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Indications for Laparoscopic Surgery of Ovarian Tumors

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Konno, R., Nagase, S., Sato, S., Fukaya, T. and Yajima, A. *Indications for Laparoscopic Surgery of Ovarian Tumors.* Tohoku J. Exp. Med., 1996, **178** (3), 225-231 —— To investigate the criteria for laparoscopic surgery in ovarian tumors, a retrospective review of indications, preoperative assessments using transvaginal ultrasonography, serum CA 125, surgical methods and diagnosis and post-operative complications were analyzed. Forty-three patients underwent surgical treatment for ovarian tumors, from November 1992 to October 1993. Of the 43 patients with ovarian tumors, 19 (44%) underwent laparoscopic surgery, and 24 (56%) underwent laparotomy. Laparoscopic surgery was performed in 18 of 34 (53%) patients with benign ovarian cysts. Eight patients with malignant ovarian tumors were treated by laparotomy. Coincidence of preoperative assessment and surgical diagnosis was 95%. No major complications were observed in the laparoscopic surgery. We suggest that malignant ovarian tumors and inextricable adhesions are contraindications to laparoscopic surgery. We propose the following criteria for laparoscopic surgery by classification into three groups: A) good indication: benign cystic tumors with good mobility, B) deliberation indication: benign tumors with poor mobility, including some dermoid cysts and endometrial cysts, C) contraindication: malignant tumors and dense adhesions. We conclude that indications of laparoscopic surgery for ovarian tumors should be determined by careful preoperative assessment using transvaginal ultrasonography and tumor markers. ———— laparoscopic surgery; ovarian tumors; indication; CA 125; ultrasonography

Laparoscopic surgery in gynecology (Semm 1987; Peterson et al. 1990; Grimes 1992), although not a new procedure, has become popular in the last few years in Japan (Fukaya et al. 1994; Konno et al. 1994; Nagase and Konno 1994). Laparoscopic surgery for ovarian lesions has several advantages (Pittaway et al. 1994), but a lack of careful adherence to indications and protocols has the potential of an adverse impact on women with ovarian tumors (Parker and Berek

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1993; Seltzer 1993). The criteria for the safe and appropriate use of laparoscopic surgery have not been fully developed (Mettler et al. 1993). We combine the use of transvaginal ultrasonography and serum CA 125 values for preoperative evaluation of ovarian masses. We report our assessment of the criteria for indications and limitations of laparoscopic surgery for ovarian tumors.

Subjects and Methods

Forty-three patients underwent surgical treatment of ovarian tumors during November 1992 to October 1993.

The cases were reviewed retrospectively with particular interest in the indications, preoperative assessment, surgical methods, surgical diagnosis, and postoperative complications. Transvaginal ultrasonographic examination of ovarian tumors was performed using a Sonovista EX (Mochida Seiyaku, Tokyo) with a 7.5 MHz transvaginal probe. Serum CA 125 levels were determined by radioimmunoassay and levels below 35 U/ml were considered normal. All patients and their families were preoperatively counseled and informed consent was obtained. The laparoscopic surgery was performed in a fully equipped operating suite with immediate laparotomy capability available. All procedures were performed under general anesthesia with endotracheal intubation.

Results

During the 12-month period, 238 women underwent gynecologic surgery. Surgery for 43 cases of ovarian tumors was performed with laparoscopic surgery in 19 cases (44%) and laparotomy in 24 cases (56%). Conversion from laparoscopic surgery to laparotomy occurred in only one patient due to severe adhesions. No complications were observed in patients who underwent laparoscopic surgery.

Table 1. *Indications for laparoscopic surgery or laparotomy of ovarian tumors*

Surgical diagnosis	Number of surgery			Incidence of laparoscopic surgery
	Total	Laparotomy	Laparoscopic	
Benign ovarian tumors	34	16	18	(53%)
Dermoid cyst	12	6	6	(50%)
Serous cyst adenoma	7	4	3	(43%)
Mucinous cyst adenoma	1	1	0	(0%)
Endometrial cyst	6	3	3	(50%)
Polycystic ovary	6	0	6	(100%)
Fibroma	2	2	0	(0%)
Paraovarian cyst	1	0	1	(100%)
Malignant ovarian tumors	8	8	0	(0%)
Total	43	24	19	(44%)

Out of 34 women with benign ovarian tumors, 18 (53%) patients underwent laparoscopic surgery and 16 (47%) patients underwent laparotomy. The incidence of laparoscopic surgery is shown in Table 1: 50% for dermoid cysts, 43% for serous cyst adenomas, and 50% for endometrial cysts. All polycystic ovaries in infertile patients were treated by laparoscopic laser drilling or electrocoagulation. Mucinous cyst adenomas and fibromas were removed by laparotomy. All eight

TABLE 2. *Preoperative and surgical diagnosis of ovarian tumors*

Preoperative diagnosis (A)		Surgical diagnosis (B)		Coincidence of (A) and (B)
Benign ovarian tumors				
Dermoid cyst	11	Dermoid cyst	11	(100%)
Serous cyst adenoma	9	Serous cyst adenoma	7	(78%)
		Dermoid cyst	1	
		Paraovarian cyst	1	
Endometrial cyst	6	Endometrial cyst	6	(100%)
Polycystic ovary	6	Polycystic ovary	6	(100%)
Benign, but suspicion of malignancy				
Mucinous cyst adenoma	1	Mucinous cyst adenoma	1	(100%)
Fibroma	2	Fibroma	2	(100%)
Malignant ovarian tumors				
Malignant tumors	8	Malignant tumors	8	(100%)
Total	43			(95%)

TABLE 3. *Preoperative indications for laparotomy*

Surgical diagnosis	Preoperative reason for laparotomy					Number of laparotomy /surgery
	Suspicion of malignancy	Abnormal tests	Severe adhesion	Emergency	Inflammation	
Benign ovarian tumors						16/34
Dermoid cyst			3*	2	2*	6/12
Serous cyst adenoma		1	1		2	4/7
Mucinous cyst adenoma	1					1/1
Endometrial cyst		3				3/6
Polycystic ovary						0/6
Fibroma	2					2/2
Paraovarian cyst						0/1
Malignant ovarian tumors	8					8/8
Total	11	4	4	2	4	24/43

*Complicated factors.

women with malignant tumors underwent laparotomy.

Preoperative diagnosis and surgical diagnosis were reviewed (Table 2) and the coincidence between preoperative and surgical diagnosis was 95%. Nine tumors were assessed preoperatively as serous cyst adenomas including two tumors, a dermoid cyst, and a paraovarian cyst. The remainder of the preoperative diagnosis were unchanged from the surgical diagnosis. Of interest, no incorrect diagnosis of malignant tumors was observed.

Common reasons for laparotomy were suggestive of malignancy (Table 3). Eight malignant tumors, one mucinous cyst adenoma, and two fibromas were suggestive of malignancy by computed tomography, transvaginal ultrasonography and CA 125.

Two patients had emergency laparotimies for a torsion of a dermoid cyst. Although indicated for laparoscopic surgery, we were unable to prepare the equipment in time for laparoscopic surgery.

Discussion

When a surgeon is considering laparoscopic surgery for ovarian tumors, it is essential that this should be done with strict adherence to careful preoperative criteria and intraoperative protocols. We propose a criteria and limitations of laparoscopic surgery of ovarian tumors (Table 4) using the combination of ultrasonography (Herrmann et al. 1987) and tumor markers, especially serum CA 125 (Vasilev et al. 1988). Transvaginal ultrasonography is preferred over the transabdominal examination due to the proximity of the vaginal probe to the pelvic structures allowing greater resolution and image clarity (Higgins 1989; Konno et al. 1992). Ultrasonographic findings of irregular borders, papillomatous lesions, solid regions, thick septa, or matted bowel raise concerns for the possibility of malignancy and laparotomy should then be performed (Parker and Berek 1993).

Group A: Good indication group. This group includes benign tumors with

Table 4. *Criteria of indications for laparoscopic surgery in ovarian tumors*

Factors	A Good indication	B Deliberation indication	C Contraindication
Histology	Benign	Benign	Malignant
Mobility	Good	Poor	Fixed
Component	Simple	Mixed	Solid, mixed
Image analysis	Simple	Complex	Complex, solid
Tumor markers	Negative	Negative (except CA 125)	Positive
Dermoid cyst	Less fatty	Fatty	Solid
Endometrial cyst	Less adhesive	Abnormal CA 125	Adhesive
Infertility	Polycystic ovary	Entero-salpingo adhesion	
Others	Diagnostic	Emergency, pregnancy, etc.	Acute inflammation

good mobility, simple ultrasonic description, and normal tumor markers. Laparoscopic management is the preferred procedure in patients with non-complexed adnexal masses and a normal CA 125 level (Shalev et al. 1994). Less fatty dermoids and less adhesive endometrial cysts also were good indications for laparoscopic surgery. Laparoscopic drilling of polycystic ovaries in the infertile patient was safe and effective treatment (Daniel and Miller 1989; Fukaya et al. 1995).

Group B: Deliberation indication group. This group needs careful consideration before the procedure and includes tumors with limited mobility because of adhesions due to previous surgery or pelvic inflammation, a dermoid cyst, a chocolate cyst, and undetected malignant tumor. Dermoid cysts are suggested if one of three following criteria is present: a densely echogenic tubercle associated with a cystic echo pattern; thin, echogenic, band-like echoes; or a dense echo pattern with or without a cystic component (Mais et al. 1995). Although elevations of serum CA 125 are associated with endometriosis, adenomyosis, dermoid cysts and peritonitis, it was the most reliable marker for discriminating benign from malignant ovarian tumors (Gadducci et al. 1992).

Group C: Contraindication to laparoscopic surgery. This group includes malignant tumors, solid or fixed tumors with severe adhesions and severe acute inflammation. Laparoscopic surgery of ovarian cancer is a controversial topic. Although some studies suggest that intraoperative rupture of ovarian cancer does not have an adverse effect on the prognosis of the patient (Grogan 1967; Dembo et al. 1990), other reports suggest that intraoperative rupture has a negative effect on survival (Webb et al. 1973; Sainz de la Cuesta et al. 1994). We propose that removal of ovarian cancer is not suitable for laparoscopic surgery. We have insufficient data to evaluate laparoscopic surgery for ovarian cancer. It is preferable to have a controlled prospective randomized study to evaluate the merits and risks of laparoscopy for the resection of malignant ovarian tumors.

Careful preoperative assessment will reduce the possibility of inadvertently encountering malignancy, but will not entirely eliminate the risk (Maiman et al. 1991). Diagnostic laparoscopy is a useful alternation to determine the presence of malignancy. At the time of laparoscopy, peritoneal fluid sample can be obtained for cytology, then the ovary, contralateral ovary, pelvic peritoneum, colic gutters, omentum and bowel should be carefully inspected. Ovarian cysts that appeared benign should be aspirated with care to minimize spillage. Pathologic examination by frozen section should be performed. If any suggestion of malignancy is present at the time of laparoscopy, the patient should undergo an immediate laparotomy. Using cautious management and strict guidelines, laparoscopic diagnosis of adnexal masses appears reliable and safe, allowing for immediate and adequate surgical treatment of malignancies (Canis et al. 1994).

We propose that malignant ovarian tumors and inextricable adhesions are contraindicated to laparoscopic surgery. We suggest that the eligibility for

laparoscopic surgery of ovarian tumors is determined by appropriate preoperative assessment using careful physical findings, transvaginal ultrasonography, and CA 125.

References

1) Canis, M., Mage, G., Pouly, J.L., Wattiez, A., Mahnes, H. & Bruhat, M.A. (1994) Laparoscopic diagnosis of adnexal cystic masses: A 12-year experience with long-term follow-up. *Obstet. Gynecol.*, **83**, 707-712.
2) Daniel, J.F. & Miller, W. (1989) Polycystic ovaries treated by laparoscopic laser vaporization. *Fertil. Steril.*, **51**, 232-236.
3) Dembo, A.J., Davy, M., Stenwig, A.E., Berle, E.J., Bush, R.S. & Kjorstad, K. (1990) Prognostic factors in patients with stage I epithelial ovarian cancer. *Obstet. Gynecol.*, **75**, 263-273.
4) Fukaya, T., Mansfield, C., Konno, R. & Yajima, A. (1994) Endoscopic treatment for the infertile women with pelvic adhesion. *Surg. Endosc.*, **8**, 514.
5) Fukaya, T., Murakami, T., Tamura, M., Watanabe, T., Terada, Y. & Yajima, A. (1995) Laser vaporization of the ovarian surface in polycystic ovary disease results in reduced ovarian hyperstimulation and improved pregnancy rates. *Am. J. Obstet. Gynecol.*, **173**, 119-125.
6) Gadducci, A., Ferdeghini, M., Prontera, C., Moretti, L., Mariani, G., Bianchi, R. & Fioretti, P. (1992) The concomitant determination of different tumor markers in patients with epithelial ovarian cancer and benign ovarian masses: Relevance for differential diagnosis. *Gynecol. Oncol.*, **44**, 147-154.
7) Grimes, D.A. (1992) Frontiers of operative laparoscopy: A review and critique of the evidence. *Am. J. Obstet. Gynecol.*, **166**, 1062-1071.
8) Grogan, R. (1967) Accidental rupture of malignant ovarian cyst during surgical removal. *Obstet. Gynecol.*, **30**, 716-720.
9) Herrmann, V., Locher, G. & Goldhirsch, A. (1987) Sonographic patterns of ovarian tumors: Prediction of malignancy. *Obstet. Gynecol.*, **69**, 777-781.
10) Higgins, R. (1989) Transvaginal sonography as a screening method for ovarian cancer. *Gynècol. Oncol.*, **34**, 402-405.
11) Konno, R., Sato, S. & Yajima, A. (1992) Transvaginal ultrasound screening for ovarian tumor. *Acta Obstet. Gyneac. Jpn.*, **44**, 109-112. (in Japanese)
12) Konno, R., Fukaya, T., Nagase, S. & Yajima, A. (1994) Indication for laparoscopic surgery of adnexal tumors. *Surg. Endosc.*, **8**, 455.
13) Mais, V., Guerriero, S., Ajossa, S., Angiolucci, M., Paoletti, A.M. & Melis, G.B. (1995) Transvaginal ultrasonography in the diagnosis of cystic teratoma. *Obstet. Gynecol.*, **85**, 48-52.
14) Maiman, M., Seltzer, V. & Boyce, J. (1991) Laparoscopic excision of ovarian neoplasms subsequently found to be malignant. *Obstet. Gynecol.*, **77**, 563-565.
15) Mettler, L., Irani, S. & Semm, K. (1993) Ovarian surgery via pelviscopy. *J. Reprod. Med.*, **38**, 130-132.
16) Nagase, S. & Konno, R. (1994) Laparoscopic treatment of adnexal torsion of hyperstimulated ovary in pregnancy. *Acta Obstet. Gynaec. Jpn.*, **46**, 543-545. (in Japanese)
17) Parker, W.H. & Berek, J.S. (1993) Management of the adnexal mass by operative laparoscopy. *Clin. Obstet. Gynecol.*, **36**, 413-422.
18) Peterson, H., Hulka, J. & Phillips, J. (1990) American association of gynecologic laparoscopists 1988 membership surgery on operative laparoscopy. *J. Reprod. Med.*, **35**, 587-589.
19) Pittaway, D.E., Takacs, P. & Bauguess, P. (1994) Laparoscopic adnexectomy: A comparison with laparotomy. *Am. J. Obstet. Gynecol.*, **171**, 385-391.

20) Sainz de la Cuesta, R., Goff, B.A., Fuller, A.F., Jr., Nikrui, N., Eichorn, J.H. & Rice, L. (1994) Prognostic importance of intraoperative rupture of malignant ovarian epithelial neoplasms. *Obstet. Gynecol.*, **84**, 1-7.
21) Seltzer, V. (1993) Laparoscopic surgery for ovarian lesions: Potential pitfalls. *Clin. Obstet. Gynecol.*, **36**, 402-412.
22) Semm, K. (1987) *Operative Manual of Endoscopic Surgery*. Year Book Medical Publishers, Chicago.
23) Shalev, E., Eliyahu, S., Peleg, D. & Tsabari, A. (1994) Laparoscopic management of adnexal cystic masses in postmenopausal women. *Obstet. Gynecol.*, **83**, 594-596.
24) Vasilev, S., Schlaerth, J., Campeau, J. & Morrow, P. (1988) Serum CA-125 levels in preoperative evaluation of pelvic masses. *Obstet. Gynecol.*, **71**, 751-756.
25) Webb, M., Decker, D., Mussey, E. & Williams, T. (1973) Factors influencing survival in stage I ovarian cancer. *Am. J. Obstet. Gynecol.*, **116**, 222-228.