laparotomy, is safe and reliable for treatment of ovarian cysts in the neonatal period. Laparoscopy is a minimally invasive procedure with excellent cosmetic results.

References

1. Valenti C, Kassner EG, Yermakov V, Cromb E. Antenatal diagnosis of a fetal ovarian cyst. *Am J Obstet Gynecol* 1975;123:216-21.
2. Nussbaum AR, Sanders RC, Hartman JS, Dudgeon DL, Parmley TH. Neonatal ovarian cyst: sonographic pathologic correlation. *Radiology* 1988;168:817-21.
3. Grumbach MM, Kaplan SL. Fetal pituitary hormones and the maturation of central nervous system of anterior pituitary function. In: Gluck L, ed. *Modern perinatal medicine*. Chicago: Medical Publishers Year Book; 1975. p. 247-56.
4. Richardson GS. Hormonal physiology of the ovary. In: Gold JJ, Josimovich JR, eds. *Gynecologic endocrinology*. New York: Harper and Row; 1980. p. 123-46.
5. Giacoia GP, Wood BP. Ovarian cyst of the newborn. *Am J Dis Child* 1987;141:1005-6.
6. Gaudin J, Treguilly C, Parent P, Le Gun H, Chabaud JJ, Boog G, et al. Neonatal ovarian cysts with antenatal diagnosis. *Pediatr Surg Int* 1988;3:158-64.
7. Debeugny P, Huillet P, Cussac L, Bourgeot F, Bonneville M. Le traitement non opératoire systématique des kystes de l'ovaire de nouveau-né: a propos de 8 observations. *Chir Pédiatr* 1989;30:30-6.
8. Schmahmann S, Haller JO. Neonatal ovarian cysts: pathogenesis, diagnosis and management. *Pediatr Radiol* 1997;27:101-5.
9. Shimada T, Miura K, Gotoh H, Nakayama D, Masuzaki H. Management of prenatal ovarian cysts. *Early Hum Dev* 2008; 6:417-20.
10. Bagolan P, Gorlandino C, Nahom A, Bilancioni E, Trucchi A, Gatti C, et al. The management of fetal ovarian cysts. *J Pediatr Surg* 2002;37:25-30.
11. Foley PT, Ford WDA, Mcewing R, Furness M. Is conservative management of prenatal and neonatal ovarian cysts justifiable? *Fetal Diagn Ther* 2005;20:454-8.
12. Chiamonte C, Piscopo A, Cataliotti F. Ovarian cysts in newborns. *Pediatr Surg Int* 2001;17:171-4.
13. Gans SL, Berci G. Peritoneoscopy in infants and children. *J Pediatr Surg* 1973;8:399-405.
14. Tseng D, Curran TJ, Silen ML. Minimally invasive management of the prenatally torsed ovarian cyst. *J Pediatr Surg* 2002;37:1467-9.
15. Brandt ML, Helmuth MA. Ovarian cysts in infants and children. *Semin Pediatr Surg* 2005;14:78-85.
16. Hengsten P, Menardi G. Ovarian cysts in the newborn. *Pediatr Surg Int* 1992;7:572-4.
17. Esposito C, Garipoli V, Di Matteo G, De Pasquale M. Laparoscopic management of ovarian cysts in newborns. *Surg Endosc* 1998;12:1152-4.
18. Koike Y, Inoue M, Uchida K, Kawamoto A, Yasuda H, Okugawa Y, et al. Ovarian autoamputation in a neonate: a case report with literature review. *Pediatr Surg Int* 2009;25:655-8.
19. Jawad AJ, Zaghmout O, Al-Muzrakchi AD, Al-Hammadi T. Laparoscopic removal of an autoamputated ovarian cyst in an infant. *Pediatr Surg Int* 1998;13:195-6.
20. Galinier P, Carfagna L, Delsol M, Ballouhey Q, Lemasson F, Le Mandat A, et al. Ovarian torsion. Management and ovarian prognosis: a report of 45 cases. *J Pediatr Surg* 2009;44:1759-65.
21. Mizuno M, Kato T, Hebiguchi T, Yoshino H. Surgical indications for neonatal ovarian cysts. *Tohoku J Exp Med* 1998;186:27-32.
22. Kessler A, Nagar H, Graif M. Percutaneous drainage as the treatment of choice for neonatal ovarian cysts. *Pediatr Radiol* 2006;36:954-8.
23. Puligandla PS, Laberge JM. Lethal outcome after percutaneous aspiration of a presumed ovarian cyst in a neonate. *Seminars in Pediatr Surg* 2009;18:119-21.
24. Colby C, Brindle M, Moss RL. Minimally invasive laparotomy for treatment of neonatal ovarian cysts. *J Pediatr Surg* 2001;36: 868-9.
25. Ferro F, Iacobelli BD, Zaccara A, Spangoli A, Trucchi A, Bagolan P. Exteriorization – aspiration minilaparotomy for treatment of neonatal ovarian cysts. *J Pediatr Adolesc Gynecol* 2002;15:205-7.
26. Oak SN, Parelkar SV, Akhtar T, Pathak R, Vishwanath N, Satish KV, et al. Laparoscopic management of neonatal ovarian cysts. *J Indian Assoc Pediatr Surg* 2005;2:100-2.
27. Armentano G, Dodero P, Natta A, Magillo P, Sugliano GC. Foetal ovarian cysts: prenatal diagnosis and management. Report of two cases and review of literature. *Clin Exp Obstet Gynecol* 1998;25:88-90.

28. Enriquez G, Duran C, Toran N, Piqueras J, Gratacos E, Aso C, et al. Conservative versus surgical treatment for complex neonatal ovarian cysts: outcomes study. *Am J Roentgenol* 2005;185:501-8.

29. Mittermayer C, Blaicher W, Grassauer D, Horcher E, Deuttinger J, Bernaschek G, et al. Fetal ovarian cysts: development and neonatal outcome. *Ultraschall Med* 2003;24:21-4.

Sažetak

Uvod

Za sada nema jedinstvenog stava o optimalnom lečenju neonatalnih jednostavnih ovarijalnih cista većih od 40 mm i komplikovanih, bilo koje veličine. Autori prikazuju hirurško lečenje ovakvih cista putem klasične laparotomije i laparoskopiskim pristupom.

Material i metode

Studija je uključila 13 novorođenčadi i odojčadi, koja su hirurški lečena zbog postojanja 6 jednostavnih i 7 komplikovanih cista. Veličina cista bila je u opsegu od 29 do 102 mm. Uзраст dece se kretao između 2 dana i 10 meseci. Laparotomija je urađena kod 8 pacijenata, a kod 5 je primenjena laparoskopiska procedura.

Rezultati

Preoperativna ultrasonografska diagnoza bila je potvrđena kod svih operisanih beba. U grupi laparotomiranih koju je činilo 8 pacijenata, 3 je imalo jednostavne ciste i kod njih je izvedena cistektomija uz maksimalnu prezervaciju ovarijalnog tkiva. Kod preo-

stalih 5 je verifikovana ovarijalna torzija, od kojih se kod 3 bebe radilo o autoamputaciji. Tokom operacije, slobodne autoamputirane ciste su uklonjene iz abdomena. Kod druga dva pacijenta sa torkviranim adneksama morla je da se uradi salpingooforektomija. Laparoskopski tretman je primenjen kod 5 novorođenčadi. Video asistirana cistektomija je izvedena kod 3 jednostavne ciste i jedne komplikovane sa torzijom. Video asistirana adneksotomija bila je neophodna u jednom slučaju sa autoamputiranom cistom.

Zaključak

Ultrasonografija je metoda izbora u dijagnostici neonatalnih ovarijalnih cista. Naša studija pokazuje da visok rizik od gubitka ovarijuma potvrđuje neophodnost hirurškog tretmana neonatalnih jednostavnih cista većih od 40 mm i svih komplikovanih cista. U odnosu na klasičnu laparotomiju, laparoskopija nudi jednako siguran i koristan način lečenja ovarijalnih cista ali sa boljim estetskim rezultatima.

Cljučne reči: Ovarijalna cista; Novorođenče; Odojče; Laparoskopija; Laparotomija; Prenatalna dijagnostika; Prenatalna ultrasonografija; Oboljenja novorođenčeta + hirurgija; Žensko

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