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Ovarian remnant syndrome after laparoscopic oophorectomy

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Objective: To report the surgical history, clinical characteristics, and operative technique used in patients with ovarian remnant syndrome after laparoscopic oophorectomy.

Design: Observational study.

Setting: Teaching hospital and private practice office.

Patient(s): Nineteen patients with documented history of unilateral or bilateral laparoscopic oophorectomies with histologic confirmation of ovarian remnants.

Intervention(s): Operative laparoscopy for resection of ovarian remnants.

Main Outcome Measure(s): Risk factors and surgical technique contributing to ovarian remnant syndrome.

Result(s): The patients underwent a mean of 4.7 previous surgical procedures (range, two to nine): 12 had bilateral oophorectomy, and seven had unilateral oophorectomy. The infundibulopelvic ligament had been secured with bipolar desiccation in 11 patients, pretied surgical loops in six, and a linear stapler in two. Cystic ovarian remnants were identified by pelvic sonography in 12 women and by computed tomography (CT) scan in one. Six women underwent reoperation, two for ovarian remnants in different sites.

Conclusion(s): With laparoscopic oophorectomy there is risk of ovarian remnant due to improper tissue extraction or misapplication or improper use of pretied surgical loops, linear stapler, or bipolar electrodesiccation on the infundibulopelvic ligament, especially in women with a history of multiple pelvic surgeries, adhesions, or endometriosis. (Fertil Steril® 2000;74:1024–8. ©2000 by American Society for Reproductive Medicine.)

Key Words: Complication, operative laparoscopy, ovarian remnant syndrome, pelvic pain

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Ovarian remnant syndrome is defined as pelvic pain in the presence of residual ovarian tissue after salpingo-oophorectomy (1). Incomplete extirpation of the ovary is more apt to occur when it is densely adherent to the pelvic sidewall, rectosigmoid, and the cul-de-sac by endometriosis, adhesions, or pelvic inflammatory disease (2–5). As the residual ovarian tissue continues to function under gonadotropin stimulation, cyclic activity and cystic changes cause pain by exerting pressure on adjacent pelvic and retroperitoneal tissues including the posterior vagina, rectum, bladder, and ureter (6). In a recent study using an animal model, devascularized ovarian tissue became revascularized and functional in 75% of the animals (7).

Although the risk of incomplete ovary removal at laparotomy is established, laparoscopic techniques to perform oophorectomy have not been similarly scrutinized. A variety of methods have evolved to laparoscopically remove the ovary, including suture loop ligation (8, 9), bipolar desiccation (10), and linear stapling (11). However, if used improperly the laparoscopic approach can result in incomplete removal of ovarian tissue with subsequent development of ovarian remnant syndrome (12). Further, morcellation or removal of the ovary from the abdominal cavity during operative laparoscopy can lead to transplantation of ovarian fragments to any peritoneal surface. Marconi et al. (13) reported on a case where an autograft of ovarian tissue occurred in the incision of a surgical trocar from a previous laparoscopy. As laparoscopic techniques are now more commonly used to perform oophorectomy, there is concern that the incidence of

ovarian remnant syndrome will increase (7). We report our experience managing 19 cases of ovarian remnant syndrome that occurred after laparoscopic oophorectomy.

MATERIALS AND METHODS

Inclusion criteria were documented unilateral or bilateral laparoscopic oophorectomy and histologic confirmation of ovarian tissue after resection of the presumed ovarian remnant. Between July 1989 and April 2000, 19 women who were evaluated at the Center for Special Pelvic Surgery in Atlanta, Georgia, and Palo Alto, California, met the inclusion criteria. Institutional Review Board approval was not required for this study as it entailed the collection of existing data and patient confidentiality was maintained at all times. Most of the patients were of premenopausal age, and all presented with de novo pelvic pain following laparoscopic surgery. The mean ± SD age was 36.5 ± 7.2 years, with a median age of 36 and a range of 26–54. The diagnosis was based on preoperative imaging techniques in 13 women (ultrasound in 12, CT scan in one) and intraoperative findings in six (Table 1). Five patients had intravenous pyelograms, which were negative. In six of the 12 women who had undergone bilateral oophorectomy (cases 1, 2, 4, 9, 15, and 17), follicle-stimulating hormone (FSH) levels were measured preoperatively, and all were in the premenopausal range (FSH < 40 mIU/mL)(2).

Laparoscopic resection of the ovarian remnant(s) was performed a mean ± SD of 14.1 ± 13.6 months (median 9, range 3–49) after the laparoscopic oophorectomy. All operations were performed on an outpatient basis in the short-stay surgical unit at Northside Hospital in Atlanta, Georgia, and Stanford University Hospital in Palo Alto, California. A mechanical and chemoprophylactic bowel preparation was administered to all women before surgery (12). Each patient was preoperatively counseled regarding the risks with emphasis on conversion to laparotomy, surrounding structure injuries, and recurrence of the disease. Surgery was performed under general endotracheal anesthesia using multipuncture operative laparoscopy (14).

Intraabdominal adhesions were lysed, and the ovarian remnants were dissected using hydrodissection, CO_2 laser or scissors, and electrosurgery. Whenever an ovarian remnant was found to be adherent to the lateral pelvic sidewall (cases 1, 3–8, 11, and 15–19), the anatomy of the retroperitoneal space was identified by subperitoneal hydrodissection and systematic dissection down to the remnant of the infundibulopelvic ligament (10, 12, 14). Related adhesions were lysed until the course of the major pelvic blood vessels and the ureter could be traced and, if necessary, dissected. The ovarian blood supply was desiccated with bipolar electrosurgery, and the ovarian tissue widely excised, removed, and submitted for histologic evaluation.

Adhesions between the ovarian remnant and the surface of the rectosigmoid colon (cases 1–3, 6, 9, 10, 12, and 17) were hydrodissected over the serosa of the bowel, creating a plane of cleavage and safe zone for incision with the CO_2 laser (15). When the ovarian tissue was deeply embedded in the muscularis and an enterotomy was necessary for complete removal of the remnant, it was laparoscopically repaired with through-and-through single-layer stitches using 0 polyglactin suture (16). Sigmoidoscopy and examination under water were used to confirm that the repair was airtight.

Follow-up results were ascertained by return examination, telephone interview, or contact with the referring physician for an average of 18 months after surgery (range, 1–40 months).

RESULTS

All women had chronic pelvic pain including referral to the deep vagina, anus, and rectum that in 16 cases could be directly attributed to the location of the ovarian remnant. The remnants were unilateral in 18 women and bilateral in one (case 3). She developed bilateral cystic remnants after salpingo-oophorectomy for symptomatic severe postsurgical pelvic adhesions during two successive laparoscopic surgeries (28 and 6 months before this surgery). One woman had two ovarian remnants on the same side. Of the patients with unilateral remnants, seven had remnants on the left and 11 on the right. Seven women had unilateral oophorectomies, five on the right and two on the left. In the patients who had bilateral salpingo-oophorectomy with unilateral remnants, six remnants were in the left and five in the right.

All patients had multiple prior laparotomies and/or laparoscopies (mean 4.7, range, two to nine) for a variety of reasons including adhesiolysis, resection of endometriosis, and either partial or complete extirpation of the uterus, ovaries, and fallopian tubes. Laparoscopic oophorectomy had been performed using bipolar desiccation in 11 patients, securing the ovarian vessels with endoloops in six and application of a linear stapler in two. Thirteen patients had preoperative laboratory and imaging studies suggestive of ovarian remnant syndrome; the remaining six patients underwent diagnostic and operative laparoscopy for chronic pelvic pain, and the ovarian remnant was diagnosed intraoperatively.

Only nine patients could provide videotapes of their oophorectomy procedure, during which oophorectomy was done with endoloop for four patients and bipolar desiccation for five. For all endoloop patients and for one bipolar patient, it was clear from the videotapes that the endoloop application or the bipolar desiccation did not go well beyond the ovarian tissue. At the time of reoperation, the ovarian remnant was on the pelvic sidewall at the level of the infundibulopelvic ligament in all patients. In the remaining patients for whom bipolar desiccation was used, the remnants were either on the rectum or on the lower portion of the pelvic sidewall and pararectal area. The patients all had severe

TABLE 1

Patient characteristics.

Case no.	Age	No. of previous pelvic surgeries	Type of antecedent oophorectomy	Laparoscopic technique	Indicated pelvic pathology	Months from prior oophorectomy	Ultrasound findings	Associated procedures	Pathologic size of ovarian remnant (cm)
1	32	6	BSO	Bipolar	Endometriosis	4	Unilateral cysts	Enterolysis, ureterolysis	1.5 × 0.4 × 0.2
2	33	4	BSO	Bipolar	Endometriosis	9	Unilateral cysts	Resection of endometriosis, enterolysis, enterotomy and repair, ureterolysis	3.5 × 1.3 × 1.0
3	39	9	BSO	Bipolar	Adhesions	6	Bilateral cysts	Enterolysis, ureterolysis	Right, 8.0 × 2.0 × 0.6 Left, 7.0 × 2.0 × 0.8
4	35	5	BSO	Bipolar	Endometriosis	9	Unilateral cysts	Resection of endometriosis, enterolysis, ureterolysis	5 × 4 × 2
5	37	4	RSO	Endoloop	Endometriosis	7	None	Resection of endometriosis, left ovarian cystectomy, enterolysis, ureterolysis	2.1 × 1.3 × 1.1
6	35	4	BSO	Endoloop	Endometriosis	3	Unilateral cysts	Resection of endometriosis, enterolysis, ureterolysis	3.2 × 1.7 × 0.9
7	37	5	LSO	Bipolar	Endometriosis	8	None	Resection of endometriosis, enterolysis, ureterolysis	3.6 × 2.2 × 0.8
8	25	3	RSO	Endoloop	Endometriosis	4	None[a]	Resection of endometriosis, left ovarian cystectomy, ureterolysis	2.6 × 1.3 × 1.0
9	31	2	BSO	Endoloop	Endometriosis	9	Unilateral cysts	Resection of endometriosis, enterolysis	1.4 × 0.3 × 0.3
10	36	6	BSO	Bipolar	Endometriosis	8	Unilateral cysts	Enterolysis, ureterolysis, appendectomy	1.5 × 0.9 × 0.5
11	38	7	BSO	Stapler	Endometriosis	12	None	Resection of endometriosis, ureterolysis, appendectomy	1.0 × 0.5 × 0.3
12	48	3	RSO	Bipolar	Endometriosis	10	None	Resection of endometriosis, ureterolysis, enterolysis, LSO	4 × 3 × 3
13	41	5	BSO	Bipolar	Adhesions	15	Unilateral cysts	Enterolysis, right uterolysis treatment of pelvic fibrosis, excision of periuteral lesion	0.7 × 0.5 × 0.3
14	40	5	RSO	Stapler	Endometriosis	13	Unilateral cysts	LSO, resection of endometriosis	3.2 × 1.5 × 1.5
15	44	5	BSO	Endoloop	Adhesions	46	Unilateral cysts	Enterolysis, right uterolysis, treatment of retroperitoneal fibrosis	6.2 × 5.5 × 0.7
16	54	3	BSO	Bipolar	Adhesions	49	Unilateral cysts	Enterolysis, treatment of pelvic fibrosis	0.8 × 0.6 × 0.2
17	26	6	BSO	Bipolar	Endometriosis	20	Unilateral cysts	Enterolysis, ureterolysis, enterotomy and repair, treatment of endometriosis	0.7 × 0.3 × 0.2
18	26	4	RSO	Bipolar	Endometriosis	4	None	Treatment of pelvic endometriosis and fibrosis	1.5 × 1.2 × 0.3
19	41	7	LSO	Endoloop	Endometriosis	32	None	Ureterolysis, treatment of endometriosis and fibrosis	1.2 × 1.1 × 0.3 1.0 × 0.53 × 0.2

Note: BSO, Bilateral salpingo-oophorectomy; RSO, right salpingo-oophorectomy; LSO, left salpingo-oophorectomy.

[a] CT scan indicated remnant ovary on the right side.

Nezhat. Ovarian remnant syndrome after laparoscopic oophorectomy. Fertil Steril 2000.

endometriosis and adhesions, which sometimes required piecemeal removal of the ovary. However, a review of the videotapes showed that all of the ovarian tissue was apparently removed at the time of oophorectomy.

All of these patients' previous ovarian surgeries were due to adhesions and endometriosis. It is possible that a piece of ovary was detached during these procedures and was implanted in the surrounding tissues. Differentiation and recognition of these pieces can be difficult at times because of fibrosis, vascularity, and inflammation. It is also possible that this tissue became active after removal of both ovaries, as rising FSH and LH levels can have a stimulating effect.

In one case where a linear stapling device had been used, the ovarian remnant was attached to the pelvic sidewall and it appeared that the ovary was not completely mobilized from its attachments before removal. This implied that the stapler had not been properly applied well below the ovarian tissue.

Significant pelvic adhesions were noted intraoperatively in all patients, and active endometriosis in 15 patients. The ovarian remnant(s) was affixed to a variety of proximal deep pelvic tissues. It was strictly adherent to the lateral pelvic sidewall (broad ligament) in eight patients, the ureter in five, the rectum and/or rectosigmoid colon in nine, the posterior uterus in one, and to a residual uterosacral ligament in one.

The procedures lasted between 1.3 and 6.25 hours (mean, 2.9 hours). There were no intraoperative or postoperative transfusions. No serious intraoperative or postoperative complications occurred. Intentional enterotomy with primary laparoscopic repair occurred in two patients (cases 2 and 17) during dissection of ovarian remnants that were densely adherent to the rectum. Another patient had umbilical incision separation with omental protrusion on postoperative day 3, which was repaired under local anesthesia. Except for two of these women, who were discharged on the third and fourth postoperative days, all patients were discharged within 48 hours after surgery.

The tissue removed laparoscopically included ovarian stroma in three patients (cases 7, 8, and 19), a corpus luteal cyst in five (cases 9, 11, 13, 17, and 19), a follicular or luteinized follicular cyst in seven (cases 1, 3, 5, 10, 11, 14, and 15), and associated fallopian tube remnants in three (cases 6, 7, and 14). A general diagnosis of "ovarian tissue" was the descriptive pathology in 12 cases (cases 1–6, 12, and 15–19). There were six women who had undergone bilateral salpingo-oophorectomy and had premenopausal FSH levels before surgery. Their postoperative FSH levels were in the postmenopausal range (>40 mIU/mL). One of these 6 (case 17) was pain free with rising FSH to 80.9 mIU/mL up to 3 months postoperative. However, 1 month later, because of increasing pain, this patient had a pelvic ultrasound and a declining FSH suggestive of ovarian remnant in another site. This was confirmed by laparoscopy. There was no recurrence at the previous site

During the follow-up period, six women underwent reoperation: two for documented ovarian remnants in other sites (cases 4 and 17), one for intermittent bowel obstruction due to adhesions (case 1), and three for recurrent pelvic pain that was attributed to adhesions and endometriosis with no recurrent ovarian remnants (cases 6, 11, and 15).

DISCUSSION

Ovarian remnant syndrome can develop in any premenopausal woman who has an incomplete oophorectomy (17). The incidence of symptomatic ovarian remnants after oophorectomy by laparotomy is unknown (18), and it is not possible to determine the incidence of this complication following laparoscopic oophorectomy from the present series. Consequently, it is not clear whether the laparoscopic approach is associated with an increased risk for this complication. However, it is possible to determine from our series the major risk factors associated with an increased incidence of ovarian remnant syndrome developing after laparoscopic oophorectomy.

Women undergoing ovarian extirpation after piecemeal removal of the ovary during multiple previous surgeries are recognized to be at greatest risk for developing this syndrome (5, 18). This is affirmed by the fact that the women in this group averaged over four major pelvic surgeries before laparoscopic resection of the ovarian remnant(s).

Recently introduced techniques for laparoscopic management of the infundibulopelvic ligament include bipolar electrodesiccation, suture ligation with pretied surgical loops or laparoscopic suturing, and automatic linear stapling devices (12). The ovarian pedicle must always be divided well beyond the ovary to reduce the risk of an ovarian remnant.

In six patients in this series, ovarian remnant syndrome followed salpingo-oophorectomy using the endoloop technique. As described by Semm (19), the infundibulopelvic ligament must be freely mobile if an endoloop is used to ligate the ovarian blood vessels. Otherwise, the most proximal suture ligature may trap ovarian tissue on excision from this pedicle. It may be difficult to adequately place a surgical loop suture on the infundibulopelvic ligament, especially when adhesions or endometriosis distorts the anatomy or when the ovary is enlarged. These six cases may suggest a common long-term complication of the endoloop technique for securing the ovarian blood supply.

When the ovary is strictly adherent to the lateral pelvic sidewall secondary to severe endometriosis or old pelvic inflammatory disease, complete removal of the ovary may require wide excision of contiguous peritoneal tissues (6, 12, 18). Oophorectomy is best ensured by first entering the retroperitoneal space at the pelvic brim to identify and isolate the infundibulopelvic ligament and adjacent ureter as it enters the pelvis (3, 14, 20). The vascular supply to the ovary can be safely electrodesiccated and incised incrementally.

Using blunt dissection and hydrodissection to develop the retroperitoneal space, the ovary, ureter, and branches of the hypogastric vessels should be systematically delineated. The ovary is then removed along with any strictly adherent peritoneum using meticulous adhesiolysis in a stepwise fashion, always mindful of the proximity of the ureter. Depending on the degree and location of adhesions, complete ovarian resection may require segmental excision of densely adherent tissues of the posterior uterus, bowel, or bladder (14, 18, 21). Therefore, the laparoscopic approach may be associated with an increased risk of incomplete removal of the ovary.

The removal of the ovarian tissue from the abdomen through the laparoscopic ports has been a subject of concern. In cases of ovarian malignancy, implantation of tumor in the abdominal wall has been reported (22–24). The ability of devascularized ovarian tissue to reimplant on peritoneal surfaces has been shown in animal studies of cats and rats (1, 7). Evidence of transplantation of free ovarian tissue exists beyond the laboratory. Wood et al. (25) described one case that required reoperation after laparoscopic adnexectomy to remove a small portion of ovary that had been left in the abdomen and apparently implanted on the bladder. Fragments of ovarian tissue left in the abdomen may implant and become hormonally active.

Ideally, the ovary should be removed in one piece, placed in a surgical specimen bag, and extracted from the abdominal cavity through an enlarged trocar site, posterior colpotomy, or large trocar. However, in patients with severe endometriosis and paraovarian adhesions, the ovary may be fragmented and removed in pieces, and great care must be taken to assure complete removal. Copious irrigation of the abdominal cavity must be used to identify and extract all ovarian fragments.

Operative laparoscopy will likely continue to replace laparotomy for certain adnexal surgeries. Regardless of the altered mode of access, the course of surgery must follow the same methodology and technical principles used during laparotomy. Ovarian extirpation must be accomplished by surgical delineation of vital structures adjacent to the ovary, completely securing its vascular supply, and then by freeing it from its usual anatomic attachments and any adherent visceral surfaces.

This series of 19 cases of ovarian remnant syndrome after laparoscopic oophorectomy underscores the fact that despite the relative advantages of magnification and visual access to the deep recesses of the pelvis, laparoscopic removal of the ovary does not necessarily ensure its complete removal. Persistence of functioning residual ovarian tissue after laparoscopic oophorectomy may result from the improper use of looped suture ligatures or the linear stapler and incomplete extraction of ovarian fragments. Because of the complexity of the surgical management of ovarian remnant resulting in persistent pelvic pain and increasing risk of occurrence, it is advisable to decrease the chances of ovarian remnant using proper surgical techniques. In certain cases, ovarian remnant syndrome may not be preventable. When the ovary is densely adherent to adjacent visceral surfaces, the ability to differentiate ovarian tissue from surrounding structures based on color and consistency can be lost. In this case, the patient should be monitored for the development of symptomatic ovarian remnant syndrome.

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