Hypothesis: In this study, we aimed to investigate whether the use of a sodium hyaluronate and carboxymethylcellulose–based antiadhesive membrane (Seprafilm, Adhesion Barrier; Genzyme Corp, Cambridge, Mass) is associated with fewer adhesions around the pelvis and rectal pouch.

Design, Interventions, and Main Outcome Measures: Forty Wistar albino female rats were divided into 4 equal groups. Each rat underwent segmental left-sided colonic resection and end colostomy. The groups were as follows: group 1, colostomy alone (control group); group 2, colostomy and Seprafilm application around distal rectal pouch; group 3, colostomy and Seprafilm application around distal rectal pouch; and group 4, colostomy and application of Seprafilm on both rectal pouch and laparotomy incision. All animals were operated on the 21st day and intra-abdominal adhesions were evaluated.

Results: The results were assessed by analysis of variance and Tukey multiple comparison tests. Intra-abdominal adhesions were significantly (*P* < .05) reduced in groups 2 through 4 compared with the control group, whereas no statistically significant difference was observed between these 3 groups.

Conclusions: The use of Seprafilm during the initial step of the Hartmann colostomy reduced intra-abdominal adhesions on the reversal. This result might be beneficial in the prevention of adhesion-related difficulties during second operation and its application beneath laparotomy incision seems to be sufficient to ensure this effect.

**METHODS**

The approval was obtained from the Institutional Animal Care Committee and the study was conducted according to the guidelines for care and use of laboratory animals for research. Forty adult Wistar albino female rats, weighing 180 to 220 g each, were divided into 4 equal groups. The animals were fed a standard laboratory regimen and allowed water ad libitum. The groups were classified as follows: group 1, colostomy alone (control group); group 2, colostomy and Seprafilm application around the distal rectal pouch; group 3, colostomy and Seprafilm application beneath laparotomy incision; and group 4, colostomy and application of Seprafilm on both rectal pouch and laparotomy incision.

**SURGICAL PROCEDURE**

Colostomy

Animals were anesthetized by intraperitoneal injection of ketamine hydrochloride (50 mg/kg of body weight). The abdominal wall was cleaned using povidone-iodine and in aseptic, sterile conditions, a midline laparotomy of 4 cm was performed. Then a 1-cm segment of the left side of the colon was resected by 3 cm proximal to the...
peritoneal reflection. In the left lower quadrant of the abdominal wall, the skin was resected with a circular incision of 2-mm diameter and a hole was created by incising fascia. Proximal colonic segment was pulled out through this defect and secured to either fascia or skin with 4 interrupted 6-0 polypropylene sutures. The distal colonic segment was closed by interrupted 6-0 polypropylene sutures (Figure 1).

Seprafilm Application

In group 2 rats, 2×1 cm of Seprafilm was wrapped around the distal rectal pouch. In group 3, 4×1 cm of Seprafilm was laid beneath the incision. The combination of these 2 different applications (beneath the incision and around the distal rectal pouch) was carried out in group 4. Seprafilm application was performed while being careful to keep the abdominal cavity and surgical instruments dry.

The muscle and skin layers of the abdomen were closed with continuous 3-0 silk sutures separately. The animals were allowed to feed 24 hours after the procedure.

Second Operation and Adhesion Scoring

The second operation was performed on postoperative day 21. Median laparotomy incisions were reopened and intraperitoneal adhesions were scored by 2 different observers who did not know either the group the animal belonged to or the score given by the other observer, as described by Nagler et al. The adhesions were classified as follows: 0 indicated no adhesions; 1, thin, easily separated adhesion; 2, several thin adhesions; 3, thick, broad adhesion; and 4, several thick adhesions or thick adhesions to organs or abdominal wall. The sum of 2 scores reflected the definitive one (eg, 0+0=0; 0+1=1; 1+1=2; 1+2=3, etc).

STATISTICAL ANALYSIS

Analysis of variance and Tukey multiple comparison tests were used for statistical analysis. *P* < .05 was considered to be significant.

RESULTS

In group 1, two rats died on the first and second days; in group 2, one rat died on the first day. No surgery-related complication was found during necropsies. Equivalent number of animals were replaced in the groups and they completed the same study period of 21 days. Neither complications of the abdominal incision (wound dehiscence, infection, abscess, etc) nor intra-abdominal serous or purulent fluid collections were found on the second operation.

The adhesion scores (mean±SD) are as follows: group 1, 3.90±0.99 (*P* < .05 vs groups 2 through 4); group 2, 2.90±0.88; group 3, 2.80±0.63; and group 4, 2.70±0.67. Statistical analysis revealed that group 1 has significantly higher values than groups 2 through 4 (*P* < .05). No statistically significant difference was observed among the other groups (*P* > .05). According to these results, Seprafilm significantly reduced adhesion formation in the pelvis and around the distal rectal pouch. However, it seems that diverse applications provide no further benefit on this positive effect (Figure 2).

The results of this study pointed out a novel use of Seprafilm in colorectal surgery. Of course, decreasing pelvic adhesions would facilitate the surgeon’s work during pelvic dissection for Hartmann colostomy reversal. Subsequent to improvements in patient care, antibiotic prophylaxis, and knowledge of gastrointestinal wound healing, primary colonic anastomoses are being increasingly performed instead of 2-stage operations that have considerable morbidity rates. However, it seems that diverse applications provide no further benefit on this positive effect (Figure 2).

**COMMENTS**

On the reversal of the Hartmann colostomy, identification of the distal rectal pouch may be hampered by retraction of the rectum beyond the vagina and bladder or by significant pelvic adhesions. It is well known that every abdominal intervention causes more or fewer adhesions; for that reason, whatever the conditions of the first operation are (although usually is a complicated case), extensive intra-abdominal adhesions are generally expected during the second operation. Therefore, several methods to overcome this problem, including fixation of the rectal pouch to presacral fascia, illumination of the rectal lumen, and creating a mucous fistula or leaving long silks on the suture line, were previously suggested. However, none of these suggestions are focused on reducing...
adhesions but rather on identifying distal rectum, and, moreover, foreign bodies that are left in the pelvis may further exacerbate adhesion formation.

Several surgical methods and drugs were suggested and investigated to prevent postoperative intra-abdominal adhesions. Performing surgery as meticulously as possible with less surgical trauma would probably decrease peri-toneal ischemia, an important promoter of adhesions. Furthermore, there are a variety of drugs developed for this purpose and among which macromolecules constitute an important part. Seprafilm is a macromolecular anti-adhesive membrane and its efficiency has been shown by randomized prospective studies. The membrane is rapidly transformed to gel form, and its anti-adhesive effect is based on keeping intra-abdominal structures apart during the most critical period of adhesion formation.

The present study is about a particular use of Seprafilm; thus, its practice in some specific conditions associated with the Hartmann colostomy may be questioned. Underwood et al investigated the effects of Seprafilm on tumor implantation at incisions and reported no relationship. In addition, a study from Tzianabos et al found that Seprafilm did not affect the intra-abdominal infection process. Another experimental study revealed that Seprafilm did not have any influence on healing of colonic anastomosis. In light of these data, it seems that the use of Seprafilm is safe in the major indications of Hartmann colostomy and no detrimental effect can be expected on the second operation.

Many experimental studies of intra-abdominal adhesions were investigated and most of them were carried out on female animals, certainly owing to specific pelvic anatomy. We preferred female animals for the same reason. As for adhesion scoring, we have chosen the method defined by Nagler et al because it seems to offer a realistic and reliable way to determine intra-abdominal adhesions.

Although a membrane, Seprafilm quickly transforms into gel, and routine clinical practice includes laying the Seprafilm between the intra-abdominal organs and the laparotomy incision. However, Diamond used Seprafilm in a different fashion; he wrapped it around the uterus after myomectomy. Diamond reported that this type of application significantly decreased uterine adhesions. In this present study, we compared different applications of the membrane and, finally, the findings in all of the applications were found to be superior to those of the control group. However, no significant difference was determined between Seprafilm groups. This fact may demonstrate that rapid transformation to gel allows Seprafilm to reach deeper areas in the pelvis.

In this study, Seprafilm significantly decreased pelvic adhesions subsequent to an end-left-sided colostomy. Therefore, it may be concluded that the use of Seprafilm in the first step of the Hartmann colostomy can ease its reversal by decreasing adhesions, and traditional use of the membrane is enough to ensure this effect. Nevertheless, controlled clinical trials are required to obtain a definite conclusion.

REFERENCES


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