ORIGINAL ARTICLE

Management of adnexal torsion by laparoscopic approach

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Abstract The study aimed to evaluate the effectiveness and
safety of laparoscopic management of adnexal torsion. Early
minimal invasive surgical management of adnexal torsion
with the main emphasis on an organ-preserving procedure
can safely be recommended. Although the incidence of
adnexal torsions has increased, the morbidity rate has de-
clined due to safer diagnostics and operative strategies. This
is a retrospective case–control study (Canadian Task Force
classification II-3) of 33 cases of adnexal torsion over an 11-
year period (December 1999–September 2010) in a gyne-
cologic endoscopy unit of a university hospital. Interven-
tions include early diagnostic laparoscopy and utmost
protection of the surrounding tissue. Thirty-three cases of
laparoscopically managed adnexal torsions were analyzed.
Fifty-two percent had conservative organ-sparing proce-
dures, while 48 % underwent resection of ovary, tube, or
both. The mean operating time was 69.2 min. There were no
complications or conversions to laparotomy. The most com-
mon predisposing factor was an adnexal mass with symp-
toms of pain. Torsion on the right tube is more common than
on the left. Laparoscopic surgery is an effective, safe, and
feasible method in the diagnosis and treatment of adnexal
torsion.

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Introduction

Torsion of the adnexa is the fifth most common gynecologic
surgical emergency [1]. The condition is more common in
premenarcheal females (children or premenarcheal adoles-
cents) in whom torsion involving previously normal adnexa
may constitute up to 15–50 % of adnexal torsion cases [2]. It
is difficult to diagnose because although adnexal torsion
may present in the form of acute pelvic pain, the symptoms
can sometimes be deceptive. When the lesions are asymp-
tomatic, the diagnosis may be made only during the surgical
procedure. Doppler evaluation in cases of ovarian torsion
can be a useful tool, but it was found to be normal in 60 %
of these cases. The absence of Doppler flow was predictive
of surgically confirmed cases of ovarian torsion, demon-
strating the low sensitivity but high specificity of Doppler
studies in the diagnosis of torsion [3, 4].

In the past, adnexal torsion was treated by salpingo-
oophorectomy without untwisting the adnexa to avoid poten-
tial thromboembolism from ovarian vein thrombosis [5].
However, a significant association between thromboembolism
and untwisting an ischemic pedicle has never been established
[6]. Recently, a review of literature concluded that the risk of
pulmonary embolism after adnexal torsion was 0.2 % and was
not increased when the adnexa was untwisted. Over 400 cases
managed with untwisting the adnexa have been reported, with
no embolic phenomena [4, 6].

The conservative management of torsion with untwisting
(detorsion) of the fallopian tube and ovary has proved to be
safe and effective in multiple case series in the late 1980s
and early 1990s. This type of management, first proposed by

Way in 1946, is highly desirable since torsion occurs most often in women of reproductive age, and ovarian conservation is preferable in this age group.

Progress made in operative laparoscopy now suggests that treatment of adnexal torsion can be carried out laparoscopically which is the procedure of choice. Laparoscopic management of adnexal torsion has been shown to be feasible and preferable to laparotomy. The advantages of laparoscopy include short hospital stay and recovery time, in addition to the fact that conservative procedures, such as detorsion and ovarian cystectomy, can be done laparoscopically [7].

Patients and methods

Data from 33 patients with adnexal torsion who underwent laparoscopic management were collected retrospectively from the computerized operating logs of the Department of Obstetrics and Gynecology, University of Schleswig-Holstein, Campus Kiel, Germany over an 11-year period between December 1999 and September 2010.

All patients underwent a clinical examination, ultrasound scanning, routine blood count, electrolyte analysis, urine analysis, and coagulation profile. In patients diagnosed to have an adnexal cyst, tumor markers, namely, CA125 and CEA, were measured. Other imaging techniques, such as MRI, were done in selected cases according to the sonographic findings. Presence of any predisposing factors such as adhesions, neoplasm, and pregnancy were noted.

Data regarding patient's demographics, intraoperative findings, and the operation performed were obtained from the clinical records. Cases were included in the analysis only if there was evidence of torsion of the ovary, fallopian tube, or entire adnexa at the time of definitive surgical evaluation. The final pathological diagnosis was also documented.

Results

For 33 patients, the diagnosis of adnexal torsion during the study period was confirmed. The mean age of the patients was 34.9 years (range 14–68 years). Of the 33 patients, 4 patients (12 %) were in the premenarcheal age group, 23 patients (70 %) were in the reproductive age group, and 6

patients (18 %) were postmenopausal (Table 1). Four out of 23 patients in the reproductive age group (17 %) were pregnant at the time of the operative intervention. One of them had a singleton pregnancy of 10 weeks gestation and two patients had triplets [in vitro fertilization (IVF)/ICSI cycle] of 7 and 14 weeks gestation, respectively. Both of them had multiple ovarian cysts because of ovarian hyperstimulation syndrome (OHSS). One patient had cornual interstitial ectopic pregnancy of 6 weeks gestation as well as a dermoid cyst on the same side.

All 33 patients had a unilateral torsion. The torsion was more common on the right side (61 %, $n=20$) than on the left side (39 %, $n=13$). Fourteen patients (43 %) had only an ovarian torsion, 10 patients (30 %) only a tubal torsion, and 9 patients (27 %) had a torsion of the entire adnexa (Table 2). Multiple predisposing conditions were found in association with torsion. The most common association was adnexal cyst in 24 patients (72 %), adhesions in 10 cases (30 %), pregnancy in 4 cases (12 %), long tube in 3 cases (9 %), OHSS in 3 cases (9 %), endometriosis in 2 cases (6 %), and pelvic inflammatory disease (PID) in only 1 case (3 %). More than one predisposing factor exists in some patients. There was no identifiable cause in 10 cases (30 %) (Table 3).

The size of the adnexal mass was documented in 26 cases (79 %). Measurements were considered accurate only if the removed specimen was intact and measured at pathological examination. The diameter of the cyst ranged from 3 to 15 cm with a median size of 8 cm. There were nine tumors (35 %) which measured less than 5 cm in size and seven tumors (27 %) which measured more than 10 cm. The majority of them, 10 tumors (38 %), measured between 5 and 10 cm.

The categorization of the operations ranged from a conservative procedure, such as laparoscopic detorsion, to an aggressive procedure, such as adnexectomy. There was no conversion to laparotomy. In 17 cases (52 %), the adnexa were preserved by performing detorsion. In two cases (6 %), detorsion alone was performed, in 13 cases, (40 %) detorsion and cyst enucleation, and in another two cases (6 %), detorsion and cyst aspiration were performed (Table 4).

Following detorsion, we waited for about 30 min, if allowed by the operation conditions, for recovery. Meanwhile, the operative field was continuously irrigated with warm saline in order to observe any sign of reperfusion. After torsion, the enlarged and blood-filled tube, ovary, or whole adnexa, with a variable diameter, are usually dark blue to

Table 1 Patient demographics

Age group	No. (%)
Premenarcheal girls	04 (12)
Reproductive age	23 (70)
Postmenopausal	06 (18)

Table 2 Intraoperative data regarding side and site of torsion

Side of torsion	Right, 20 (61%)
	Left, 13 (39%)
Site of torsion	Ovary, 14 (43%)
	Tube, 10 (30%)
	Adnexa, 9 (27%)

Table 3 Conditions associated with adnexal torsion

Condition	No. (%)
Ovarian cyst (functional and organic)	24 (72)
Adhesions	10 (30)
Pregnancy	04 (12)
Long tube	03 (9)
OHSS	03 (9)
Endometriosis	02 (6)
PID	01 (3)
None	10 (30)

OHSS ovarian hyperstimulation syndrome, *PID* pelvic inflammatory disease

Table 5 Pathological diagnosis

Diagnosis	No. (%)
Functional ovarian cyst	7 (21)
Serous cystadenoma	3 (9)
Dermoid cyst	4 (12)
Endometrioma	2 (6)
Paraovarian cyst	7 (21)
Hydrosalpinx	3 (9)
Para tubal hydatid cyst	1 (3)
Ovarian fibroma	1 (3)
Normal adnexa	1 (3)
No histological specimen	4 (12)

black and partly necrotic. After detorsion, the according organ is left atraumatically to wait for any signs of reperfusion. This is a slight change of color towards a pinkish appearance; however, if reperfusion did not occur, the ovary, tube, or both were resected, which occurred in 16 patients (48 %). Unilateral salpingectomy was performed in 5 patients (15 %) and unilateral adnexectomy in 11 patients (33 %), 6 of them (37 %) were postmenopausal. The mean operating time was 69.2 min (range 40–120 min). No patient had serious complications, such as thromboembolic events, blood transfusion, febrile morbidity, or reoperation. The average duration of stay in the hospital was 2.5 days (range 1–3 days).

The histopathological reports revealed functional or developmental adnexal cyst in 15 cases (45 %), dermoid cyst in 4 cases (12 %), endometrioma in 2 cases (6 %), serous cystadenoma in 3 cases (9 %), ovarian fibroma in only 1 case (3 %), hydrosalpinx in 3 cases (9 %), and normal adnexa in 1 case (3 %) (Table 5). All removed tubes and ovaries showed focal necrosis next to hemorrhage in submucosal as well as orthotopic normal ovarian cortical tissue. There was no histopathological specimen in four patients (4 %) who underwent adnexal-sparing procedures.

Discussion

Despite recent progress with the color Doppler techniques [8], preoperative diagnosis is often difficult, and adnexal torsion can be confused with many other gynecological conditions. The surgical evaluation of these patients should be performed by laparoscopy, thereby avoiding unnecessary laparotomies.

Adnexal torsion is a rare condition which predominantly occurs in the reproductive age group although it has also been reported in premenarcheal girls [9, 10]. Unilateral torsion associated with an adnexal mass is seen more commonly although cases of torsion of normal adnexa have been reported [11]. The mechanism of adnexal torsion is not known conclusively; however, various theories, such as the presence of a long tube, sudden valsalva maneuver [12], pelvic congestion [13], and autonomic dysfunction of tubal peristalsis, have been suggested [14]. Factors that could possibly influence the occurrence of fallopian tube torsion are divided into two types: internal and external (Table 5). Taken together, the existing reports indicate that the mechanism underlying tubal torsion is apparently a sequential mechanical event (Table 6).

In our study, the most common predisposing factor was adnexal cyst in 24 patients (72 %). Ten patients (30 %) had no individual predisposing factors; however, an equal number of patients (30 %) had adhesions which may promote torsion. These results correspond with current literature [15]. Four patients (12 %) were pregnant. The presence of

Table 4 Operation performed for adnexal torsion

Operation	No. (%)
Only detorsion	2 (6)
Detorsion and cyst enucleation	13 (40)
Detorsion and cyst aspiration	2 (6)
Detorsion and adnexectomy	11 (33)
Detorsion and salpingectomy	5 (15)

Table 6 Intrinsic and extrinsic causes of fallopian tube torsion

Intrinsic	Extrinsic
Congenital anomalies	Changes in the neighboring organs
Excessive length of tube or spiral course	Neoplasm, adhesions, pregnancy
Acquired pathology	Mechanical factors
Hydrosalpinx, hematosalpinx, neoplasm, surgery	Movement or trauma to the pelvic organs
Autonomic dysfunction and abnormal peristalsis	Pelvic congestion

Table 7 Possible mechanisms for tubal torsion

- Mechanical disturbance
- Venous obstruction
- Lymphatic congestion
- Diffuse edema
- Tubal enlargement
- Tubal torsion

long tube, OHSS, endometriosis, and PID were all associated with less than 10 % of cases.

Adnexal torsion was more common on the right side (61 %) than on the left (39 %) which may be attributed to the protective effect of the sigmoid colon on the left side and subclinical appendicial infection on the right side, as confirmed, e.g., by Nichols [14]. In the present study, we encountered isolated ovarian torsion in 14 (43 %), entire adnexal torsion in 9 (27 %), and isolated fallopian tube torsion in 10 (30 %) patients. However, isolated fallopian tube torsion has been reported as sporadic cases by many authors [9, 16, 17].

The most common pathological diagnosis in our series was benign ovarian neoplasm (24 %). Half of them were dermoid cyst, functional ovarian cyst (21 %), paraovarian and paratubal cyst (24 %), endometrioma (6 %), hydrosalpinx (9 %), and normal adnexa (3 %). There was no case of malignancy in our series. Many studies report organic ovarian pathologies to be the most common pathological finding [1, 4]. Intrinsic and extrinsic causes of fallopian tube torsion and the possible mechanisms for tubal torsion are given in Tables 5 and 7.

Historically, the treatment of choice for adnexal torsion has been laparotomy and unilateral salpingo-oophorectomy. Although, there has been concern about the significant risk of thromboembolic events by detorsion, various reports, starting from as early as 1946 by S. Way, have suggested the safety of ovarian conservation by detorsion. Laparoscopy has been shown to be a favorable option in patients with torsion. There has been a trend towards increased used of laparoscopy and adnexal-sparing procedures in many centers because of its obvious benefits regarding safety, reliability, and preserving fertility [1, 7, 18, 19].

For the whole of our series, we were able to use laparoscopic surgery to treat 100 % of cases (33 patients) because there was no suspicion of neoplastic pathology during the diagnostic part of the laparoscopy. Seventeen cases of adnexal torsion (52 % of patients) benefited from conservative laparoscopic treatment. These patients underwent detorsion only, with or without cyst aspiration or enucleation. The majority of these were young women desiring fertility. In 48 % of cases, detorsion followed by salpingectomy or adnexectomy was performed. More than half of the patients having an adnexectomy were postmenopausal. In the recent literature, the rate of conservative laparoscopic treatment varies from 35 to 93 % [1, 4, 7, 18, 20].

Laparoscopy in early pregnancy provides a better chance for successful continuation of pregnancy. In our study, there were four pregnant women at the time of conservative laparoscopic surgery. One of the pregnant women who underwent laparoscopic detorsion and cyst aspiration during the 10th week of gestation has an ongoing pregnancy of 30 weeks gestation. Two women of 7 and 14 weeks gestation, with triplets after IVF, miscarried at 20 and 22 weeks, respectively, due to cervical incompetence. The last one had an interstitial ectopic pregnancy. Laparoscopy in pregnancy, especially in later pregnancy, is technically difficult owing to the increased risk of perforation and bleeding. Postoperatively, there is an increased risk of miscarriage or preterm delivery [21].

Conclusion

This study confirms that laparoscopy is the preferable approach for diagnosis and treatment of adnexal torsion. Conservative treatment should be considered in women within the reproductive age, still desiring fertility. Adnexectomy should only be considered beyond the reproductive age and really only in cases with extreme pathology on the adnexa.

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