Original Article

Retrospective analysis of patients with surgically proven ovarian torsion, our experience

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Abstract

Aim: To study the patients who were admitted to our hospital with surgically proven ovarian torsion and were operated for the same and to study for whom detorsion was done. **Materials and Methods:** A retrospective analysis of the medical records and surgical notes of 150 patients with surgically proven ovarian torsion over a 10-year period between January 2011 and January 2021 was carried out. Surgical notes included details like mode of the surgery (laparotomy or laparoscopy), type of surgery (oophorectomy, detorsion, detorsion with cystectomy), whether fixation was done or not, size of mass/ovary, laterality, appearance of the torted ovary, color of the ovary, and number of twists. Histopathologic reports of the patients who underwent oophorectomy or detorsion with cystectomy were also recorded. **Results:** During the 10-year study period, 88 (58.7%) patients had undergone laparotomy and 62 (41.2%) patients had undergone laparoscopy. Detorsion with cystectomy was done in 96 (64%) cases, detorsion alone in 14 (9.3%) cases, and oophorectomy was done in 40 (26.6%) cases. There was no significant difference in terms of increase in postoperative complications. **Conclusion:** Laparoscopic detorsion with cystectomy is the most common surgical procedure used for ovarian torsion at King Hussein Medical Center.

Keywords: Laparoscopic, oophorectomy, ovarian cystectomy, torsion

Introduction

Twisting of the adnexal pedicle usually involves tube and ovary, but 5% of the time, isolated tubal torsion is involved.[1] The ovaries are nonfixed organs that are supported and connected to the uterus by the utero-ovarian (UO) ligament, also known as the ovarian ligament.[2]

When an adnexal mass is present, it is most commonly a benign functional ovarian cyst or teratoma. The right adnexa is more likely to twist than the left, suggesting that the sigmoid colon may help prevent torsion.[3] Torsion happens 80% unilaterally with slight predominance to the right adnexa/ovary due to the longer right ligament of the ovary and also because the space occupied by the sigmoid colon on the left side protects the left ovary.[4-6] There are no specific size criteria for ovarian torsion, but one study found that 83% of torsion occurred in ovaries that were 5 cm or larger.[7] Ovarian torsion has been reported to occur with masses from 1 to 30 cm (mean 9.5 cm), but it can happen with a mass of any size.[8]

Adnexal torsion is reported in approximately 3% of all emergent gynecologic surgeries.[9] Torsion of normal ovaries occurs more commonly in young girls than in women.[10,11] Ovarian torsion most commonly (70%–80%) occurs in women of reproductive age (between 20 and 40 years of age).[12-14]

Ovulation induction may cause multiple large ovarian follicular cysts; the large cysts carry an increased risk of torsion.[15]

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The most common symptoms are sudden onset of abdominal pain that is intermittent, nonradiating, and associated with nausea and vomiting, and fever.[16,17]

The onset of pain in ovarian torsion (OT) may also follow a chronic, intermittent, or subacute course, which makes the diagnosis much more difficult.[18] Owing to its nonspecific symptoms and lack of a specific diagnostic test and management guidelines, it can cause diagnostic dilemma and delay in management. However, it should be suspected in any woman in the reproductive age group with sudden-onset abdominal pain, especially with a known risk factor for ovarian torsion.[19] Ovarian torsion eventually leads to occlusion of the vascular supply, hemorrhagic infarction, and necrosis of the ovary. However, due to the dual blood supply, partial torsion, or intermittent detorsion, ovaries that appear necrotic on laparoscopy can often remain viable. The long-term effect on fertility is not known.[20]

No single or combined markers have been identified that improve diagnostic accuracy in adnexal torsion. Transvaginal ultrasound remains the first-line investigation.[21] The absence of radiological suggestion of adnexal torsion should not rule out the diagnosis, especially if the symptoms are persistent and severe enough to decide on performing surgery.[21]

A torsed ovary may be rounded and enlarged compared to the contralateral ovary because of edema or vascular and lymph engorgement.[22,23] An ultrasound can easily distinguish an ovarian mass by its components, location, density, Doppler flow, and size. There can be decreased or absent Doppler flow in the vessels of a torted ovary.[24-26]

The most common sonographic sign is asymmetric ovarian enlargement to greater than 5 cm, while obstruction to venous outflow can manifest in stromal edema and heterogenous appearance of the ovary. The "whirlpool sign" is another sonographic finding that may be present, although it cannot be reliably obtained in all cases. Conversely, free pelvic fluid is another finding that may be present, although it is quite nonspecific for ovarian torsion.[27] Oophorectomy was frequently performed in these cases due to the fear of leaving necrotic ovary tissue, suspicion of malignancy, and the risk of venous thromboembolism and peritonitis.[28-30] However, thromboembolism has not been reported particularly often.

Conservative surgery for maintaining ovarian preservation in young women has been given increasing attention in recent years, but it remains difficult to solve the problem on how to avoid thromboembolism and ensure the recovery of ovarian blood supply function.[31] Consequently, ovarian detorsion with ovarian preservation is considered as a safe procedure that should be considered in menopausal patients.[32,33] The increased use of detorsion has been followed by isolated reports of recurrence of ovarian torsion.[34-36]

The main objective of this study was to present and analyze our experience in preserving the adnexa following laparoscopic detorsion despite apparent severe ischemia.

Laparoscopy is becoming more important in the early diagnosis and treatment of adnexal cyst torsion due to its advantages, such as its minimally invasive nature, reduced acute stress reaction, and facilitation of direct observation of intra-abdominal lesions.[37-39] However, if cancer of the ovary or fallopian tube is suspected, a laparotomy should be done.[40,41]

While performing the surgery, it is necessary to assess ovarian viability and preserve its function. The only way to determine the viability of a torsed ovary during surgery is by gross visual inspection. In the conventional point of view, dark and enlarged ovaries may have vascular and lymphatic congestion and may seem nonviable. However, multiple studies have suggested that even those black or blue-like ovaries may retain ovarian function following detorsion.[42-49]

Materials and Methods

A retrospective analysis of the medical records and the surgical notes of 150 patients with surgically proven ovarian torsion over a 10-year period between January 2011 and January 2021 was conducted.

All patients above 14 years of age (those less than 14 years are seen by pediatric surgeons in our hospital) with surgically proven ovarian torsion were identified from the surgical records. Ovarian torsion is defined as partial or complete rotation of the ovarian vascular pedicle. All patients were presented to the emergency room at the King Hussein Medical Center.

The study was approved by the ethical committee of the Royal Medical services. Demographic data which included age, marital status, parity, and menopausal status were noted.

Emergency department residents' history, examination, and specialist notes were reviewed for clinical details such as presenting complaints, time from the onset of symptoms to presentation, time from presentation to surgery, leukocyte count, ultrasound findings, and color Doppler findings.

Surgical notes included details like the mode of surgery (laparotomy or laparoscopy), type of surgery (oophorectomy, detorsion, detorsion with cystectomy), whether fixation was done or not, time of surgery (day or night), seniority of the surgeon who did the surgery, size of mass/ovary, laterality, appearance of the torted ovary, color of the ovary, and number of twists.

Histopathologic reports of the patients who underwent oophorectomy or detorsion with cystectomy were also included in the study.

Statistical analysis was performed using Statistical Product and Service Solutions (SPSS) statistical software, version 21.1 (SPSS,

Inc.). Patients' general clinical characteristics were analyzed using descriptive statistics.

Results

A total of 150 cases of surgically proven ovarian torsion over a 10-year period from January 2021 to January 2021 were included in the study. The demographic details are presented in Table 1. Our patients were aged between 14 and 55 years, and 133 (88.6%) of them were between 14 and 40 years of age. There were eight (5.3%) patients in the menopausal age group and 142 women (94.7%) in the reproductive age group. Out of 150 patients, 104 (69.4%) patients were unmarried and 58 (36.6%) patients were nulligravidas. Eight (5.3%) patients were pregnant; of these, five were in the first trimester and the other three were in the second trimester. Five (3.3%) patients had undergone ovarian stimulation during infertility treatments (two of them had undergone it as a part of *in vitro* fertilization).

Time from the onset of symptoms to presentation was 1–36 h. All patients had acute onset of lower abdominal pain on one side of the abdomen (100%). All our patients had tenderness upon abdominal examination. This pain was described as colicky in nature, while 14 (9.3%) had intermittent pain over nearly 36 h. Also, 108 (72%) patients experienced nausea or vomiting. Low-grade fever was present in 18 (12.0%) patients. Time from the onset of symptoms to presentation was 1–36 h. Time from admission to surgery was 2–36 h, as shown in Table 2.

Basic laboratory investigations need to be performed to rule out other causes of acute abdominal or pelvic pain and include urine analysis, pregnancy tests, and full blood count.

Laboratory studies revealed a mild elevation of the white blood cell (WBC) count, and leukocytosis was found in only 34 (22.6.%) patients. Imaging is primarily achieved through either a transvaginal (in married patients) or a transabdominal approach. The most common sonographic sign was cyst with thickened walls and echogenic contents or a complex ovarian mass in 136 (90.6%) patients, while 14 (36%) patients had enlarged ovary with ovarian edema and peripherally arranged follicles. Free fluid was present in 54 (36%) patients. The most common sign is asymmetric ovarian enlargement to greater than 5 cm. Eighty-two (54.6%) patients had cysts or masses measuring between 5 and 10 cm, and 28 (18.6%) patients had masses or cysts measuring more than 12 cm. Obstruction to venous outflow can manifest in stromal edema and heterogeneous appearance of the ovary. Compromised arterial flow may be observable in abnormal Doppler tracings, although normal Doppler tracings do not exclude torsion, as abnormalities are only observed in about half of all cases. Doppler was documented in only 102 (68%) patients; Doppler flow was present in 34 (33.3%) patients and absent in 68 (67.7%) patients, as shown in Table 3.

During the 10-year study period, 88 (58.7%) patients underwent laparotomy and 62 (41.2%) underwent laparoscopy. The operative findings during surgery were also recorded, which included size of the ovary or the mass, appearance of the torted ovary, laterality and the number of twists (not documented in all patients), and the type of surgery done. The size of the mass in adnexal torsion was 5 cm in 26 (17.3%) patients, 5–10 cm in 92 (61.3%) patients, and more than 10 cm in 32 (21.3%) patients. Right-sided torsion was seen in 92 (61.3%) cases and left-sided torsion in 58 (38.7%) cases.

Appearance of the torted ovaries was also reported at the time of surgery. The color of the torted ovary was dusky in 28 (18.6%) patients, brown to black in 46 (30.6%) patients, and blackish necrotic in 67 (50.7%) patients. Surgery for ovarian torsion was done within 2–36 h of admission.

During the 10-year study period, there was a shift from radical to conservative surgery, the latter being done more commonly in the last 5 years. Detorsion with cystectomy was done in 96 (64%) cases, detorsion alone in 14 (9.3%) cases, oophorectomy was done in 40 (26.6%) cases. Conservative surgery was performed based on surgeon's discretion for the color of the ovary and return of circulation after detorsion. Oophoropexy was done in 22 (14.3%) cases, as shown in Table 4.

Table 1: Demographic details of the patients

Variable	Frequency	Percentage (%)
Age (years)	14-40 (133)	88.6
	41-55 (17)	12.4
Marital status		
Married	46	30.6
Not married	104	69.4
Pregnancy		
0	58	38.6
1	40	26.7
2 or more	52	34.7
Pregnant	8	5.3
Menopausal status		
Yes	8	5.3
No	142	94.7
Risk factors		
Ovarian mass	123	82.0
Ovarian stimulation	5	3.3
PCOS	7	4.7
Pregnancy	8	5.3
Previous pelvic surgery	7	4.7

PCOS=polycystic ovarian syndrome

Table 2: Symptoms and signs

Variable	Frequency	Percentage (%)
Complaint of the patients		
Acute abdominal pain	150	100
Nausea and vomiting	108	72
Intermittent pain	14	9.3
Fever	18	12.0
Tenderness	150	100
Time from the onset of symptoms to presentation	1-36 h	
Leukocyte count >10,000	34	22.6

Table 3: Ultrasound and Doppler findings of patients

	Frequency	Percentage (%)
Ultrasound findings		
Size of the cyst or mass (cm)		
<5	40	22.6%
5-10	82	54.6%
>10	28	18.6%
Cyst with thickened walls and echogenic contents or complex mass	136	90.6%
Enlarged edematous ovary and peripherally arranged follicles	14	9.4%
Free fluid	54	36%
Doppler flow		
Documented	102	68%
Not documented	48	32%
Present	34	33.3%
Absent	68	67.7%

Table 4: Surgical details of the patients

	Frequency	Percentage (%)
Laparoscopy	62	41.2%
Laparotomy	88	58.7%
Time from admission to surgery	2-36 h	
Time of surgery		
Day time	72	44%
Night	78	56%
Seniority of the surgeon who did the surgery		
Consultant and senior specialist	58	38.7%
Junior specialist	86	57.3%
Senior resident	6	4.0%
Size of the ovary (cm)		
<5	26	17.3%
5-10	92	61.3%
>10	32	21.3%
Right	92	61.3%
Left	58	38.7%
Appearance of the torted ovary		
Dusky	28	18.6%
Brown to black	46	30.6%
Blackish, necrotic	76	50.7%
Number of twists		
Not documented	46	2-5
Documented	104	
Type of surgery		
Oophorectomy	40	26.6%
Detorsion with cystectomy	96	64%
Detorsion alone	14	9.3%
Fixation	22	14.6%

Histopathologic examination was done for 136 specimens. Simple cyst was the most common pathology, followed by dermoid cyst and serous, mucinous cystadenoma.

Forty-six women (33.8%) had a dermoid cyst, 42 (30.8.2%) had simple cysts, and 12 (8.8%) each had mucinous and serous cystadenomas. We had two cases of serous cystadenocarcinoma; one of them was postmenopausal and the other patient presented with torsion, for whom detorsion alone was done, and she got pregnant and was lost to follow-up.

She presented 2 weeks after delivery with recurrent torsion. Detorsion with cystectomy was done and the histopathology showed cystadenocarcinoma as presented in Table 5.

Discussion

Adnexal torsion occurs mostly in women of childbearing age, and adnexa removal on the affected side causes adverse effects. This study included 150 patients diagnosed with ovarian torsion surgically.

In our study, the majority of the women (88.6%) were of reproductive age, with age ranging between 14 and 40 years. The median age of women with ovarian torsion in the present study was 24 years, which is comparable to the median age in the study by Gupta *et al.*[50] and Tsafrir *et al.*[41] with range of age (29 ± 12)[41] and by Vijayalakshmi *et al.*[51] with the mean age of 39.7 years (mean 39.7, standard deviation [SD] 14.3).[51]

Out of total 150 patients, 58 women (36.6%) were nulliparous, 40 women were para 1 (26.7%), and 34 (33.7%) women were para 2 and more (44.4%). Our results corelate with the reports of Descargues *et al.*[52] and Gupta *et al.*;[50] 42% of their patients were nulliparous.[50,52]

Several longitudinal studies (retrospective reviews) of ovarian torsion in pregnancy estimated that 10%–25% of women with torsion are pregnant.[53,54] The main risk factors for OT in the first trimester are corpus luteum cysts and ovarian hyperstimulation. In our study, the incidence in pregnancy was 5.3% and is less than that reported by the previously mentioned studies.

Adnexal torsion is uncommon in postmenopausal women.[55] Eight (5.3%) of our patients were in the postmenopausal group; this is a little bit higher than that reported by Hibbard,[10] which was approximately 2.7%.

Spinelli *et al.*[9] presented a review of literature to discuss the management of ovarian torsion in children and adolescents. It was found that 76.7% cases were associated with underlying pathology, while in the remaining 23.3% cases, ovarian torsion was found with normal adnexa. In our study, 123 (76.7%) had ovarian mass and eight (4.7%) had polycystic ovarian syndrome (PCOS).

The preoperative diagnosis of ovarian torsion is challenging because of the nonspecific clinical presentation. All patients in our study had abdominal pain; 150 (100%) patients presented with acute-onset abdominal pain, while 14 (9.4%) had intermittent pain until presentation to the emergency room. Also, 108 (72%) patients reported nausea and vomiting. Fever was documented in 12 (8.0%) patients. Time from onset of symptoms to presentation was 1–36 h. Upon abdominal examination, 150 (100%) had lower abdominal tenderness. This is consistent with a systematic review of clinical data among patients with surgically diagnosed ovarian torsion, which noted that 97.5% reported abdominal

Table 5: Histopathology report

	Frequency	Percentage (%)
Dermoid	46	33.8
Functional cyst	42	30.8
Mucinous cyst adenoma	12	8.8
Serous cyst adenoma	12	8.8
Borderline tumors	2	1.5
Endometrioma	2	1.5
Hemorrhagic cyst	10	7.3
Serous adenocarcinoma	2	1.5
Granulosa cell tumor	2	1.5
Paratubal cyst	6	4.4

pain with associated nausea/emesis.[56] In another study done by Shadinger *et al.*,[57] in 2008, 39 cases of ovarian torsion were reviewed retrospectively. All patients presented with the chief symptom of abdominal pain (100%); 85% patients reported nausea and vomiting, while low-grade fever was seen in only 18% cases. Elevated WBCs was not a frequent finding in our study (found in only 34 [22.6%] patients), which was consistent with previous studies.[18,58]

Oltmann *et al.*[59] and Budhram *et al.*[60] reported that there is more likelihood of torsion when the size of the ovarian mass is 5 cm or larger. In our study, there were 110 (73.2%) cases having adnexal mass of size 5–10 cm, which had undergone torsion. This finding suggests a higher adnexal mass (>5 cm in size) as a risk factor for adnexal torsion. This is consistent with the report of Houry and Abbott.[4]

In our study, ultrasound (vaginal in married patients or abdominal in unmarried patients) was performed in all 150 (100%) patients and color Doppler was documented in 102 (68%) patients. The most common ultrasound finding in our study was enlarged ovary along with concomitant cyst showing thickened walls and echogenic contents due to hemorrhage and necrosis (136 [90.2%]). This is consistent with the finding of Servaes *et al.*,[25] who reported that the most common sonographic finding of OT was an enlarged and heterogeneous adnexal mass.

It was previously reported that despite the presence of ovarian torsion, Doppler ultrasonography[61,62] was normal in 60% of the cases because of the presence of a dual blood supply to the ovary; but this is contrary to our study which showed absent Doppler flow in 68 (67.3%) patients. Presence of Doppler flow does not exclude ovarian torsion as Doppler flow may be present in the early stage of torsion.

Similar to previous studies, ovarian torsion happened more frequently in the right ovary than the left ovary in our study also.[63] The fact that the hypermobility of the cecum and ileum on the right side compared to the proximity of the relatively fixed sigmoid colon is the proposed mechanism for this tendency.[64]

Laparotomy was the main approach to treatment of OT in the past. However, laparoscopy has now been popularized as a more reliable method of diagnosis and treatment of OT.[65] In our study, 88 (58.7%) patients underwent laparotomy and 62 (41.3%) patients underwent laparoscopy. In our study, the number of cases that underwent laparoscopy is less than that reported by Nair *et al.*,[5] where 81.7% of the torsion was treated by laparoscopy; this could be due to lack of experience by the junior doctors to do laparoscopy, as 86 (57.7%) and six (4.0%) of our cases were operated by junior specialists and senior residents, respectively. Also, 78 (56.0%) of our cases were operated at night when laparoscope may not be available and the staff on duty may not be experienced in laparoscopic surgery.

In our study, 96 (64%) patients underwent detorsion with cystectomy and 14 (9.3%) underwent detorsion alone. Performing a conservative surgery would have saved the ovarian function in these 110 patients (73.3%) patients. Ovarian salvage rate in this study was 73.3%. This is comparable to the ovarian salvage rates in adults reported in previous studies, which was 82% by Resapu *et al.*,[66] and is much more than that reported by Huang *et al.*[6] (35.8%).

Over the past years, oophorectomy was the standard treatment for adnexal torsion due to fear of thromboembolism.[67] Oophorectomy was done in 40 (26.6%) of our patients; eight of them were postmenopausal and in the remaining, surgeons claimed that they cannot preserve the ovaries.

Regarding pathological findings, the reported pathology in our study was benign in 146 cases (97%) and malignant in four cases (3.0%) (two cases of cystadenocarcinoma and two cases of granulosa cell tumors). White and Stella[68] and Rotoli[69] have reported in their case series about malignancy in 2% or lesser of cases of torsion.

The most common presentation in the current study was dermoid cyst (33.8%) and functional cysts (30.8%), whereas Balci *et al.*[70] reported dermoids (32.0%) and follicular cyst (14.6%) as the most common presentation.

The limitations of our study are that since it is a retrospective study, bias due to incomplete data might have crept in and the single-center design of the study. Only surgically proven cases of adnexal torsion were included, and we may have missed cases with the less-typical presentation of ovarian torsion who did not undergo surgery or cases with spontaneous detorsion of the ovary who were not classified as ovarian torsion. Patients with retorsion were not followed, and the reproductive potential of the retwisted ovary was not assessed.

Conclusion

Diagnosis of ovarian torsion is a difficult and challenging task which requires good clinical skills. High index of clinical suspicion is essential. Ultrasound with Doppler helps in diagnosing adnexal

mass with torsion. Once ovarian torsion is suspected, surgery is the mainstay of diagnosis and treatment. Laparoscopy is not only useful for diagnosis, but also for treating torsion with less morbidity. Conservative surgery is preferred for patients in the reproductive age group.

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Conflicts of interest

There are no conflicts of interest.

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