Minimal surgery for the twisted ischaemic adnexa can preserve ovarian function

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BACKGROUND: Recently detorsion has replaced salpingo-oophorectomy as treatment for the twisted ischaemic adnexa. This paper assesses whether the ovary resumes normal function after preservation by detorsion.

METHODS: The results of detorsion performed between January 1988 and December 2001 were retrospectively analysed. Post-operative complications and subsequent ovarian function were assessed including: ultrasound monitoring of follicular development, adnexal appearance during subsequent surgery, and the outcome of IVF.

RESULTS: A total of 102 detorsions were performed; 67 by laparoscopy, 35 by laparotomy. No patient developed thromboembolism. Post-operative fever occurred in 15% of patients after laparoscopy and 29% after laparotomy \((P < 0.01)\). Patients were hospitalized for a mean \((\pm SD)\) of 2.1 \pm 1.2 and 7.4 \pm 1.5 days after laparoscopy and laparotomy respectively \((P < 0.001)\). Ultrasound showed normal follicular development in 93 and 91% of patients after detorsion by laparoscopy and laparotomy respectively. At subsequent surgery, the adnexa appeared normal in nine out of nine patients after laparoscopy and in four out of five patients after laparotomy. Four patients of the laparoscopy group and two patients of the laparotomy group underwent subsequent IVF. In all six patients oocytes retrieved from the previously ischaemic ovary were fertilized.

CONCLUSIONS: Detorsion with adnexal sparing is the treatment of choice for twisted ischaemic adnexa, and preferably performed by laparoscopy.

Key words: laparoscopy/laparotomy/twisted ischaemic adnexa

Introduction

Torsion of the adnexa is considered a surgical emergency. Until recently, the standard approach to the twisted ischaemic adnexa was salpingo-oophorectomy (Munro, 1996; Rapkin, 1996). Recently it has been suggested that detorsion is an alternative mode of treatment (Mage et al., 1989; Wagaman and Williams, 1990). For the last 15 years, we have routinely treated all patients with twisted ischaemic adnexa by detorsion, and salpingo-oophorectomy has been avoided (Bider et al., 1989). The advantages of ovarian preservation are clear, as adnexal torsion occurs most often in adolescent girls and in women of childbearing age (Haskins and Shull, 1986), most of whom desire future fertility. We originally performed the procedure in 25 patients by laparotomy. However, as the proficiency with laparoscopic surgery has increased, laparoscopy has replaced laparotomy. The purpose of this study was to assess the immediate post-operative course and subsequent ovarian function.

Materials and methods

Between January 1988 and December 2001, 110 patients were found to have black-bluish ischaemic adnexa at surgery. Eight patients were post-menopausal. These eight patients were treated by bilateral adnexectomy. The remaining 102 patients were children or women of childbearing age; they were included in the study. A presumptive diagnosis of adnexal torsion was made on the basis of abdominal pain, clinical examination including temperature, and ultrasound scanning (Graif et al., 1984). Prior to operation, a routine blood count, urine analysis and coagulation profile were performed.

All 102 patients underwent detorsion without oophorectomy or salpingo-oophorectomy, regardless of the ischaemic appearance of the adnexa. Detorsion was performed by laparoscopy in 67 patients and by laparotomy in 35 patients. Detorsion alone was performed in 36 patients. Thirty-four patients also had the ovarian cyst aspirated, 31 had the cyst excised, and one patient had ovariopexy performed as this was a repeat detorsion in a patient with polycystic ovaries (Table I). The duration of operation was not extended in order to observe signs of reperfusion.

Post-operative follow-up included physical examination with special emphasis on the clinical signs of thromboembolic phenomena.
Patients were reassessed at 8±10 weeks after discharge by pelvic examination and transvaginal ultrasound scanning to assess the size of both ovaries, and to demonstrate follicular development. Further evidence was also sought regarding ovarian viability. This included: (i) documentation of the macroscopic appearance of the previously twisted adnexa if a subsequent unrelated operation was performed, and (ii) documentation of fertilization of oocytes retrieved from the previously twisted adnexa in patients undergoing subsequent IVF. The follow-up period ranged from 2 months to 14 years with a median of 4.5 years.

Statistical analysis
Statistical analysis included two-way, non-paired Student’s t-test for continuous variables. Statistical significance was assumed at P < 0.05.

Results
The mean age of the 102 patients included in the study was 22.7 years (range 2.5–38). The time interval from the first appearance of symptoms until surgical intervention ranged from 2 to 144 h, with a median of 16 h. Twenty-six (25.4%) were pregnant on admission. Eighteen (17.6%) patients had ovarian hyperstimulation syndrome (OHSS), following treatment with menotrophins. Ten (9.8%) had a previous ovarian laparoscopic cystectomy, six (5.9%) were known to have polycystic ovaries. Eight had pre-operative fever, the highest temperature being 38.2°C.

Ovarian torsion was diagnosed by laparoscopy in 67 patients, and by laparotomy in 35 patients. The laparoscopy group was not different to the laparotomy group with respect to ethnic origin; 53% of the laparoscopy group were of European-American origin, 41% were of Asian African origin, and 6% were of mixed origin. The corresponding proportions in the laparotomy group were 54, 40 and 6% respectively. The mean adnexal size (ovary plus lesion) as measured by transvaginal ultrasound scanning was 7.5 ± 3.1 cm versus 12.4 ± 2.8 cm in the laparoscopy and laparotomy groups respectively (P < 0.001). In all patients, surgery revealed torsion of the adnexa with a gross macroscopic appearance of ischaemia, engorgement, black-bluish colour and distinct foci of haemorrhage. The mean number of twists was 2.5 times with a range of 0.5–5 times. Histological findings were available in 31 patients who underwent ovarian cystectomy concurrent with the detorsion (Table II).

In patients who underwent laparoscopy, the mean (± SD) duration of hospitalization was 2.1 ± 1.2 days compared with 7.4 ± 1.5 days after laparotomy (P < 0.001). There was a post-operative fever in 10 (14.9%) patients in the laparoscopy group, and 10 (28.6%) patients in the laparotomy group (P < 0.1, not significant). No fever persisted >2 days post-operatively. No patient had clinical signs of thromboembolism.

Vaginal ultrasound was available 8–10 weeks after operation, in 60 (89.5%) patients in the laparoscopy group and 32 (91.4%) patients in the laparotomy group (Table III). The 10 additional patients were lost to follow-up. The ovaries were of normal size and with normal follicular development in 56 of the 60 (93.3%) patients in the laparoscopy group, and 29 of the 32 (90.6%) patients in the laparotomy group. In seven of the 92 (7.6%) patients, ultrasound showed a small ovary with no follicles. Fourteen patients underwent subsequent unrelated operations within a 5 year period. In 13 of the 14 patients, the previously ischaemic adnexa had a normal macroscopic appearance. In the fourteenth patient, aged 7 years at detorsion, subsequent laparotomy (for appendicitis at age 12 years) showed a band of adhesions and no adnexa.

Five of the 102 (4.9%) patients had retorsion in the same adnexa within the follow-up period. All five patients had follicular development on post-operative ultrasonography. Retorsion was treated by repeat laparoscopic detorsion.

Table I. Surgical procedures

<table>
<thead>
<tr>
<th></th>
<th>Detorsion only</th>
<th>Detorsion and cyst aspiration</th>
<th>Detorsion and ovarian cystectomy</th>
<th>Detorsion and ovariopey</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laparoscopy</td>
<td>26</td>
<td>30</td>
<td>10</td>
<td>1</td>
<td>67</td>
</tr>
<tr>
<td>Laparotomy</td>
<td>10</td>
<td>4</td>
<td>21</td>
<td>0</td>
<td>35</td>
</tr>
<tr>
<td>Total</td>
<td>36</td>
<td>34</td>
<td>31</td>
<td>1</td>
<td>102</td>
</tr>
</tbody>
</table>

The eight post-menopausal women treated by adnexectomy are not included.

Table II. Histology of cyst excised at detorsion

<table>
<thead>
<tr>
<th></th>
<th>Follicular</th>
<th>Corpus luteum</th>
<th>Dermoid</th>
<th>Serous cystadenoma</th>
<th>Mucinous cystadenoma</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laparoscopy</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Laparotomy</td>
<td>5</td>
<td>8</td>
<td>7</td>
<td>0</td>
<td>1</td>
<td>21</td>
</tr>
<tr>
<td>Total</td>
<td>6</td>
<td>12</td>
<td>9</td>
<td>1</td>
<td>3</td>
<td>31</td>
</tr>
</tbody>
</table>

Table III. Preservation of ovarian function

<table>
<thead>
<tr>
<th>Diagnostic means</th>
<th>Proportion of ovaries preserved, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultrasound</td>
<td>85/92 (91.3)</td>
</tr>
<tr>
<td>Subsequent surgery</td>
<td>13/14 (92.4)</td>
</tr>
<tr>
<td>IVF</td>
<td>6/6 (100)</td>
</tr>
</tbody>
</table>

European-American origin, 41% were of Asian African origin, and 6% were of mixed origin. The corresponding proportions in the laparoscopy group were 54, 40 and 6% respectively. The mean adrenal size (ovary plus lesion) ± SD, as measured by transvaginal ultrasound scanning was 7.5 ± 3.1 cm versus 12.4 ± 2.8 cm in the laparoscopy and laparotomy groups respectively (P < 0.001). In all patients, surgery revealed torsion of the adnexa with a gross macroscopic appearance of ischaemia, engorgement, black-bluish colour and distinct foci of haemorrhage. The mean number of twists was 2.5 times with a range of 0.5–5 times. Histological findings were available in 31 patients who underwent ovarian cystectomy concurrent with the detorsion (Table II).

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Five of the 102 (4.9%) patients had retorsion in the same adnexa within the follow-up period. All five patients had follicular development on post-operative ultrasonography. Retorsion was treated by repeat laparoscopic detorsion.
These patients were given an urgent appointment for excision of the cyst.

Six patients underwent subsequent IVF. Oocytes retrieved from the previously ischaemic ovaries were fertilized in all six patients (Table III).

### Discussion

This retrospective study included 110 patients with ovarian torsion. Eight women were post-menopausal, and treated by bilateral adnexitomy. In post-menopausal women, ovarian function cannot be preserved, negating the need for detorsion. In the remaining 102 patients (children and women of childbearing age), detorsion was performed without adnexitomy in order to try to preserve ovarian function. The results of this series demonstrate that detorsion of the twisted black-blue ischaemic adnexa preserves ovarian function, as shown by follicular development on ultrasound, subsequent unrelated laparotomy and fertilization at IVF. Of the 102 patients in this series, 92 were assessed by ultrasound at 8–10 weeks after surgery. Follicles were demonstrated on subsequent ultrasound in 92.3% (85/92) of the ovaries, indicating that ovarian function had apparently been salvaged. However, in seven of the 92 patients (7.6%), no follicles could be demonstrated, the ischaemic insult to the ovary had been too severe to allow recovery. Unfortunately, there is no way to predict which ovaries have been too severely injured to recover. However, leaving the necrotic and non-viable ovaries in situ did not cause further injury to the patient. Further evidence of ovarian function was obtained from 14 patients who underwent subsequent unrelated laparotomy. In 13 patients, the ovary appeared normal. In only one of the 14 patients, no adnexitis could be identified on the side of the previous operation. The six patients who underwent IVF had oocytes retrieved from the previously ischaemic ovary. These oocytes were fertilized in all six patients, providing strong evidence of preservation of ovarian function. However, in order to confirm the impression that ovarian function is preserved, it is necessary to have long-term follow-up including serial ultrasound scans to confirm ovulation, and ovarian size. If oocytes are recovered from the ipsilateral ovary for IVF, follow-up of the oocytes and of subsequent pregnancies will indicate whether ovarian function has been fully preserved at detorsion.

Table IV summarizes the literature on detorsion, which refers to follow-up as obtained by a Medline search. Together with the present series, 198 cases have been documented. Follow-up was available in 172 patients from the series of Mage et al. (1989), Levy et al. (1995), Shalev et al. (1995) and Pansky et al. (2000). Ovarian function was preserved in 160 patients (93%). Mage et al. (1989) performed oophorectomy if the ovary appeared gangrenous at operation, and detorsion alone if the ovary did not appear gangrenous, and they concluded that conservative management of the non-gangrenous ischaemic adnexa is safe and effective. It is our opinion that even gangrenous-appearing adnexa should not be removed, since it is not possible to estimate the chance of the ovary recovering during operation (91.3% of patients with twisted bluish-black ovaries in this series recovered function). The average time from the onset of symptoms to surgery was 16 h in this series. The ability to retain viability despite prolonged ischaemia, as revealed by the good outcome in apparently severely injured ovaries, indicates that complete arterial obstruction does not usually occur, and some blood supply can still be obtained from either the ovarian or uterine arteries. The ischaemic–haemorrhagic appearance of the adnexa is due to venous and lymphatic stasis rather than gangrene. The adnexa was not excised in any of our patients, even if appearing gangrenous.

The twisted ischaemic adnexa is edematous and friable, and liable to be traumatized. Detorsion should therefore be performed with care, and preferably with blunt instruments if laparoscopy is used. We recommend that detorsion alone should be performed, and cystectomy should be avoided. In adnexal torsion, there is no clear plane of separation between the cyst and its bed. Excision of a cyst may cause an undue amount of ovarian tissue to be removed inadvertently. In this series, 18 of the 31 cysts removed were functional (Table II), and excision was not indicated. It is preferable to perform detorsion alone, and to perform cystectomy as a later elective procedure. Of the seven patients in whom ovarian function was impaired post-operatively, five (71.4%) had undergone ovarian cystectomy at the time of detorsion. However, if cystectomy is deferred, it should not be delayed too long, as five of the 92 (5.4%) patients who were followed up in this series had repeat torsion. In OHSS, cyst aspiration might be warranted at detorsion.

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**Table IV. Detorsion of twisted adnexa and subsequent ovarian function: review of literature**

<table>
<thead>
<tr>
<th>Study</th>
<th>No. of patients</th>
<th>Laparoscopy</th>
<th>Laparotomy</th>
<th>Subsequent functioning ovaries, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mage et al. (1989)</td>
<td>27</td>
<td>22</td>
<td>5</td>
<td>16/17 (94)</td>
</tr>
<tr>
<td>Levy et al. (1995)</td>
<td>3</td>
<td>3</td>
<td>–</td>
<td>3/3 (100)</td>
</tr>
<tr>
<td>Shalev et al. (1995)</td>
<td>58</td>
<td>58</td>
<td>–</td>
<td>49/52 (94)</td>
</tr>
<tr>
<td>Pansky et al. (2000)</td>
<td>8</td>
<td>8</td>
<td>35</td>
<td>7/8 (88)</td>
</tr>
<tr>
<td>Present study</td>
<td>102</td>
<td>67</td>
<td>35</td>
<td>85/92 (91)</td>
</tr>
<tr>
<td>Total</td>
<td>198</td>
<td>158</td>
<td>40</td>
<td>160/172 (93)</td>
</tr>
</tbody>
</table>

The articles listed are those in which adnexal sparing operations were performed, and in which follow-up data are available.
It has been stated (Nichols and Julian, 1985) that if the adnexal blood vessels are thrombosed, or the adnexa is gangrenous, excision is indicated without detorsion in order to lessen the chance of pulmonary embolism. There were no cases of thromboembolus after detorsion in the series of Mage et al. (1989), or in the series reviewed by Wagaman and Williams (1990). McGovern et al. (1999) compared the prevalence of pulmonary embolus in 672 patients after adnexitomy without detorsion, and 309 patients after detorsion. McGovern et al. (1999) concluded that detorsion of the twisted adnexa did not increase the risk of pulmonary embolus. No patient of the 102 in this series had clinical signs of pelvic or systemic thromboembolism. Therefore, the assumption that detorsion of the adnexa endangers the patient by exposing her to thromboembolism cannot be supported.

Detorsion can be performed by laparoscopy or laparotomy. Preservation of ovarian function was similar after either approach (93.3% after laparoscopy and 90.6% after laparotomy). Laparoscopy is associated with a shorter length of hospitalization, and greater degree of patient comfort. Therefore, in our opinion, laparoscopy is the preferred approach whenever experienced laparoscopists are available.

Our data strongly support the conservative approach for management of the twisted ischaemic adnexa whenever fertility is desired. Ovarian function was apparently maintained in 91.3% of patients. In the 8.7% of patients whose ovaries were irreversibly damaged by ischaemia, there was no further injury caused by attempted conservation.

References


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