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# The Incidence of Adhesions After Prior Laparotomy: A Laparoscopic Appraisal

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**Objective:** To relate the presence of intra-abdominal adhesions after laparotomy to the site of incision, repeat laparotomy, and the clinical indication for prior surgery.

**Methods:** Three hundred sixty women undergoing operative laparoscopy after a previous laparotomy were assessed for adhesions between the abdominal wall and the underlying omentum and bowel. Complications resulting directly from these adhesions were documented.

**Results:** Patients with prior midline incisions had significantly more adhesions (58 of 102) than those with Pfannenstiel incisions (70 of 258). Patients with midline incisions performed for gynecologic indications had significantly more adhesions (109 of 259) than all types of incisions performed for obstetric indications (12 of 55). The presence of adhesions in patients with previous obstetric surgery was not affected by the type of incision. Adhesions to the bowel were significantly more frequent after midline incisions above the umbilicus. Twenty-one women suffered direct injury to adherent omentum and bowel during the laparoscopic procedure.

**Conclusions:** Intra-abdominal adhesions between the abdominal scar and underlying viscera are a common consequence of laparotomy. Patients undergoing laparoscopy after a previous laparotomy should be considered at risk for the presence of adhesions between the old scar and the bowel and omentum. (*Obstet Gynecol* 1995;85:269-72)

Whenever prior laparotomy has been performed, the laparoscopist must be mindful during Veress needle and trocar insertion that the underlying intra-abdominal anatomy may be altered. Adhesive bridging between the intestines and the old abdominal scar can negate any protection from trocar injury usually afforded by the elevation of the abdominal wall, creation

of the pneumoperitoneum, Trendelenburg positioning, and the reliable mobility of the bowel. In some of these cases, injury inevitably will occur to the vasculature of the adherent omentum or directly to the wall of the bowel secondary to adherence to the old abdominal scar.<sup>1</sup> A recent physician survey involving over 50,000 cases of laparoscopy reported the incidence of trocar and Veress needle injury to the small and large intestines to be 1.8 per 1000 cases.<sup>2</sup> Traditionally, patients regarded at highest risk for this complication have previously undergone some type of major intestinal surgery, whereas those with other types of uncomplicated abdominal surgery have been perceived to be at low risk.

To assess the potential threat of adhesions accompanying prior laparotomy, bowel and omental adhesions to the anterior abdominal wall scar were documented during operative laparoscopy in women who previously had undergone a variety of abdominal operations. The presence of intra-abdominal adhesions was analyzed with regard to the site of abdominal incision, effect of repeat laparotomy, and existence of any relationship to clinical indications for laparotomy.

## Materials and Methods

All women undergoing operative laparoscopy between May 1991 and January 1993 and who had prior laparotomies were evaluated for inclusion into this study. Those with a history of cholecystectomy or appendectomy performed through either a McBurney or right upper quadrant incision were excluded because of the distant anatomic relationship to the umbilicus. Laparoscopic procedures included lysis of adhesions, ovarian cystectomy, oophorectomy, salpingectomy, myomec-tomy, presacral neurectomy, hysterectomy, urethropexy, and resection of endometriosis as described previously.<sup>3</sup> All patients were from the authors' (FN, CRN, and CHN) private surgical practices and were cared for

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**Table 1.** Type and Number of Incisions

Incision type	No. of incisions						Total no. patients
	1	2	3	4	5	6	
Pfannenstiel	180	51	19	4	4	0	258
Midline below umbilicus	55	18	9	4	0	1	87
Midline above umbilicus	10	2	1	2	0	0	15

at a large community referral hospital in Atlanta, Georgia. At the beginning of each laparoscopic procedure, the abdominal and pelvic cavities were assessed for the presence of adhesions between the anterior abdominal wall and the underlying omentum and surface of the bowel.

Patients were divided into three groups according to the type of prior laparotomy incision: Pfannenstiel, midline below the umbilicus, and midline above the umbilicus. Each group was further divided according to the number of previous abdominal operations (Table 1). Patients were then subdivided according to clinical indication for each prior laparotomy. The presence of adhesions in each of these divisions was then analyzed for any significant differences. Intraoperative complications directly related to the presence of intra-abdominal adhesions were recorded. Both perforation of the bowel and traumatic hemorrhage of the omentum were encountered.

The data were analyzed using a statistical computer program that performed a generalized  $\chi^2$  analysis of the categorical data using weighted least squares.<sup>4</sup>  $P < .05$  indicated statistical significance.

## Results

Three hundred sixty patients were included in the study: 258 (72%) had prior Pfannenstiel incisions, 87 (24%) had prior midline incisions below the umbilicus, and 15 (4%) had prior midline incisions above the umbilicus (Table 1). Adhesions to the omentum and bowel were found in 70 women (27%) in the Pfannenstiel group, 48 women (55%) in the midline below the umbilicus group, and 10 women (67%) in the midline above the umbilicus group. Patients with prior midline incisions of either type were more likely to have adhesions than those with prior Pfannenstiel incisions ( $P < .01$ ). No significant difference was noted between the two types of midline incisions ( $P > .05$ ).

Of 128 women with adhesions, 108 (84%) had adhesions to the omentum only and 20 (16%) had adhesions to the omentum and bowel. The distribution of adhesions to the omentum and bowel varied for each type of incision. In the Pfannenstiel group, 61 of 70 women (87%) had adhesions to the omentum and nine (13%)

had adhesions to the omentum and bowel. In the midline below the umbilicus group, 72 of 87 (83%) had adhesions to the omentum and 15 (17%) had them to the omentum and bowel. In the midline above the umbilicus group, six of ten (60%) had adhesions to the omentum and four (40%) had adhesions to the omentum and bowel. Midline incisions above the umbilicus were more likely to have adhesions to the bowel than either Pfannenstiel or midline below the umbilicus incisions. ( $P < .05$ ). Bowel surgery had been performed in two subjects of the Pfannenstiel group, in five of the midline below the umbilicus group, and in one of the midline above the umbilicus group.

To test the hypothesis that repetitive surgical incision into the peritoneal cavity may increase the incidence of intra-abdominal adhesions, the presence of adhesions was related to increasing numbers of laparotomies. When all patients having adhesions with a single incision (78 of 245) were compared to those with two or more incisions (48 of 115), the difference was not significant ( $P > .05$ ). Based on the percentage of adhesions after one or more abdominal operations by using data from our results and other relevant studies,<sup>5,6</sup> we calculated that 829 patients would be needed to achieve a power of 80% with a type I error of 5%.

The number of prior incisions was further related to subsequent adhesion formation by dividing each type of incision into two groups, single incisions versus two or more. When compared in this fashion, 45 of 180 (25%) in the Pfannenstiel group had adhesions after a single incision, whereas 24 of 78 (31%) had adhesions after two to five incisions. In the midline below the umbilicus group, 29 of 55 (53%) had adhesions after a single incision, whereas 19 of 32 (59%) had adhesions after two to six incisions. In the midline above the umbilicus group, five of ten had adhesions after a single incision, and all five had adhesions after two to four incisions. Data analysis failed to demonstrate any significant differences between single incisions and two or more for the presence of adhesions ( $P > .05$ ).

The presence of adhesions was then related to the clinical indications for prior laparotomy. Although some of the women had undergone general surgical procedures, only the gynecologic and obstetric surgery subgroups were of adequate sample size for this type of analysis (Table 2). When subjects with all types of incisions were combined, adhesions were present in 12 of 55 (22%) in the obstetric group, a finding that was significantly different than the 109 of 259 (42%) in the gynecologic group ( $P < .01$ ). Within the gynecologic group, adhesions were present in 51 of 73 (70%) with midline incisions, which was significantly different than the 58 of 186 (31%) with Pfannenstiel incisions ( $P < .01$ ). Similar analysis of the obstetric group revealed the

**Table 2. Clinical Indication and Incision Type**

Incision type	Gynecologic	Obstetric
Pfannenstiel	186	43
Midline	73	12
Total patients	259	55

presence of adhesions in two of 12 (17%) with midline incisions not significantly different than the ten of 43 (23%) with Pfannenstiel incisions ( $P > .05$ ).

Laparoscopy was performed with a standard closed technique after establishing a pneumoperitoneum with a Veress needle in 328 (91%) women; the remaining 32 (9%) patients underwent trocar insertion by the classic Hasson "open" laparoscopy technique.<sup>7</sup> The use of "open" laparoscopy was based on the patient's surgical history and preoperative judgment.

Twenty-one (6%) women sustained injury to the small bowel or omentum during trocar insertion related to the presence of adhesions to the old abdominal scar. Three types of traumatic operative complications were identified. Six patients developed expanding hematomas after direct trocar injury to the adherent omentum. These injuries were all managed successfully with bipolar desiccation. All trocar insertions were performed with a standard closed technique. Five of these women had adhesions only to the omentum; the remaining patient had adhesions to the small bowel. All but one patient had undergone multiple laparotomies.

Nine patients developed active arterial bleeding within the adherent omentum. Hemorrhage in each case was managed successfully with bipolar desiccation. All trocar insertions were performed in a routine, closed fashion. Seven of these patients had adhesions only to the omentum, and two had adhesions to the small bowel. Seven of these women had undergone a single laparotomy, whereas the remaining two had two or more incisions.

Six patients suffered direct trocar perforation of the adherent bowel. Two of these women underwent trocar insertion by the "open" laparoscopy technique. All of these patients were noted to have adhesions to the small bowel. Five women had undergone two or more laparotomies, except for one who had a single Pfannenstiel incision.

Although this small number of cases could not reveal any significant association between hemorrhagic or bowel complications and the type or number of incisions, it appears that women with two or more incisions experienced more complications.

## Discussion

The incidence of postoperative, intra-abdominal adhesions has been examined previously in several studies. Turunen<sup>8</sup> studied the presence of adhesions in 270 cases after gynecologic laparotomy and found adhesions to the omentum in 57%, to the small bowel in 21%, and to the colon in 19%. In the present study, the incidence of adhesions was noted less frequently (30% to the omentum and 6% to the small bowel). Weibel and Majno<sup>5</sup> examined 752 subjects at autopsy for evidence of intra-abdominal adhesions. Among the 336 female subjects, 69% of those with a history of prior gynecologic surgery were noted to have intra-abdominal adhesions. This is considerably higher than the 42% incidence of intra-abdominal adhesions observed in a similar group in our study. Adhesions were noted in 60% of subjects after a single surgery and in 93% of those having undergone two or more laparotomies. In our study, a similar trend was observed that was not statistically significant. Patients having undergone a single laparotomy had a 32% incidence of adhesions, and those with two or more laparotomies had a 42% incidence of adhesions ( $P > .05$ ). Menzies and Ellis<sup>6</sup> studied a group of 210 patients prospectively for the presence of intra-abdominal adhesions after abdominal surgery. At laparotomy, 93% of the subjects were found to have adhesions. The abdominal scar was adherent to the omentum in 80% and to the small bowel in 20%. These findings are similar to those of the present study (84% to the omentum and 16% to the bowel). Kaali and Barad<sup>9</sup> evaluated 1133 women with prior abdominal surgery for the presence of adhesions during a variety of laparoscopic procedures; 25% had intra-abdominal adhesions, whereas only one patient had adhesions to the umbilicus.

Laparoscopy is the most common gynecologic procedure performed. Despite advances in instrumentation and techniques, inadvertent injury to the underlying viscera still occurs. A variety of techniques have evolved attempting to address the dangers to the viscera from trocar insertion. The use of the Veress needle to create a pneumoperitoneum before blind trocar insertion helps to minimize this potential for injury. More recently, direct trocar insertion without antecedent pneumoperitoneum has been reported without higher morbidity.<sup>10-12</sup> However, one study<sup>13</sup> recommended this direct technique only for patients without prior laparotomy.

In 1971, Hasson<sup>7</sup> introduced the direct technique for peritoneal entry of "open" laparoscopy, which promised to be useful in avoiding trocar injury to the underlying viscera and larger vascular structures. Individuals having undergone prior abdominal surgeries, and who are therefore at risk for intra-abdominal adhe-

sions between the underlying viscera and the old abdominal scar, seem to be more apt candidates for this approach. For many gynecologists and general surgeons, peritoneal entry by such direct palpation and peritoneal visualization makes this technique the logical procedure of choice in patients after prior abdominal surgery. However, our experience (as in this study) and that of others demonstrate that inadvertent intestinal injury does occur despite the careful application of this "open" technique.<sup>14,15</sup>

This study also confirms the risk of developing significant intra-abdominal adhesions after laparotomy. Adhesions between the old abdominal scar and underlying omentum or bowel were noted in 130 of 360 (36%) and contributed to significant intra-operative morbidity in 21 (6%) of these women.

To evaluate the relation between the number of previous laparotomies and the presence of adhesions to the bowel and omentum, 829 patients would have been required to detect a statistically significant difference. However, we only evaluated 360 patients in this study, and therefore could not eliminate a type II error. A larger sample size would be required to resolve this important issue.

Other risk factors emerged from this study. Patients with a history of prior gynecologic surgery performed through a midline incision were found to be most likely to develop adhesions to both the omentum and small bowel. Adhesions to the bowel were more likely to occur after a midline incision above the umbilicus. Patients with previous midline incisions for obstetric indications were not more likely than those with Pfannenstiel incisions to have adhesions of both types.

Our experience and that of others confirm the danger of injury to both the fatty appendages of the bowel and the bowel itself, regardless of the technique applied. These observations can only reinforce the mandate to inspect thoroughly any bowel or omentum found anatomically related to the site of trocar insertion at the completion of any laparoscopic procedure; especially in patients with a history of laparotomy.

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