

# *Acta Medica Okayama*

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*Volume 37, Issue 1*

1983

*Article 8*

FEBRUARY 1983

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## Abstract

The incidence of intraperitoneal adhesion after abdominal surgery was studied. Peritoneoscopy was performed in 933 patients with liver diseases over the 6 year 5 month period from March 1974 to July 1980. Of the patients, 352 (37.7%) had undergone an abdominal operation, and intraperitoneal adhesion was detected in 205 (58.2%) of these patients. The liver was not observable in 5 out of 61 patients with adhesions after upper abdominal operations. Whereas, the liver was clearly observable in patients with lower abdominal operations in spite of adhesions. Out of the 581 patients without any abdominal operations, 30 patients (5.2%) had adhesions in the abdominal cavity, and 6 of them had extensive adhesions that partially obscured the observation of liver surface. In all patients, peritoneoscopy was performed without complications by avoiding the surgical scar for puncture sites and ensuring a free air lumen before trocar puncture.

**KEYWORDS:** peritoneoscopy, liver, adhesion, abdominal operation

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\*PMID: 6221509 [PubMed - indexed for MEDLINE]

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Acta Med. Okayama 37, (1), 67-72 (1983)

## PERITONEOSCOPY OF THE LIVER AFTER ABDOMINAL SURGERY

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*Received August 5, 1982*

*Abstract.* The incidence of intraperitoneal adhesion after abdominal surgery was studied. Peritoneoscopy was performed in 933 patients with liver diseases over the 6 year 5 month period from March 1974 to July 1980. Of the patients, 352 (37.7 %) had undergone an abdominal operation, and intraperitoneal adhesion was detected in 205 (58.2 %) of these patients. The liver was not observable in 5 out of 61 patients with adhesions after upper abdominal operations. Whereas, the liver was clearly observable in patients with lower abdominal operations in spite of adhesions. Out of the 581 patients without any abdominal operations, 30 patients (5.2 %) had adhesions in the abdominal cavity, and 6 of them had extensive adhesions that partially obscured the observation of liver surface. In all patients, peritoneoscopy was performed without complications by avoiding the surgical scar for puncture sites and ensuring a free air lumen before trocar puncture.

*Key words :* peritoneoscopy, liver, adhesion, abdominal operation.

Peritoneoscopy is indispensable in the diagnosis of liver diseases. However, the observation of the liver is obscured sometimes by adhesions after abdominal operations. Patients with liver disease who have had a history of abdominal surgery are increasing, and they are often submitted to peritoneoscopy. Moreover, injury of abdominal organs and the formation of adhesions after insertion of a pneumoperitoneum needle or a trocar of the peritoneoscopy have been reported also (1-5). In this paper, incidence of intraperitoneal adhesion after various abdominal operations and the influence of the adhesion on observation of the liver by peritoneoscopy were studied.

### MATERIALS AND METHODS

Peritoneoscopy was performed in 933 patients with liver diseases over the 6 year 5 month period from March 1974 to July 1980. There were 357 chronic hepatitis, 199 liver cirrhosis, 68 hepatocellular carcinoma, 68 acute hepatitis, 39 fatty liver, and 202 other liver disease

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patients. Guided liver biopsy was performed in 918 patients (98.4 %) with a Vim-Silverman needle or a punch biopsy forceps. Intraperitoneal adhesion was investigated using peritoneoscopic photographs and records.

*Premedication for peritoneoscopy.* Patients were given 100 mg of pentobarbital calcium orally at 9:00 pm on the day previous to peritoneoscopy, and drinking and eating were restricted. High enema was performed in the morning of peritoneoscopy. An additional 100 mg of pentobarbital was given 2 h before starting peritoneoscopy. Thirty minutes before the start of the examination, 50-100 mg of pethidine hydrochloride and 0.25-0.5 mg of atropin sulfate were injected subcutaneously.

*Instruments and procedure of peritoneoscopy.* A CL-2 type (Shinko Optical Co., Tokyo) peritoneoscope was used. A Veress needle was used for insufflation of nitrous oxide (N<sub>2</sub>O) gas into the abdominal cavity. The needle was usually introduced at a point along the Monro-Richter line one-third of the way from the outer end of the line. When a surgical scar was present at that point, other sites were selected such as, 3 finger breadths above the pubic symphysis, just below the umbilicus on the midline, the McBurney point, or on the outer line of the muscoli rectus abdominis. After local anesthesia with 7-10 ml of 0.5 % xylocaine, the needle was introduced into the abdominal cavity, while the patient was urged to push his abdominal wall forward. To ensure that the needle tip was in the free abdominal cavity, 3 ml of air was injected (6, 7). If the needle tip is located in the free abdominal cavity, the air does not return because the cavity is under negative pressure. About 3 l of N<sub>2</sub>O was insufflated using an artificial pneumoperitoneum apparatus with the pressure around 20 cm H<sub>2</sub>O.

The trocar was usually introduced at the intersection of a vertical line 1 finger breadth left of the umbilicus, and a horizontal line at the height of the liver edge on the right midclavicular line if the liver was palpable. Skin and peritoneum were anesthetized with 40 ml of 0.5 % xylocaine at the site of trocar introduction. If the liver was not palpable, the cross point of the same vertical line and the horizontal line connecting both costal margins (2-3 finger breadths above the umbilicus) was selected. When a surgical scar was observed on the above points, and when enough free space was not confirmed by aspiration of gas through a long needle (7 cm length), the site for trocar introduction was changed to below the umbilicus or on the pararectal line being careful to avoid epigastric vessels and collateral vessels. After insertion of the trocar, the peritoneoscope was introduced being sure that the pneumoperitoneum needle was free and did not injure any organs.

*Liver biopsy.* The biopsy site was ordinarily the upper liver surface, 3 cm or more right of the gallbladder. After obtaining the specimen, a few pieces of absorbable gelatin foam (Spongel, Yamanouchi Pharm. Co., Tokyo) were inserted to prevent bleeding through the trocar using a Vim-Silverman needle. It was confirmed that the omentum was not left in the trocar path at the end of the examination, and the wound was sutured.

## RESULTS

*Incidence of adhesions in patients with or without an abdominal operation.* Adhesions were observed in the abdominal cavity in 205 (58.2 %) out of 352 patients with a history of abdominal surgery (Table 1). In 1 patient with a history of trans-abdominal left nephrectomy, adhesion was so extensive that insufflation of 3.5 l gas could not make enough space to introduce the trocar at any point. Thirty patients (5.2 %) had adhesions out of 581 patients who had not had an abdom-

TABLE 1. INCIDENCE OF ADHESIONS IN PATIENTS WITH OR WITHOUT AN ABDOMINAL OPERATION

Operation method	Patient	With adhesion
With an operation	352 (37.7)	204 (58.2)
Upper abdominal op		
Gastrectomy	29	28 (96.6)
Cholecystectomy	8	8 (100)
Splenectomy	5	5 ( 〃 )
Others	19	19 ( 〃 )
Total	61 (17.3)	60 (98.4)
Gynecological op	28 ( 8.0)	22 (78.6)
Appendectomy	162 (46.0)	100 (61.7)
Peritoneoscopy	98 (27.8)	20 (20.4)
Lower abdominal op	3 ( 0.1)	3 (100)
Without an operation	581 (62.3)	30 ( 5.2)
Total	933 (100)	235 (25.4)

( ) %

TABLE 2. INCIDENCE OF VISUALIZATION OF THE LIVER BY PERITONEOSCOPY

Operation method	Visualization of liver lobe				Total
	Both	Right	Left	Not visible	
With an operation	318	13	16	5	352
Upper abdominal op					
Gastrectomy	22	4	2	1	29
Cholecystectomy	4	0	3	1	8
Splenectomy	1	3	1	0	5
Others	4	6	6	3	19
Total	31	13	12	5	61
Gynecological op	26	0	2	0	28
Appendectomy	160	0	2	0	162
Peritoneoscopy	98	0	0	0	98
Lower abdominal op	3	0	0	0	3
Without an operation	575	4	2	0	581
Total	893	17	18	5	933

inal operation.

*Incidence of visualization of the liver by peritoneoscopy.* Out of 61 patients who had a history of an operation in the upper abdomen, 60 patients (98.4 %) had intraperitoneal adhesions under the abdominal scars (Tables 1, 2). Out of 29 cases with gastrectomy, 28 (96.6 %) had adhesions. Out of the gastrectomy

cases, both liver lobes were observed in 22 patients (75.9 %). The left lobe could not be observed in 4 patients (13.8 %) and the right lobe could not be observed in 2 patients (6.9 %). The liver could not be observed at all in 1 patient (3.4 %). Adhesion was observed in all 8 patients who had a cholecystectomy. Both liver lobes were observed in 4 patients, only the left lobe in 3 patients, and the liver was not observed in 1 patient. In splenectomy cases, the right lobe was observed in 4 out of the 5 patients observed. Adhesion was observed in 19 other patients who had an upper abdominal operation. The adhesion restricted but did not interfere with observation of the liver except in 3 patients who had had a choledochojejunostomy, gastrectomy with cholecystectomy, and left nephrectomy, respectively.

A transabdominal gynecological operation had been performed in 28 patients. Adhesion was found in 22 (78.6 %) of them, and was localized under the abdominal scars in 20 patients. Adhesion extended to the upper abdomen in 2 patients, one case of ectopic pregnancy and one of hysterectomy, and liver observation was partially restricted in these 2 cases.

An appendectomy had been performed in 162 patients. Out of them, 100 patients (61.7 %) had adhesions which were localized in the ileocaecal region except in 9 patients (5.9 %). The right liver lobe was not observable in 2 patients.

Peritoneoscopy had been performed previously in 98 patients. Adhesion existed beneath the scar of trocar insertion in 13 patients. Adhesions of the liver capsule to the diaphragm or omentum at the previous biopsy site were observed in 7 patients. Observation of the liver was not restricted.

Lower abdominal operations had been performed in 3 male patients. Adhesions were observed under the scar in all 3 of the patients. Observation of the liver was not hindered.

Thirty (5.2 %) out of 581 patients without an abdominal operation had adhesions in the abdominal cavity. Adhesions extended into the upper abdominal cavity in 6 patients. The liver was partially observable in all 6 of the patients. Out of the 6 patients, 2 had a history of pleuritis tuberculosa, and 2 had severe hepatitis with ascites.

*Complications.* Complications were encountered in 4 patients without adhesion. Two patients had bleeding after the liver biopsy with a punch biopsy forceps. One of them was surgically treated and the other was treated by compressing of the abdomen using an abdominal bandage, injection of a large amount of blood coagulating agent, and blood transfusion. One patient had bleeding from an omental vessel injured at the insertion point of the trocar, which bleeding was stopped surgically. Bile leakage from the needle biopsy site occurred in a case of obstructive jaundice. The leakage was stopped surgically.

## DISCUSSION AND CONCLUSION

The incidence of intraperitoneal adhesion after abdominal surgery has rarely been studied (8, 9). In this study, 98 % of those having had an upper abdominal operation, 79 % of those having had a gynecological operation and 62 % of those having had an appendectomy had such adhesions. Peritoneoscopy failed in only 1 (0.1 %) out of 933 patients, 38 % of whom had a history of abdominal surgery. The incidence of failure was lower than those of other studies: 3-6.3 % (4, 10, 11). Liver observation was not possible due to intraperitoneal adhesion in 5 patients (8.2 %) out of 61 patients who had had an upper abdominal operation. The incidence was higher than the 1.9 % of Wildhirt (12).

The site of trocar insertion has to be carefully selected in patients with a history of upper abdominal surgery. We agree that the right side of the scar, as has been recommended, is the best place to insert a trocar in gastrectomy and splenectomy cases, and the left side is best in cases with cholecystectomy (11, 13, 14).

Though no complication due to adhesion was encountered in this study, accidents due to adhesions have been reported, such as, penetration of the colon or puncture of vessels by a pneumoneedle or trocar. Therefore, in the case of patients with a history of abdominal surgery, it is important to confirm that there is enough space to insert the needle or trocar into the peritoneal cavity.

In this study, marked adhesions were observed in patients with severe hepatitis or pleuritis in spite of having had no previous abdominal operations. Precise taking of the patient's history, especially in regards to pleuritis or peritonitis, is also important. Incidence of adhesions without previous surgery was 5.2 % in this study and similar to that in other reports (15, 16). Incidence of adhesion after prior peritoneoscopy was about 20 %. Blood leakage after liver biopsy has been suspected of causing adhesion (17). An effort to reduce blood leakage after a liver biopsy is necessary.

In conclusion, the liver was not observable by peritoneoscopy in only 5 (1.4 %) out of 352 patients with a history of abdominal surgery. Peritoneoscopy is not contraindicated even after an abdominal operation as long as careful attention is paid to select a proper site for insertion of the trocar and needle.

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