

## Evaluating the Efficacy of Adhesiolysis at Early Second-Look Laparoscopy for Women Undergoing Bilateral Ovarian Surgery

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**Abstract :** Objective : To evaluate adhesion formation and efficacy of early second-look laparoscopic adhesiolysis in the management of adhesions and the preservation of tubal patency after ovarian conservative surgery in a prospective study. Methods : Eighteen patients underwent second-look laparoscopy between 5 and 9 days after bilateral ovarian conservative surgery (laparoscopy group). In this group, post-operative adhesion formation and the preservation of tubal patency was evaluated at second-look laparoscopy. Twenty-two patients who underwent only bilateral ovarian surgery were allocated to a control group. Hysterosalpingography was performed to evaluate the adhesion formation and the tubal patency in both groups. The degree of adhesion formation and the preservation rate of tubal patency were graded according to our simple grading method. Results : At second-look laparoscopy, 28 adnexa were adhered and only 3 adnexa were adhesion-free in laparoscopy group. Laparoscopic adhesiolysis could free 25 adnexa from adhesion. HSG evaluated that only 5 out of 41 adnexa were free from adhesion in the control group. However, 23 out of 31 adnexa demonstrated normal HSG findings, thus suggesting no adhesion formation ( $p < 0.01$ ). HSG also demonstrated that tubal patency was significantly better preserved in laparoscopy group than in control group (96.8% vs. 70.7% ;  $p < 0.01$ ). Conclusions : These results suggest that early second-look laparoscopy is efficacious in preventing adhesion re-formation and tubal obstruction after bilateral ovarian conservative surgery.

**Key words :** Ovarian conservative surgery, Adhesion, Second-look laparoscopy, Laparoscopic adhesiolysis, Tubal obstruction

### Introduction

The development of post-surgical adhesion of the fallopian tubes is one of the most important problems for women who wish to get pregnant after undergoing pelvic surgery. In the past twenty years, many valuable procedures have been developed to prevent post-surgical adhesion.<sup>1)-4)</sup> However, many tubo-ovarian adhesions are still observed at second-look laparoscopy,<sup>5)-10)</sup> and on hysterosalpingography (HSG).<sup>11)-12)</sup>

Since the early 1980s, there have been several re-

ports suggesting that early laparoscopy was useful in identifying peritubal adhesions and to free such adnexa from adhesions.<sup>5)-10)</sup> Nevertheless, the efficacy of adhesiolysis at early laparoscopy has not yet been clarified, because no randomized control study has been done.<sup>6,8,10)</sup> This is because it may not always be medically feasible or ethically acceptable to do a randomized control trial as a sham operation with no manipulation for adhesiolysis at early laparoscopy and followed up by a third-look laparoscopy in such patients. On the other hand, HSG is considered to be much more convenient for such patients and it is now widely used for evaluat-

ing the patency of the fallopian tubes and tubo-ovarian adhesions,<sup>13,14)</sup> although its diagnostic accuracy for identifying peritubal adhesions remains controversial.<sup>15)-19)</sup> Therefore this prospective study was designed to evaluate the efficacy of early laparoscopic adhesiolysis by HSG in the prevention of post-surgical tubo-ovarian adhesion and of post-surgical tubal occlusion in patients who underwent bilateral ovarian conservative surgery.

### Subjects and methods

#### *Profiles of patients*

Forty patients who had for the most part consecutively undergone operations during the 4-year study period at Kyushu University Hospital were recruited to this study. The Ethics Committee of Kyushu University approved this study, and written informed consent was obtained from all participants. All women who desired to bear a child after ovarian surgery underwent bilateral ovarian conservative surgery, such as an ovarian cystectomy, ovarian wedge resection, or ovarian biopsy for a benign ovarian lesion. The conservative ovarian surgery was performed only by a laparotomy in these patients during study period at Kyushu University Hospital. Eighteen women who agreed to receive second-look laparoscopy underwent early laparoscopy at between the 5th and

9th day after the laparotomy and were allocated to the laparoscopy group, while twenty-two women who did not agree were allocated to the control group. To prevent any post-surgical adhesion formation, 50 to 100 ml of 32% dextran 70 (Hyscon, SHIONOGI & CO., LTD, Tokyo, Japan) was routinely poured into the pelvic cavity just before closing the peritoneum both during the laparotomy and during the early laparoscopy.<sup>1)</sup> The tubal patency was confirmed by the chromatubation method at the end of both the laparotomy and the laparoscopy. The profiles of the women in these two groups are shown in Table 1. There were no significant differences between two groups regarding age, marital status, rate of infertile women, varieties of disease, types of operations and the interval between the laparotomy and HSG.

#### *The procedures of early laparoscopy*

Early laparoscopy was performed on the 7th post-surgical day in 15 out of 18 women, on the 5th day in 2 women and on the 9th day in 1 woman. All pelvic findings and adhesiolytic procedures were monitored by a video camera (CIRCON-NTSC, Santa Barbara, CA, or STRYKER-782, San Jose, CA) and recorded on a video tape recorder (HITACHI-VT-S625, Tokyo, Japan). The videotapes were reviewed by one of the authors (M.N) who was not involved in the first laparotomy and the findings of post-surgical adhesions in the pelvis

Table 1. Profiles of the study groups

	Control group (%)	Laparoscopy group (%)
Number of patients	22 (100)	18 (100)
Mean age of patients (years old) (Mean ± SD)	29.1 ± 4.5	28.7 ± 3.8
Marital status		
Married	20 (90.9)	13 (72.2)
Unmarried (single)	2 (9.1)	5 (27.8)
Infertile women	10 (45.5)	10 (55.6)
Number of adnexa	41 (100)	31 (100)
Ovarian disease with		
Endometriotic cyst	13 (59.1)	11 (61.1)
Cystic teratoma	5 (22.7)	2 (11.1)
Others	4 (18.2)	5 (27.8)
Type of operation		
Cystectomy	34 (82.9)	23 (74.2)
Biopsy or partial resection	7 (17.1)	8 (25.8)
Interval between the laparotomy and HSG (mean ± SD)	3.5 ± 1.0	3.3 ± 1.5

and tubal patency were noted for each patient.

Each grade of tubo-ovarian adhesion that was detected both at the first surgery and at the early laparoscopy was defined as follows: Grade 0; an adnexa of a patent fallopian tube without any adhesion formation at the tube and/or the ovary, Grade 1; an adnexa of a patent tube with adhesion formation of less than a half of the tube and/or the ovary, Grade 2; an adnexa of a patent tube with adhesion formation of half or more of the tube and/or the ovary, and Grade 3; adnexa of complete fimbrial obstruction, or of an obstructed tube with adhesion formation of more than half of the tube and/or the ovary. Any tubes that were obstructed at laparotomy were excluded from this study (Three out of 44 adnexa in the control group and 5 out of 36 adnexa in the laparoscopy group were excluded).

#### Hysterosalpingography

Each HSG was performed at the early proliferative phase. Oil contrast media (Lipiodol Ultra-Fluid, Kodama Co., Tokyo, Japan) of at least 10 ml was used. Tubal patency was estimated both on the TV monitor and on X-ray film. On the next

day, plain pelvic X-rays of a postero-anterior view and a lateral view were taken in order to check the diffusion or trapping of any contrast media in the pelvic cavity. The status of intraperitoneal adhesion in each adnexal area was evaluated on the plain X-ray films which were taken on the next day after HSG and was defined as follows: Grade 0; an adnexa of the patent tube with a clear spreading of contrast media throughout the whole pelvis, Grade 1; an adnexa of the patent tube with an accumulation of contrast media in either part in the pelvis (Fig. 1A) or in a small area of the fallopian tube (Fig. 1B), Grade 2; an adnexa of a patent tube with remaining contrast media in the tube, and an accumulation of contrast media in the same area of the pelvis (Fig. 1C), Grade 3; an adnexa with tubal occlusion either with or without hydrosalpinx (Fig. 1D). The X-ray films were also blindly reviewed for each patient.

#### Statistical analysis

Student's *t*-test and the chi-square test were used for the statistical analysis in this study. A value of  $p < 0.05$  was considered to be statistically significant.

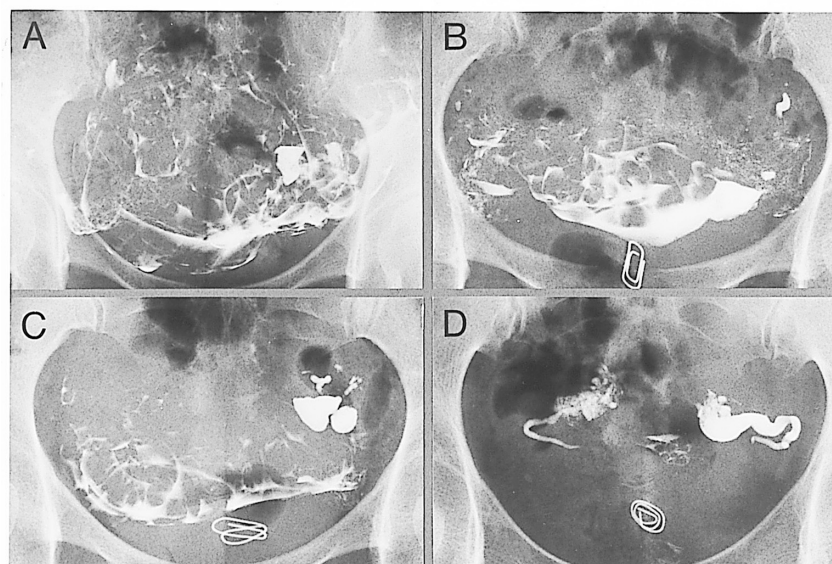


Fig. 1. Examples of the diagnostic status of intraperitoneal adhesions defined by HSG. Grade 1; left adnexa demonstrating an accumulation of contrast media at a part in the pelvis (Fig. 1A) or the remaining of contrast medium in a small part of the fallopian tube (Fig. 1B). Grade 2; left adnexa with the remaining contrast media in the tube and with accumulation at the same part of the pelvis (Fig. 1C). Grade 3; right adnexa with hydrosalpinx (Fig. 1D).

## Results

The status of tubo-ovarian adhesion of the two groups at the end of the first ovarian conservative surgery is shown in Table 2. No difference of the status of adnexal adhesion was observed in these two groups. At the first laparotomy, adhesiolysis under a laparotomy was performed as completely as possible, but 5 out of 41 adnexa and 2 out of 31 adnexa could not be freed from adhesion in the control group and in laparoscopy group, respectively. However, tubal patency was confirmed in all adnexa of both groups at the end of the first laparotomy.

The findings regarding the patency of fallopian tubes and intraperitoneal adhesion assessed by HSG in both groups are presented in Table 3. In the control group, out of 41 adnexa included in this study at the laparotomy, 5 adnexa showed a normal diffusion of contrast media, 16 adnexa had grade 1 peritubal adhesion, 8 adnexa had grade 2 adhesion, and 12 adnexa demonstrated grade 3 of

tubal occlusion either with or without hydrosalpinx. In the laparoscopy group, out of 31 adnexa, 23 showed normal diffusion of contrast media, 6 had grade 1 peritubal adhesion, 1 had grade 2 adhesions, and 1 demonstrated grade 3 tubal obstruction. A statistically significant difference was observed in the HSG findings between the control group and laparoscopy group by the chi-square test (chi-square = 30.1,  $p < 0.01$ ).

When only the adhesion-free adnexa at the end of the laparotomy were compared between the control group and laparoscopy group, HSG indicated that, in the control group, out of 36 adnexa that were free from adhesion at the end of laparotomy, only 5 adnexa (11%) remained free from adhesion while 31 adnexa (89%) demonstrated post-surgical adhesions of various degree. In contrast in the laparoscopy group, out of 29 adhesion-free adnexa at the end of laparotomy, 23 adnexa (79%) were estimated to be free while 6 adnexa (21%) demonstrated post-surgical adhesion formations (chi-square = 28.0,  $p < 0.01$ ; Table 4).

Because there have been some reports, which

Table 2. Comparison of the status of tubo-ovarian adhesions at the end of the first laparotomy between the control and the laparoscopy group

Status of tubo-ovarian adhesion	Control group	Laparoscopy group
Grade 0	36 (87.8)	29 (93.5)
Grade 1	3 (7.3)	2 (6.5)
Grade 2	2 (4.9)	0
Grade 3	0	0
Total number of adnexa	41 (100)	31 (100)

(chi-square = 1.60; NS)

Table 3. Comparison of the findings of adnexa assessed by hysterosalpingography (HSG) between the control and the laparoscopy groups

Findings of HSG	Control group (%)	Laparoscopy group (%)
Grade 0	5 (12.2)	23 (74.2)
Grade 1	16 (39.0)	6 (19.4)
Grade 2	8 (19.5)	1 (3.2)
Grade 3	12 (29.3)	1 (3.2)
Total number of adnexa	41 (100)	31 (100)

(chi-square = 30.06;  $p < 0.01$ )

Table 4. Comparison of the preservation of adhesion-free adnexa between the control group and the laparoscopy group

	adhesion-free adnexa at the laparotomy (%)	adnexa with adhesion evaluated by HSG (%)	adhesion-free adnexa evaluated by HSG (%)
Control group	36 (100)	31 (86.1)	5 (13.9)
Laparoscopy group	29 (100)	6 (20.7)	23 (79.3)

(chi-square = 28.0,  $p < 0.01$ )

demonstrated the limitation of the usefulness of HSG in the evaluation of pelvic adhesions,<sup>15)-18)</sup> but HSG is still believed to be useful in the evaluation of tubal patency,<sup>19)</sup> we examined the preservation rate of tubal patency in both groups. As shown in Table 5, tubal patency was preserved in 30 out of 31 adnexa (96.8%) in the laparoscopy group, while the preservation rate was significantly lower in the control group (29 out of 41 adnexa, 70.7%;  $p < 0.01$ ).

### Discussion

Ovarian endometriotic cyst and mature cystic teratoma commonly occur in the bilateral ovaries of young women. In women who undergo bilateral ovarian conservative surgery, post-surgical peritubal and/or periovarian adhesion formation is believed to be one of the important factors that might impair fertility by disturbing the ovum pick-up mechanism and gamete transport. Tubal occlusions, hydrosalpinx and peritubal/periovarian adhesion are frequently observed at second look laparoscopy<sup>5)-10)</sup> or on HSG.<sup>11)-12)</sup> This prospective study was designed to assess the degree of post-surgical adhesion formation and the efficacy of adhesiolysis at early laparoscopy for women who wish to conceive after such ovarian conservative surgery as a bilateral ovarian cystectomy, biopsy, or wedge resection.

Jansen<sup>7)</sup> and Ugur et al.<sup>10)</sup> reported that early second-look laparoscopic adhesiolysis is efficacious for the prevention of post-surgical adhesion re-formation by evaluating the adhesion at the third-look pelvic surgery which they could perform in a part of patients by chance. On the other hand, Peretz<sup>9)</sup> employed third-look laparoscopy to evaluate the efficacy of second-look laparoscopic adhesiolysis in post-myomectomy patient. It is needless to say that third-look laparotomy or laparoscopy is more persuasive to evaluate the adhesion formation than HSG. However Trimbos-Kemper<sup>6)</sup> and

Tulandi<sup>8)</sup> stated in their reports that the efficacy of early laparoscopy remains to be clarified in a randomized controlled trial either with or without adhesiolysis and following third look laparoscopy, while they also noted that such a controlled study including sham-operation without any manipulation at the time of early laparoscopy may not always be medically feasible or ethically acceptable. Therefore, in this study, we set up two groups of patients, namely the patients who gave us their informed consent about early laparoscopy and adhesiolysis and the patient who did not agree to undergo such procedures. In addition, the tubal patency and the status of adnexal adhesion were both evaluated by HSG instead of performing the third-look laparoscopy. To detect tubal patency, tubal occlusion and hydrosalpinx, HSG is considered to be an effective method along with laparoscopy, but some difficulties remain in accurately detecting peritubal adhesion.<sup>15)-19)</sup> The discrepancy between the laparoscopy and HSG findings in evaluating peritubal adhesion have been reported to vary between 25% and 70%,<sup>14)-20)</sup> because there are essential differences between two methods in recognizing tubal appearance and functions.<sup>14)</sup> However, the detection of adnexal adhesion by HSG has recently improved by infusing an adequate amount of contrast material,<sup>12)</sup> by observing the tubal drainage both on a TV screen and on X-ray films, by using oil contrast media<sup>21)</sup> instead of an aqueous one and evaluating contrast material diffusion on a plain X-ray film taken 24 hours after the HSG. Furthermore, HSG is still a gold standard to evaluate the tubal patency,<sup>19)</sup> we examined the efficacy of early second-look laparoscopic adhesiolysis on the preservation of tubal patency, and found that the preservation rate of tubal patency evaluated by HSG was higher in laparoscopy group than in control group. This finding suggested that laparoscopic adhesiolysis might be effective in preventing tubal occlusion af-

Table 5. Comparison of the preservation of tubal patency between the control group and the laparoscopy group

	patent tube at the laparotomy (%)	patent tube evaluated by HSG (%)	obstructed tube evaluated by HSG
Control group	41 (100)	29 (70.7)	12 (29.3)
Laparoscopy group	31 (100)	30 (96.8)	1 (3.2)

(chi-square = 8.1,  $p < 0.01$ )

ter bilateral ovarian conservative operations.

A variety of intrapelvic adhesion score classifications<sup>22)</sup> have been reported in recent years, and some of such classifications have succeeded in accurately estimating the pregnancy rates. As many of those classifications use a combined score system of the area and density of adhesion, they may not be considered suitable for assessing the early phase of adhesion formation. Because the new adhesion formation may either still be growing in some parts or resolving spontaneously in other parts on 7th post-surgical day, and the discrimination between filmy and dense adhesions is very difficult at this early stage of adhesion formation. Therefore, a simplified classification as described in the Subjects and Methods section was utilized in this study. The classification of tubal disturbance as evaluated by HSG was also simplified as shown previously.

In this study 41 fallopian tubes and ovaries from 22 patients in the control group and 31 tubes and ovaries from 18 patients in the laparoscopy group were examined. Three adnexa in the control group and 5 adnexa in the laparoscopy group were overlooked in this study because these adnexa had been obstructed before the ovarian conservative surgery and could not be freed from adhesions. Out of 36 adnexa without adhesion in the control group at the laparotomy only 5 adnexa were free from adhesion or obstruction based on the HSG findings. This result apparently indicates that ovarian conservative surgery may substantially cause post-surgical periadnexal adhesion and tubal occlusion. On the other hand, 23 out of 29 adhesion-free adnexa at the laparotomy still remained free from post-surgical disturbance, which could be evaluated by HSG. There was a significant difference in the degree of post-surgical adhesion formation observed by HSG between two groups. At the beginning of early laparoscopy 3 adnexa were free from adhesion, 5 adnexa were completely obstructed and 23 adnexa showed partial adhesions to various degrees. The proportion of adnexa without adhesion (10%) to adnexa with adhesion (90%) as evaluated by early laparoscopy in the laparoscopy group closely correlated with the proportion of adnexa without and with adhesion (11% and 89%, respectively) as evaluated by

HSG in the control group. This indicates that post-surgical adhesion formation occurs earlier than the day when laparoscopy was done. These findings do not conflict with those reported by Ellis et al.<sup>23)</sup> and Johnson and Whitting.<sup>24)</sup>

At early laparoscopy 25 adnexa were found to adhere and they could be freed from adhesion by laparoscopic adhesiolysis. Of those 25 adnexa that underwent adhesiolysis at early laparoscopy, 5 adnexa later demonstrated a re-formation of adhesion. Although some of the tubes that were freed from adhesion seemed to demonstrate adhesion re-formation by HSG, this study strongly suggests that early laparoscopy is able to detect post-surgical adhesion formations in the fallopian tubes and ovaries after ovarian conservative surgery, and can easily free them, thus preventing adhesion re-formation.

Based on the above findings, it could be concluded that early laparoscopy is useful for preventing tubo-ovarian adhesion and tubal occlusion in patients who undergo bilateral ovarian conservative surgery. Needless to say, a laparoscopic cystectomy has become a standard procedure to treat benign adnexal masses, the frequency of performing open surgery for such clinical conditions has also recently decreased. However, we sometimes encounter cases in which it is difficult to distinguish whether her adnexal mass is benign or malignant,<sup>25)</sup> and finally we cannot avoid performing open surgery for such cases. We thus believe that adhesiolysis during early second-look laparoscopy still maintains its clinical importance even in the era of laparoscopy. The final goal of such manipulation, including early laparoscopic adhesiolysis, is to achieve pregnancy.<sup>26)</sup> As a result, it is necessary to assess the improvement in the pregnancy rate after early laparoscopic adhesiolysis in a future randomized study.<sup>27)</sup>

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