



## Original Article

## Effect of Ovarian Torsion on Fertility

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## ABSTRACT

Ovarian torsion (OT) accounts for two to five percent of all gynecological emergencies. Clinical evidence indicates that 90% of patients who had surgical detorsion have functioning ovaries, however, there is a lack of information on the effect of OT on fertility in women who have been identified and treated for OT. **Objectives:** To tackle gaps in research on how fertility is affected in women who have had ovarian torsion surgery, based on imaging results, intraoperative findings, and operation type. **Methods:** A combination of retrospective and prospective studies was carried out on patients who were treated for ovarian torsion at Dr. Soliman Fakeeh Hospital in Jeddah, Saudi Arabia. The study was carried out through information collected from hospital records of patients who underwent ovarian torsion treatment during the period from January 2010 until March 2020. Patients who fulfilled the eligibility criteria were contacted by telephone, and information was collected regarding pregnancy (fertility). In this study, 20 patients who fulfilled the eligibility criteria were included in the analysis. **Results:** The follow-up data on the patient's fertility showed that 14 (70%) women got pregnant and two patients who were already pregnant at the age of presentation of OT underwent term delivery. **Conclusions:** The study findings showed that ovarian torsion management irrespective of the type of treatment approach and procedure didn't significantly affect fertility, where 17(85%) of patients showed a positive outcome on fertility. However, surgeons need to follow a more conservative approach by preserving both ovaries as much as possible.

## INTRODUCTION

Ovarian torsion (OT) is an uncommon disorder characterized by partial or total twisting of the ovary and a segment of the fallopian tube on its ligamentous support, resulting in a cut-off or interruption of blood supply to the ovary and, in some cases, necrosis [1]. According to epidemiological studies, two to five percent of all gynecological crises are caused by this [2]. The majority of OT cases are caused by the presence of a cyst or tumor on the ovary, which can obstruct the ovary's blood flow, affecting the patient's fertility. However, 80% of ovarian cysts and masses are benign and often measure more than five centimetres in diameter [3]. Because of the increased risk of cancer, postmenopausal women who have cystic ovarian lesions should have a good follow-up and therapy. Pregnancy, infertility therapy, hypothyroidism, tamoxifen, maternal gonadotropins, cigarette smoking, and tubal ligation are all risk factors for ovarian cysts [4-7]. Pregnant

women have a greater risk of having a corpus luteal cyst, and 20% of pregnant women's OTs are due to this kind of cyst. Women who have necrosis of the torsion-affected ovary have no method of producing primordial follicles in the unaffected ovary, which might limit fertility [8]. According to a survey by Al-Turki et al., the prevalence of infertility in Saudi Arabia is estimated to be 18.3 % [9], which is higher than the Middle East region (3.8 %)[10] and the United States (7.5 %)[11]. Ovarian torsion is difficult to diagnose, and most patients have symptoms including severe lower abdomen or pelvic discomfort, cramping, nausea, vomiting, and fever [12]. Due to discomfort relating to the location of the kidney and pelvis, misinterpretation of ovarian torsion is a typical issue in clinical practice, and the differential diagnosis for this illness is extensive. Doppler sonography is a typical non-invasive test for detecting OTs because it can quickly reveal indications of

decreased or absent flow in the ovary owing to torsion [13]. Even though laparoscopy is the gold standard in the management of ovarian torsion, some authors suggest that it should be avoided in pregnant women because it may pose a risk to the fetus due to complicated access and prolonged working time, which may cause increased abdominal pressure and a reduction in uterine perfusion [14]. Treatment for OT has progressed over time, from surgical detorsion to excision of the afflicted ovary. A laparoscopic surgical technique that includes direct imaging of the torn ovary is frequently advised [15]. Even though clinical evidence demonstrates that 90% of patients who had surgical detorsion have functioning ovaries, there is a dearth of data on the effect on fertility in women who have been identified and treated with OT. The objective of this study was to address this insufficiency of information on how is fertility affected in women with OTs.

## METHODS

A combination of retrospective and prospective observational studies was carried out on patients who were being treated for ovarian torsion at Dr. Soliman Fakeeh Hospital in Jeddah, Saudi Arabia. The study was carried out on information collected from hospital records of patients who underwent ovarian torsion treatment done by laparoscopy or laparotomy from January 2010 until March 2020. Patients who fulfilled the eligibility criteria were contacted by telephone, and information was collected regarding pregnancy (fertility) and other treatment outcomes. All married women below the age of 45 years with ovarian torsion for a year or more and with confirmed torsion intraoperative were included in the study. Women with a history of infertility or those with malignant histopathological findings or who have used any kind of contraception methods were not included. The data collected from the patient records and through telephonic surveys were entered into SPSS version 23 for statistical analysis. Descriptive statistics in the form of frequencies and percentages using suitable tables and figures were used to represent categorical data. The relationship between treatment outcome (fertility) and other categorical variables was measured using Pearson's Chi-Square test. A p-value <0.05 was considered statistically significant. This research was approved by the Institutional ethics review board (IRB committee) at Dr. Soliman Fakeeh Hospital research center.

## RESULTS

In this study, 20 patients who fulfilled the eligibility criteria were included in the analysis. The baseline characteristics of the patients are given in Table 1. The follow-up data on the patient's fertility showed that 14 (70%) patients got

pregnant, two patients who were already pregnant while dealing with OT underwent term delivery, whereas three patients didn't get pregnant at all.

Characteristics		N(%)
Age presentation of ovarian torsion	<20	1(5.0%)
	20-24	2(10.0%)
	25-29	7(35.0%)
	30-34	5(25.0%)
	35-39	3(15.0%)
	40-44	2(10.0%)
Location of the torsion	Right	15(75.0%)
	Left	5(25.0%)
Type of imaging used	No imaging	2(10.0%)
	Ultra Sound	16(80.0%)
	Computer Tomography	2(10.0%)
Size of cyst	No cyst	7(35.0%)
	<=5 cm	5(25.0%)
	5.1- 10 cm	7(35.0%)
	Undetermined	1(5.0%)
Flow of Doppler	Normal	2(10.0%)
	Decrease	1(5.0%)
	Absent	14(70.0%)
	Undetermined	3(15.0%)
Ovary enlargement	No Enlargement	4(20.0%)
	>5 cm	3(15.0%)
	Bulky-Undetermined size	13(65.0%)
Edematous with peripheral follicles	Edematous	9(45.0%)
	No edema	11(55.0%)
Intraoperative Findings	No necrosis	2(10.0%)
	No necrosis but Bulky or edematous	2(10.0%)
	Bluish or dark	8(40.0%)
	Necrotic	3(15.0%)
	No comments	5(25.0%)
Diagnostic procedure	Laparoscopy	10(50.0%)
	Laparotomy	10(50.0%)
Management	Detorsion	2(10.0%)
	Detorsion + Cystectomy	5(25.0%)
	Detorsion + fixation	3(15.0%)
	Detorsion + cystectomy + fixation	1(5.0%)
	Oophorectomy	1(5.0%)
	Salpingectomy	5(25.0%)
	Others	3(15.0%)

**Table 1:** Baseline characteristics of patients (n=20)

On comparison of the relationship between different ages of OT exhibition with the outcome on fertility, there was no statistically significant association observed ( $p=0.759$ ) (Table 2).

Age group at presentation, years	Outcome on Fertility				p-value
	No follow up	Was pregnant, underwent smooth delivery	Got pregnant	Did not get pregnant	
<20	0	0	1(100%)	0	0.759
20-24	0	1(50%)	1(50%)	0	
25-29	0	0	6(85.7%)	1(14.3%)	
30-34	1(20%)	1(20%)	2(40%)	1(20%)	
35-39	0	0	2(66.7%)	1(33.3%)	
40-44	0	0	2(100%)	0	

**Table 2:** Age at presentation and Outcome on Fertility (n=20)

In our study, 15 (75%) of ovarian torsion was on the right side and the remaining on the left side was 25% (n=5). No statistically significant association was observed between OT location with the fertility (p=0.751). The imaging findings showed that 16 (80%) women used ultrasound imaging and 2 (10%) women used Computer Tomography (CT) (Table 3). The analysis showed that 14 (70%) of patients had complete loss of blood supply to the ovary during Doppler Ultrasound, while 12/14 (85.7%) got pregnant, which showed a statistically significant association (p=0.003) [Table 3]. In this study, all three patients who had enlarged ovaries of greater than five centimeters became pregnant, and out of 13 patients who had bulky ovaries with undetermined size, nine patients (69.2%) became pregnant whereas the remaining three didn't get pregnant (p=0.096). Out of 9 patients who had edematous ovary with peripheral follicles, 2 (22.2%) didn't get pregnant, whereas the remaining 7 (77.8%) became pregnant, which didn't show any statistically significant association with fertility outcome (p=0.367) (Table 3).

		Outcome on Fertility				p-value
		No follow up	Was pregnant, underwent smooth delivery	Got pregnant	Did not get pregnant	
Location of the torsion	Right	1(6.7%)	1(6.7%)	11(73.3%)	2(13.3%)	0.751
	Left	0	1(20.0%)	3(60.0%)	1(20.0%)	
Imaging findings	No imaging	0	0	2(100.0%)	0	0.544
	Ultra Sound	1(6.3%)	1(6.3%)	11(68.8%)	3(18.8%)	
	CTScan	0	1(50.0%)	1(50.0%)	0	
Flow of Doppler	Normal	0	0	0	2(100)	0.003
	Decrease	0	1(100.0%)	0	0	
	Absent	1(7.1%)	0	12(85.7%)	1(7.1%)	
	Undetermined	0	1(33.3%)	2(66.7%)	0	
Enlarged ovary	No Enlargement	0	2(50.0%)	2(50.0%)	0	0.096
	>5 cm	0	0	3(100%)	0	
	Bulky-un-determined size	1(7.7%)	0	9(69.2%)	3(23.1%)	
Edematous with peripheral follicles	Edematous	0	0	7(77.8%)	2(22.2%)	0.367
	No edema	1(9.1%)	2(18.2%)	7(63.6%)	1(9.1%)	

**Table 3:** Characteristics of Ovarian Torsion and Outcome of Fertility

During the intraoperative findings, it was found that 8 (40%) had bluish or dark ovaries, and 3 (15%) had necrotic ovaries. One patient who had a bluish or dark ovary and one patient who had a necrotic ovary didn't get pregnant, whereas all the patients who had normal intraoperative findings got pregnant (p=0.123). In the present study, 10 patients underwent Laparoscopy, and it was found that three patients who did Laparoscopy didn't get pregnant, whereas nine patients who did Laparotomy became pregnant (90%) while one patient failed to follow up. The details on management (treatment procedure) of ovarian torsion showed that only 2 (10%) of women underwent Detorsion, while Detorsion with Cystectomy was seen in 5 (25%) women, Detorsion with fixation in 3 (15%), Salpingectomy in 5 (25%), and one patient had Detorsion with cystectomy and fixation and another patient had undergone Oophorectomy. When we assessed the relationship between the type of management with fertility outcome, there was no statistically significant association observed (p=0.216) (Table 4).

		Outcome on Fertility				p-value
		No follow up	Was pregnant, underwent smooth delivery	Got pregnant	Did not get pregnant	
Intraoperative findings	No necrosis	1(50%)	0	1(50%)	0	0.123
	No necrosis but Bulky or edematous	0	0	2(100%)	0	
	Bluish or dark	0	0	7(87.5%)	1(12.5%)	
	Necrotic	0	0	2(66.7%)	1(33.3%)	
	No comments	0	2(40%)	2(40%)	1(20%)	
Diagnostic Procedure	Laparoscopy	0	2(20%)	5(50%)	3(30%)	0.067
	Laparotomy	1(10%)	0	9(90%)	0	
Management of torsion	Detorsion	1(50%)	0	1(50%)	0	0.216
	Detorsion + cystectomy	0	1(20%)	3(60%)	1(20%)	
	Detorsion + fixation	0	0	2(66.7%)	1(33.3%)	
	Detorsion + cystectomy + fixation	0	1(100%)	0	0	
	Oophorectomy	0	0	1(100%)	0	
	Salpingectomy	0	0	4(80)	1(20%)	
	Others	0	0	3(100)	0	

**Table 4:** Relationship of Procedure and outcome on fertility

## DISCUSSION

The results of this study demonstrate that 16 (80%) of the 20 patients had fertility preservation and had a successful birth after torsion therapy. We rely on asking patients if they become pregnant following the operation since pregnancy is the gold standard for evaluating ovarian function. Half of the patients had a laparoscopy, while the other half had a laparotomy. The laparoscopic approach is the preferred procedure among surgeons because it

requires less operating time, is less costly, and requires less hospitalization and recuperation time than the laparotomy approach [16, 17]. Some researchers have indicated that if ovary or fallopian tube cancer is detected, a laparotomy should be done [18, 19]. In around 55% of the OT cases, simple detorsion was used alone or in combination with other treatments to remove the associated cyst. Detorsion has been proven in several trials to be effective in restoring normal ovarian shape and function [20-22]. The size of the mass connected is the most important element in deciding which surgical method to choose [23]. A CRP level of 0.3 mg/dL was linked to a positive prognosis for ovarian conservation, according to Tobiume et al., [24] unfortunately, we were unable to get sufficient data on the patients' CRP levels for our investigation. The extra weight of the corpus luteum in pregnant women can induce torsion, thus it's best to keep the adnexa intact in these cases. It's especially important during the first 12 weeks of pregnancy because progesterone is created in the corpus luteum, which is necessary for the pregnancy's survival [25]. OT can affect women at any age, although it is more frequent in women in their reproductive years [26]. There were no significant variations in fertility outcomes across different stages of OT. Women's reproductive potential reduces as they become older owing to a variety of intrinsic and extrinsic variables like lifestyle, endocrine changes, and oxidative stress, putting their ability to conceive naturally at risk [25]. The risk of saving the ovary and becoming pregnant is once again present in late-stage OT, posing a significant barrier to recovering fertility. In the current study, 75% of torsions were diagnosed on the right side, and there were no statistically significant differences in fertility noted between right and left torsions. The OT is predominantly seen on the right side as the sigmoid colon on the left side prevents the incidence of torsion, and/or the infundibulopelvic ligament is longer on the right side [27]. The study findings showed that 70% (n=14) of OT patients had absent blood flow during Ultrasonography (US), and Doppler flow and 12 patients got pregnant after torsion management. In modern fertility management, transvaginal US plays an essential role, and maintenance of ovarian blood flow is a crucial aspect of reproductive physiology [28]. It is reported that pelvic ultrasound has a sensitivity of 40-75% in diagnosing ovarian torsion [29] and in our study, 80% of the OT cases were diagnosed using ultrasonography. In our study, the ultrasound finds suggested OT, the intraoperative finding did not show a negative effect on fertility. We outline our experience of ovarian torsion with a benign pathology and ischemia suggested by ultrasound at the time of diagnosis or intraoperative findings as not a contradiction for ovarian

preservation and no effect on fertility future. Ovarian torsion, if it happens during pregnancy, is often difficult to diagnose because of its non-specific signs and symptoms and is always confused with acute abdominal conditions. MRI is found to be useful in diagnosing torsion during pregnancy when it is difficult to visualize ovaries during the second and third trimesters using US [30]. OTs during pregnancy are rare and occur during the first half of the gestation period [31]. In such cases, early diagnosis and appropriate management are crucial to salvaging the ovary to continue the pregnancy and preserve the future functioning of the ovary. There is limited data on the long-term fertility issues in patients with surgery due to OT, and it has been reported that the loss of a single ovary should not affect fertility; contrary to this, there are women with ovarian torsion surgery having infertility treatment [8]. It has been reported by Turki et al., that the management of OT with a procedure such as a salpingo-oophorectomy increases the risk of infertility in women [9]. In our study, only one patient out of four who underwent a Salpingectomy didn't get pregnant, whereas there was only one patient who underwent Oophorectomy and suffered from infertility. In another study done by Bellati et al., [32] out of 35 patients who underwent unilateral ovariectomy, 17 had a successful pregnancy after a post-interval period of 10 years. There is a lack of evidence from human studies about unilateral ovariectomy and its effect on fertility outcomes. However, animal studies have demonstrated that unilateral ovariectomy does not decrease follicle reserve in the remaining ovary that doesn't have short- and long-term effects on animals' fertility potential [33, 34]. One of the major limitations of this study is its retrospective design, even though it has allowed us to evaluate the patients with prolonged follow-up. Another limitation is its relatively small sample size. Thirdly, we didn't record any information about the patient's Anti-Mullerian hormone (AMH) serum levels or assessment of pre-surgical fertility defects that contributed to infertility. One of the strengths of this study is that we excluded patients who were on any contraceptive methods during the post-operative period and who don't desire pregnancy, which could have allowed us to draw more conclusive data on fertility outcomes.

## CONCLUSIONS

The study findings showed that ovarian torsion management; irrespective of the ultrasound findings, intra-operative findings, and type of procedure; didn't significantly affect fertility, where 17 (85%) patients showed a positive outcome on fertility. However, surgeons need to follow a more conservative approach by preserving both ovaries as much as possible. The primary aim of any

torsion management procedure should be to preserve the conceiving capacity of the ovary while treating the disease at the same time.

### Conflicts of Interest

The authors declare no conflict of interest.

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