

Adhesion Prevention in Gynaecological Surgery

This clinical practice guideline has been reviewed and approved by the Clinical Practice Gynaecology Committee and by the Executive and Council of the Society of Obstetricians and Gynaecologists of Canada.

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Disclosure statements have been received from the primary authors and all committee members.

Outcomes: The outcomes measured are the incidence of postoperative adhesions, complications related to the formation of adhesions, and further intervention relative to adhesive disease.

Evidence: Medline, EMBASE, and The Cochrane Library were searched for articles published in English from 1990 to March 2009, using appropriate controlled vocabulary and key words. Results were restricted to systematic reviews, randomized control trials/controlled clinical trials, cohort studies, and meta-analyses specifically addressing postoperative adhesions, adhesion prevention, and adhesive barriers. Searches were updated on a regular basis and incorporated in the guideline to March 2009. Grey (unpublished) literature was identified through searching the websites of health technology assessment and health technology assessment-related agencies, clinical practice guideline collections, clinical trial registries, and national and international medical specialty societies.

Values: The quality of evidence was rated using the criteria described in the Report of the Canadian Task Force on Preventive Health Care

Summary Statements

1. Meticulous surgical technique is a means of preventing adhesions. This includes minimizing tissue trauma, achieving optimal hemostasis, minimizing the risk of infection, and avoiding contaminants (e.g., fecal matter) and the use of foreign materials (e.g., talcum powder) when possible. (II-2)
2. The risk of adhesions increases with the total number of abdominal and pelvic surgeries performed on one patient; every surgery needs to be carefully considered in this context. (II-2)
3. Polytetrafluoroethylene (Gore-Tex) barrier is more effective than no barrier or oxidized regenerated cellulose in preventing adhesion formation. (I)
4. Oxidized regenerated cellulose (Interceed) adhesion barrier is associated with a reduced incidence of pelvic adhesion formation at both laparoscopy and laparotomy when complete hemostasis is achieved. Oxidized regenerated cellulose may increase the risk of adhesions if optimal hemostasis is not achieved. (II-2)
5. Chemically modified sodium hyaluronate/carboxymethylcellulose (Seprafilm) is effective in preventing adhesion formation, especially following myectomies. There is insufficient evidence on the effect of sodium hyaluronate/carboxymethylcellulose on long-term clinical outcomes such as fertility, chronic pelvic pain or small bowel obstruction. (II-2)
6. No adverse effects have been reported with the use of oxidized regenerated cellulose, polytetrafluoroethylene, or sodium hyaluronate/carboxymethylcellulose. (II-1)
7. Various pharmacological agents have been marketed as a means of preventing adhesions. None of these agents are presently available in Canada. There is insufficient evidence for the use of pharmacological agents in preventing adhesions. (III-C)

Abstracts

Objectives: To review the etiology and incidence of and associative factors in the formation of adhesions following gynaecological surgery. To review evidence for the use of available means of adhesion prevention following gynaecological surgery.

Options: Women undergoing pelvic surgery are at risk of developing abdominal and/or pelvic adhesive disease postoperatively. Surgical technique and commercial adhesion prevention systems may decrease the risk of postoperative adhesion formation.

Key Words: Hysterectomy, postoperative adhesions, adhesion barriers

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Key to evidence statements and grading of recommendations, using the ranking of the Canadian Task Force on Preventive Health Care

Quality of evidence assessment*	Classification of recommendations†
I: Evidence obtained from at least one properly randomized controlled trial	A. There is good evidence to recommend the clinical preventive action
II-1: Evidence from well-designed controlled trials without randomization	B. There is fair evidence to recommend the clinical preventive action
II-2: Evidence from well-designed cohort (prospective or retrospective) or case-control studies, preferably from more than one centre or research group	C. The existing evidence is conflicting and does not allow to make a recommendation for or against use of the clinical preventive action; however, other factors may influence decision-making
II-3: Evidence obtained from comparisons between times or places with or without the intervention. Dramatic results in uncontrolled experiments (such as the results of treatment with penicillin in the 1940s) could also be included in this category	D. There is fair evidence to recommend against the clinical preventive action
III: Opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees	E. There is good evidence to recommend against the clinical preventive action
	L. There is insufficient evidence (in quantity or quality) to make a recommendation; however, other factors may influence decision-making

*The quality of evidence reported in these guidelines has been adapted from The Evaluation of Evidence criteria described in the Canadian Task Force on Preventive Health Care.¹

†Recommendations included in these guidelines have been adapted from the Classification of Recommendations criteria described in the The Canadian Task Force on Preventive Health Care.¹

Recommendations

1. Surgeons should attempt to perform surgical procedures using the least invasive method possible in order to decrease the risk of adhesion formation. (II-1B) When feasible, for example, a laparoscopic surgical approach is preferable to an abdominal approach, and a vaginal or laparoscopic hysterectomy is preferable to an abdominal hysterectomy.
2. Precautions should be taken at surgery to minimize tissue trauma in order to decrease the risk of postoperative adhesions. These precautions include limiting packing, crushing, and manipulating of tissues to what is strictly required for safe completion of the procedure. (III-B)
3. Surgeons could consider using an adhesion barrier for patients who are at high risk of forming clinically significant adhesions (i.e., patients who have endometriosis or pelvic inflammatory disease or who are undergoing a myomectomy). If there is a risk of ongoing bleeding from the surgical site, oxidized regenerated cellulose (Interceed) should not be used as it may increase the risk of adhesions in this situation. (II-2B)

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INTRODUCTION

Adhesions have a variety of causes, including surgical procedures. Pelvic and abdominal adhesions have been associated with significant gynaecological morbidity, including infertility, chronic pelvic pain, small bowel obstruction, and difficulty with surgical access or surgical complications in the future. It is therefore important to minimize adhesions at the time of surgery. Traditionally, techniques such as meticulous hemostasis have been advocated as a means of minimizing adhesion formation. Many new products have recently been marketed to further

reduce the formation of adhesions, but the evidence for adhesion barriers is limited by the difficulty in assessing the impact of postoperative adhesion formation in patients.

Recommendations for the prevention of adhesion formation in gynaecological surgery are quantified according to the evaluation of evidence guidelines developed by the Canadian Task Force on Preventive Health Care (Table).¹

INCIDENCE OF ADHESIONS

It has been estimated that 90% of patients undergoing major abdominal surgery and 55% to 100% of women undergoing pelvic surgery develop adhesions.² It would therefore seem that adhesions are an inevitable consequence of abdominal and pelvic surgery. Fortunately, the majority of patients with intra-abdominal adhesions are asymptomatic.³ As surgeons we are faced with the difficult task of trying to predict which patients are predisposed to symptomatic adhesion formation on the basis of the type of surgery performed and the patients' underlying pathology.

CAUSES AND ASSOCIATIONS OF ADHESIONS

Within hours of surgery, fibrin is deposited in the area of surgery.⁴ This fibrin is either then resorbed or becomes organized into fibrous adhesions.⁴ It is unclear why some patients experience resorption, while others have further formation of these adhesions. Two specific risk factors for the further organization of fibrin into adhesions have been identified: tissue injury and an inflammatory response.⁴

Ischemic Injury

When tissue damage is associated with vascular insufficiency, adhesions form as a means of preventing ischemic injury.⁴ Therefore, following operations during which the tissues are crushed, sutured, or ligated, adhesions typically form in the area of injury to provide new blood supply to the devascularized organ.

Inflammatory Response

Contamination of the peritoneal cavity by foreign material (e.g., talcum powder, sutures, fecal material) has also been associated with the formation of adhesions because it produces an inflammatory response.^{4,5} Bacterial infection causes a similar inflammatory reaction.⁶ Averting bowel injury, preventing postoperative infections, and precluding the use of foreign materials are advocated as means of preventing inflammation but cannot always be achieved.

CONSEQUENCE OF ADHESIONS

The majority of patients who develop postoperative adhesions are asymptomatic. Clinically significant outcomes associated with adhesions include chronic pelvic and abdominal pain, bowel obstruction, infertility due to the formation of adnexal adhesions, and complications at subsequent surgeries, such as difficult dissection and visceral injury.³

METHODS OF ADHESION PREVENTION

Meticulous Surgical Technique

Meticulous surgical technique has long been advocated in the prevention of adhesions.⁴ Avoidance of tissue trauma with gentle tissue handling and prevention of thermal injury, meticulous hemostasis, prevention of bacterial infection or fecal contamination, use of copious irrigation, and avoidance of foreign objects intuitively make sense as intraoperative means of preventing postoperative adhesions.³ When possible, the omentum can be placed such that bowel is shielded from the abdominal wall before closure of the laparotomy incision.⁴

With every surgery, a certain amount of tissue injury inevitably occurs.⁷ With increasing number of surgeries there is an increased risk of adhesion formation.⁸ It is therefore important to attempt to minimize the total number of surgeries performed on one patient.

Laparoscopic surgical procedures have been associated with fewer postoperative adhesions than open surgeries.^{7,9-11} Patients requiring a hysterectomy should be offered a vaginal or laparoscopic approach rather than an abdominal approach when feasible.¹² Surgeons should attempt to perform surgical procedures using the least invasive method possible, while respecting the limitations of the individual patient characteristics, anticipated pathology, and their own level of skill.

Adhesions are not always preventable despite meticulous surgical technique. Some conditions may increase the likelihood of forming adhesions, such as endometriosis or chronic pelvic inflammatory disease.¹³ Patients undergoing myomectomy are also at increased risk of adhesions, and in those women who are hoping to preserve fertility adhesions add an element of risk of interrupting tubal patency.¹⁴ When patients are at particular risk of postoperative adhesions, the use of adjuvant measures of adhesion prevention could be considered.

Summary Statements

1. Meticulous surgical technique is a means of preventing adhesions. This includes minimizing tissue trauma, achieving optimal hemostasis, minimizing the risk of infection, and avoiding contaminants (e.g., fecal matter) and the use of foreign materials (e.g., talcum powder) when possible. (II-2)
2. The risk of adhesions increases with the total number of abdominal and pelvic surgeries performed on one patient; every surgery needs to be carefully considered in this context. (II-2)

Recommendations

1. Surgeons should attempt to perform surgical procedures using the least invasive method possible in order to decrease the risk of adhesion formation. (II-1B) When feasible, for example, a laparoscopic surgical approach is preferable to an abdominal approach, and a vaginal or laparoscopic hysterectomy is preferable to an abdominal hysterectomy.
2. Precautions should be taken at surgery to minimize tissue trauma in order to decrease the risk of postoperative adhesions. These precautions include limiting packing, crushing, and manipulating of tissues to what is strictly required for safe completion of the procedure. (III-B)

Two systematic reviews have considered whether barrier agents and pharmacological agents are clinically effective in preventing the formation of postoperative adhesions in patients who have undergone pelvic surgery.^{15,16}

Barrier Agents

Barrier agents were devised to create a synthetic barrier agent between opposing pelvic structures during tissue healing that would prevent the formation of adhesions. The main theoretical concern with the use of these agents is that they could cause a foreign material reaction, thus contributing to adhesion formation. There is insufficient evidence of the effect of barrier agents on long-term clinical outcomes such as fertility, chronic pelvic pain, or small bowel obstruction.

Oxidized regenerated cellulose (Interceed)

Interceed is an absorbable synthetic mechanical barrier made of oxidized regenerated cellulose. When applied on

damaged peritoneum, Interceed transforms into a gel that covers the area and is postulated to prevent adhesion formation.¹⁷ The membrane may be cut as necessary, which may allow for its use in both open and laparoscopic surgeries; however, the product monograph specifies that it has been approved only for use at laparotomy. It should be applied in a single layer between two adjacent tissues. Interceed is completely absorbed within two weeks. Meticulous hemostasis must be achieved before Interceed is applied; when mixed with blood Interceed increases fibrin deposition and may increase the formation of adhesions.¹⁸

There have been numerous studies evaluating the use of Interceed versus no treatment.¹⁹⁻²⁸ When compared with no treatment, Interceed was associated with a reduced incidence of pelvic adhesion (OD 0.39; 95% CI 0.28 to 0.55) following laparotomy.¹⁵ Similar results were noted following laparoscopy, with a reduction noted in new formation (OD 0.31; 95% CI 0.23 to 0.79) and in reformation (OR 0.19; 95% CI 0.09 to 0.42) of adhesions.¹⁵ There are no data on its effects on the incidence of small bowel obstruction, chronic pelvic pain, or pregnancy rates.

Polytetrafluoroethylene (Gore-Tex)

Gore-Tex is a permanent, nonabsorbable membrane that must be sutured into place. Particularly at laparoscopy, the need to stabilize the membrane with sutures may result in surgical delays.

There is evidence to suggest that, compared with no treatment, Gore-Tex results in a reduction in the formation of new adhesions in patients undergoing a myomectomy (OR 0.21; 95% CI 0.05 to 0.87).²⁹ Gore-Tex has been reported to have less adhesion reformation than Interceed in women undergoing adhesiolysis (OR 0.16; 95% CI 0.03 to 0.80).^{15,30} Results should be interpreted with caution, as it is unclear if the surgeon was unblinded at the time of second look laparoscopy.¹⁵ Again, no studies have evaluated the incidence of small bowel obstruction and chronic pelvic pain or pregnancy rates following the use of Gore-Tex.

Chemically modified sodium hyaluronate/ carboxymethylcellulose (Seprafilm)

Seprafilm is an absorbable synthetic membrane made up of two polysaccharides: sodium hyaluronate and carboxymethylcellulose. Seprafilm is supplied within a plastic sleeve which must be removed before the Seprafilm is placed on the tissues. Within 24 to 48 hours, the membrane becomes gelatinous, and it is absorbed within one week. At the present time, Seprafilm is indicated only for use at laparotomy.

Some surgeons use Seprafilm at laparoscopy by creating a "slurry" (i.e., a thin mixture of Seprafilm mixed with normal saline) and then flushing this preparation via a catheter

through one of the laparoscopic ports. The slurry produces a gelatinous membrane coating on any surface on which it is deposited, and it is postulated that its adhesion-preventing effects may be similar to those produced when Seprafilm is used at laparotomy. Although this slurry is being used by Canadian and international surgical experts, there is insufficient evidence to support its use in preventing adhesions, and this constitutes an off-label use of the product. Trials of benefits are presently underway.

The only study to examine the use of Seprafilm at laparotomy versus no treatment³¹ concluded that it reduced the incidence, extent, and severity of postoperative adhesions. However, the Cochrane database found that suboptimal statistical analyses were used in this study, and the results should therefore be interpreted with caution.¹⁵ No studies have yet evaluated the incidence of small bowel obstruction or chronic pelvic pain or pregnancy rates following the use of Seprafilm.

Summary Statements

3. Polytetrafluoroethylene (Gore-Tex) barrier is more effective than no barrier or oxidized regenerated cellulose in preventing adhesion formation. (I)
4. Oxidized regenerated cellulose (Interceed) adhesion barrier is associated with a reduced incidence of pelvic adhesion formation at both laparoscopy and laparotomy when complete hemostasis is achieved. Oxidized regenerated cellulose may increase the risk of adhesions if optimal hemostasis is not achieved. (II-2)
5. Chemically modified sodium hyaluronate/ carboxymethylcellulose (Seprafilm) is effective in preventing adhesion formation, especially following myomectomies. There is insufficient evidence on the effect of sodium hyaluronate/ carboxymethylcellulose on long-term clinical outcomes such as fertility, chronic pelvic pain, or small bowel obstruction. (II-2)
6. No adverse effects have been reported with the use of oxidized regenerated cellulose, polytetrafluoroethylene, or sodium hyaluronate/ carboxymethylcellulose. (II-1)

Recommendation

3. Surgeons could consider using an adhesion barrier for patients who are at high risk of forming clinically significant adhesions (i.e., patients who have endometriosis or pelvic inflammatory disease or who are undergoing a myomectomy). If there is a risk of ongoing bleeding from the surgical site, oxidized regenerated cellulose (Interceed) should not be used as it may increase the risk of adhesions in this situation. (II-2B)

Pharmacological Agents

The use of various pharmacological agents has been proposed to prevent the formation of adhesions. None of these agents have been approved for use in Canada. There is insufficient evidence for the use of pharmacological agents in preventing adhesions.

Summary Statement

7. Various pharmacological agents have been marketed as means of preventing adhesions. None of these agents are presently available in Canada. There is insufficient evidence for the use of pharmacological agents in preventing adhesions. (III-C)

SUMMARY

Meticulous surgical technique is an inexpensive and risk-free practice that may decrease likelihood of adhesion formation. Studies involving the use of commercial adhesion prevention and barrier methods such as Interceed, Gore-Tex, and Seprafilm revealed that these agents appear safe for use in gynaecological surgery. However, there is limited evidence for the long-term benefits of adhesion prevention agents in gynaecological surgery. Previous studies typically assessed only the rate of adhesion formation and did not evaluate long-term, clinically relevant outcomes such as fertility rates or abdominal or pelvic pain. Further studies of commercial adhesion prevention and barrier methods that evaluate these long-term clinical outcomes are needed.

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