Total Occlusive Ionic Silver-Containing Dressing vs Mupirocin Ointment Application vs Conventional Dressing in Elective Colorectal Surgery: Effect on Incisional Surgical Site Infection

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BACKGROUND: Several pre- and intraoperative factors have been associated with incisional surgical site infection (SSI), but little is known about the influence of postoperative wound care and especially, the use of different dressings on incisional SSI. The aim of this study was to compare 3 methods of wound dressings (conventional dressing, silver-containing dressing, and mupirocin ointment dressing) for their ability to prevent SSI, as measured by SSI rates, in patients with colorectal cancer undergoing elective open surgery.

STUDY DESIGN: A prospective, randomized study was performed. Inclusion criteria were diagnosis of colorectal neoplasms and plans to undergo elective surgery with curative aims. Patients were randomized using a 1:1:1 allocation into 3 groups: patients receiving an ionic silver-containing dressing (ISD) (group 1), a mupirocin ointment application (MOA) (group 2), and a conventional dressing (group 3 or standard dressing). The primary outcomes variable was occurrence of incisional SSI. Follow-up was 30 days postoperatively.

RESULTS: A total of 147 patients were included, 49 in each group. Incisional SSI occurred in 9 patients (18.4%) in the ISD group, 2 (4.1%) in the MOA group, and 10 (20.4%) in the standard dressing group ($p = 0.028$). Adjusting for multiple comparisons, there were no significant differences between ISD and standard dressing groups; a significant difference was observed between ISD and MOA (relative risk [RR] 4.5; 95% CI (1.1 to 19.8); $p = 0.046$) and between the standard group and the MOA group (RR 5; 95% CI (1.2 to 21.7); $p = 0.031$).

CONCLUSIONS: Topical application of mupirocin ointment achieves better results for the prevention of SSI than ionic silver-containing dressing or standard dressing in patients undergoing elective open colorectal surgery. (J Am Coll Surg 2015;221:424–429. © 2015 by the American College of Surgeons)

Surgical site infection (SSI) is a frequent complication after any surgical procedure, implying a decrease in health-related quality of life, double the risk of readmission, a prolonged hospital stay, and increased hospital costs.[1,2]

Elective colorectal surgery is considered a clean-contaminated procedure, with incisional SSI rates between 5% and 15%.[1] Several factors have been associated with incisional SSI, such as asepsis, type of operation, perioperative antibiotic prophylaxis, and comorbidities. However, little is known about the influence of postoperative wound care and especially, the use of different types of dressings.[3,4] Recently, the use of total occlusive ionic silver-containing dressings (ISD) was found to be effective in reducing bacterial colonization on the surgical site compared with no dressing.[5] The benefits of these dressings in terms of reduction of SSI, when compared with conventional methods of dressing, are controversial.[6]

More than 25% of incisional SSIs after elective colorectal surgery are caused by gram-positive microorganisms, including *Streptococcus spp* and *Entercoccus spp*.[7] Mupirocin is an antibiotic agent active against gram-positive bacteria. It is frequently used for nasal decontamination in *Staphilococcus aureus* carriers,[8] but it has also seen cutaneous application for SSI prevention of central venous catheters and placement of peritoneal dialysis catheters.[9]

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Abbreviations and Acronyms
ISD = ionic silver-containing dressing
MOA = mupirocin ointment application
RR = relative risk
SSI = surgical site infection

The aim of this study was to compare 3 methods of wound dressings (conventional dressing, silver-containing dressing, and mupirocin ointment dressing) for their ability to prevent SSI, as measured by SSI rates, in patients with colorectal cancer undergoing elective open surgery.

METHODS

A prospective, randomized study was performed at our institution between January 2012 and December 2013 (Fig. 1). Inclusion criteria were a diagnosis of colorectal neoplasms and plans to undergo an elective operation with curative aims. An open surgical approach was used in all patients included. In our institution colorectal surgery is mainly performed with an open approach.

The sample size calculation was based on historic data for our center's incisional SSI rate in elective colorectal surgery using conventional dressings (18%) and an expected incisional SSI rate of 6% in both experimental groups (silver-containing dressings and mupirocin ointment dressing), based on the best data reported in literature, referring to incisional SSI after elective colorectal surgery.[10] At 80% power and a significance level of 0.05, it was calculated that 45 patients were required in each arm of the study. The sample size was calculated to obtain adequate statistical power for the multiple comparison procedures performed. The number of patients was increased by 10%, in anticipation of loss at follow-up.

Patients were randomly assigned in a 1:1:1 allocation scheme using a random-number table into 3 groups: those patients undergoing an ionic silver-containing dressing (ISD) (group 1), those undergoing a mupirocin ointment application (MOA) (group 2), and those using a conventional dressing (group 3 or standard dressing). Perioperative systemic antibiotics (cefuroxime 1,500 mg and metronidazol 1,500 mg; single dose preoperatively, within 30 minutes of incision, and redosed after 4 hours when the surgery longer) were used in the 3 groups. No mechanical bowel preparation took place in any patient.

Methodology

An aqueous solution of 10% povidone-iodine was applied to the skin preoperatively. Bowel clamping was used by all surgeons during bowel section and anastomoses to avoid fecal contamination. The abdominal wall was closed in all patients using continuous sutures of absorbable monofilament polydioxanone (size 2), and the skin with staples. After placing the staples, povidone-iodine solution was applied to the wound again. Once the skin was dry from the antiseptic solution, an ISD was placed in group 1 (ISD group). In group 2, mupirocin ointment was applied over the wound (MOA group), covered with gauze, and finally, plastic adhesive tape. In the standard dressing group, the wound was covered with gauze and plastic adhesive tape.

In order to maintain the blind characteristic of this trial, some actions were taken. First, the generator of the assignment was a data manager, who was separated from those who applied dressings (scrub nurses in the operating room at the end of each procedure). The ISD and MOA groups received a common wound dressing; a double standard dressing (standard dressing over another standard dressing) was applied to patients in the standard dressing group to blind the patient, the nursing and the medical staff, and the independent data collector (epidemiology nurse) as to the nature of the dressing used. Dressings were removed on postoperative day 5, as per protocol, or earlier whenever SSI was suspected. Surgical site infection was suspected when the patient presented with fever, a red, painful, and tender region adjacent to the dressing, or the dressing was impregnated with a liquid suspicious of purulent discharge. These signs were detected by the surgeon and the epidemiology nurse. The operating surgeon became aware of which dressing had been applied only after the superficial dressing was removed. Once the dressing was removed, the epidemiology nurse who diagnosed SSI on the basis of criteria developed by the Centers for Disease Control and Prevention (CDC) still remained unaware of the group assignments because she was not present at the time of dressing removal, and she evaluated the wound later.

Variables

Clinical variables investigated were age, sex, comorbidities, location of the neoplasm, complications (anastomotic leak, incisional and organ-space SSI), mortality, and hospital stay. Technical variables evaluated were surgical technique and creation of a stoma. Microbiologic variables included cultures of the patients with incisional SSI.

Incisional SSI was defined as the presence of a purulent discharge from the surgical wound and confirmed with microbiologic culture. Incisional SSI was determined by an epidemiology nurse blinded to the treatment groups. Infection surveillance was extended for 30 days after discharge.

Statistical analysis

Statistical analysis was performed with SPSS 19.0 for Windows. Quantitative variables that followed a normal