Feasibility and Safety of Early Removal of Incisional Dressings following Thoracic Surgery

Hai-Bin Zhou a Yu Wu a Li-Quan Wang a Sheng-Lu Zou a Yi-Ze Qiao a
Le-Xin Wang b

a Department of Thoracic Medicine, Liaocheng People’s Hospital and Liaocheng Clinical School of Taishan Medical University, Liaocheng, PR China; b School of Biomedical Sciences, Charles Sturt University, Wagga Wagga, N.S.W., Australia

Key Words
Surgical dressing · Thoracic surgery · Wound infection · Wound management

Abstract
Objective: To investigate the feasibility and safety of early dressing removal of clean wounds following thoracotomy.

Subjects and Methods: A total of 230 patients (127 males, mean age 55.6 ± 16.7 years) were randomly divided into study and control groups. In the study group the cotton gauze dressing was removed 48 h after the surgery, whereas in the control group the dressing was kept on for 7–8 days until the removal of skin sutures. The infection and healing of the wounds were examined, and patients were followed up for 30 days. Results: There was no statistically significant difference in age, sex, smoking rates, concurrent illnesses and operational characteristics between the study and control groups (p > 0.05). The wound infection rate in the study and control groups was 6 (5.2%) and 7 patients (6.1%), respectively (p = 0.775). Two patients (1.7%) from the study group and 1 (0.9%, p = 0.561) from the control group had partial wound approximation by day 7. Surrounding skin integrity was normal in 106 (92.2%) of the study group and 107 (93.0%) of the control group patients by postoperative day 7 (p = 0.801).

Conclusion: Removal of wound dressing 48 h after thoracic surgery was not associated with an increased risk of surgical site infection. Hence the early removal of wound dressing did not appear to have an adverse impact on wound healing.

Introduction
Thoracic surgeries are major surgeries that are often associated with large incisional wounds and lengthy postoperative hospital stay [1, 2]. Surgical site infection has been reported in 2–3% of the patients, and the incidence of surgical site infection is associated with a history of diabetes, preoperative length of stay, and obesity [1–4]. It is generally believed that in order to prevent postoperative wound infection, the incision should be covered with wound dressings for a few days. However, as early as the 1950s, some investigators suggested that the thoracotomy with one-stage suture requires sterile dressings only for 24 h on the basis of a full hemostasis, after which the dressings can be removed without causing wound infection [5, 6]. For adult patients who have a non-draining thoracotomy, the best practice for incision dressing removal to prevent surgical site infection is yet
to be defined, but some guidelines recommend that closed surgical wounds should be covered for 24–48 h, because at this time, hemostasis is achieved and a fibrin scab formed to seal the wound [7]. However, it has been common practice today that surgical wounds following thoracotomy are covered by dressing for an extended period, until the skin sutures are removed. This longer period of dressing requires regular changes of the dressings by medical staff, thereby leading to higher cost for staff and of the dressings. In the present study, we conducted a prospective and randomized clinical trial to compare the wound healing and rate of surgical site infection between patients with a short (48 h) and long wound dressing time (>7 days).

Subjects and Methods

Patient Selection

This study was approved by our hospital’s Institutional Review Board. Written informed consent was obtained from all participants. Between January 2009 and March 2010, consecutive patients undergoing elective thoracic surgery were approached to participate in this study. Patients were excluded from the study if they were unable to provide written consent, were immunosuppressed, or under the care of surgeons who did not wish to have their patients participate in this study. Patients receiving steroids or chemotherapy before or immediately after the surgery were also excluded. The recruited subjects were randomly divided into a study and a control group, by random drawing of a number from a container. The patients with an odd number were allocated into the study group and the patients with an even number were treated as controls.

A total of 416 thoracic surgical patients were screened for this study, and 230 patients were recruited (males: 127, females: 103), with a mean age of 55.6 ± 16.7 years (range 43–76). The 230 patients were divided into two groups of 115 patients in each group.

Experimental Methods

All procedures were performed through thoracotomy. Patients who were treated with thoracoscopic procedures, sternotomy and ministernotomy were not included. Transcutaneous suture technique was used for all wound closures, with nonabsorbable monofilament (Prolene 4.0, Ethicon, Inc.; Somerville, N.J., USA). Dressing protocols for each group were done according to customary clinical practice in our hospital. Dry sterile cotton gauze was used as standard dressing in all patients. Forty-eight hours after the surgery, wound dressings in the study group were removed and the wound was exposed to room air. Patients were instructed to temporarily cover the wounds when showering. Skin sutures were removed on day 7 or 8 following the surgery. Patients in the control group underwent replacement of sterile dressing every 2 days until the day after removal of the skin sutures, which was usually 7–8 days after the surgery.

Following surgery, patients were transferred directly from the operating theater to the surgical intensive care unit (ICU). Fazolín 1.0 g was administered intravenously every 8 h postoperatively for 48 h, or until all chest draining tubes were removed, whichever comes first. Patients who were allergic to penicillin received 1.0 g of vancomycin every 12 h for 48 h. Demographic data for both groups of patients were collected on the operative day (day 0) on admission to the surgical ICU. From postoperative day 1 to day 7, daily data collection and wound assessment were conducted at 10 a.m. each day. Wound assessment was also performed 30 days after the surgery. Potential indicators of wound infection, exudate, and dressing integrity were measured daily. Exudate was swabbed for microscopy if present beyond the first 48 postoperative hours or earlier if infection was suspected. Patients were followed up postoperatively for 30 days.

Outcome Measures

Wound infection was defined as either superficial, involving skin and subcutaneous tissues, or deep, involving muscle, bone and/or mediastinum, in conjunction with one of the following: excision of wound tissue, a positive wound culture finding, or treatment with antibiotics [4]. Wound healing was measured by assessing both wound approximation and skin integrity [4]. Wound approximation was arbitrarily classified into three categories: total approximation, mild separation (<2 cm of superficial separation), and severe separation (>2 cm of superficial separation). Surrounding skin integrity was classified as normal (pink, no redness), inflamed (heat, redness, swelling), or macerated within a 2.5-cm border of the incision [4]. Excessive postoperative hemorrhage requiring reexploration was defined as constant leak of blood through the drainage tube that resulted in reduction of blood pressure and blood hemoglobin.

Statistical Analysis

Data are expressed as means ± SD or percentages where appropriate. Data were analyzed using SPSS 11.0 statistical software. Categorical data were analyzed by χ² test or Fisher’s exact test. Mann-Whitney’s test was used for the evaluation of continuous variables. A p value <0.05 was considered statistically significant. A power analysis was performed prior to the study to determine the number of patients required for this study, using a 5% alpha error level and a 50% beta error level. For a 10% difference in superficial infection between the two groups, a minimum sample of 80 patients was required for each group.

Results

The general characteristics of the patients are shown in table 1. There was no statistically significant difference in patients’ age, sex, smoking rates, and concurrent medical conditions between the two groups (p > 0.05).

As shown in table 2, there was no statistically significant difference in the type of underlying disease for surgery; ICU stay, hemorrhage in ICU, hemorrhage requiring reexploration and total length of postoperative stay between the study and the control groups were similar (p > 0.05).
There was no deep wound infection, however, superficial wound infection was observed in 6 (6.1%) of the study and 7 (6.7%) of the control group patients. There was no statistically significant difference in the wound infection rate between the study and the control groups (table 2, $p = 0.775$). Two (1.7%) patients from the study group and 1 (0.9%) from the control group ($p = 0.561$) had mild wound separation. All 3 patients were obese and 2 were current cigarette smokers prior to hospitalization. In 3 patients there was a slight hemoserous exudate but swab culture showed no bacterial growth. The suture lines were approximated and reinforced and the wounds in all 3 patients healed during the follow-up period. Surrounding skin integrity was normal in 106 (92.2%) of the study group and 107 (93.0%) of the control group patients ($p = 0.801$).

The median postoperative length of stay was 7 days for patients without a wound infection (range 5–8), compared with a median length of 10 days for patients with a wound infection (range 8–21) ($p = 0.001$).

**Discussion**

In this study on thoracic surgical patients, the overall surgical site infection rate was 5.7%. Normal surrounding skin integrity was found in more than 90% of patients at the time of hospital discharge. There were no statistically significant differences in the rate of surgical site infection between the study and the control groups. The wound healing or skin integrity surrounding the surgical wounds was also similar between the two groups. These results suggest that the practice of covering the wound with cotton gauze for more than 48 h does not offer any advantage in wound healing or in reducing wound infection following thoracic surgery as previously reported [7, 8]. Although we did not perform any cost analysis, longer dressing times in the control group were expected to be associated with higher costs, as all patients in the control group received three or more dressing replacements.

Also, the optimal dressing times for different surgical wounds are not very clearly defined. A randomized study on 1,202 patients with clean or clean-contaminated surgical wounds found that, in the group characterized by long dressing time until suture removal, the rate of postoperative wound infections was 4.9%, whereas the rate was 4.7% in the group without dressings after the first postoperative day [7]. The authors concluded that using short dressing time not only reduced the number of nursing hours, it also limited the need for costly dressing material [7]. Also, short dressing times made the observation of the wounds and maintenance of patients’ personal hygiene much easier [7]. In a randomized trial in patients undergoing clean or clean-contaminated intra-abdomi-

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**Table 1. Baseline characteristics of patients**

| Characteristics               | Study (n = 115) | Control (n = 115) | p   |
|-------------------------------|----------------|-------------------|-----|
| Age, years                    | 54.1 ± 10.1    | 52.4 ± 12.6       | 0.996|
| Male                          | 66 (57.4)      | 61 (53.0)         | 0.463|
| BMI, kg/m²                    | 25.6 ± 3.7     | 26.2 ± 4.0        | 0.221|
| Smoking status                |                |                   |     |
| Current                       | 21 (18.2)      | 19 (16.5)         | 0.737|
| Ex-smoker                     | 32 (27.8)      | 35 (30.4)         | 0.663|
| CAD                           | 16 (13.9)      | 13 (11.3)         | 0.691|
| COPD                          | 13 (11.3)      | 15 (13.0)         | 0.687|
| PAD                           | 4 (3.5)        | 6 (5.2)           | 0.746|
| Preexisting renal impairment  | 9 (7.8)        | 6 (5.2)           | 0.423|
| Type 2 diabetes               | 29 (25.2)      | 26 (22.6)         | 0.647|

Figures in parentheses are percentages. CAD = Coronary artery disease; COPD = chronic obstructive pulmonary disease; PAD = peripheral artery disease.

1 Defined as persistent albuminuria with a glomerular filtration rate of <89 ml/min/1.73 m².

**Table 2. Operation data of patients**

| Characteristics               | Study (n = 115) | Control (n = 115) | p   |
|-------------------------------|----------------|-------------------|-----|
| ICU time, h                   | 36.8 ± 11.0    | 38.6 ± 16.5       | 0.266|
| Thoracotomy procedures        |                |                   |     |
| Lung cancer                   | 33 (28.7)      | 30 (26.1)         | 0.753|
| Tumor of mediastinum          | 26 (22.6)      | 25 (21.7)         | 0.404|
| Pulmonary cysts               | 16 (13.9)      | 18 (15.7)         | 0.710|
| Diaphragmatic hernia          | 15 (13.0)      | 12 (14.3)         | 0.539|
| Esophageal cancer             | 15 (13.0)      | 17 (14.8)         | 0.703|
| Esophageal diverticulum       | 10 (8.7)       | 13 (11.7)         | 0.819|
| Hemorrhage in ICU             | 8 (6.9)        | 5 (4.3)           | 0.392|
| Reexploration                 | 3 (2.6)        | 2 (1.7)           | 0.651|
| Postoperative LOS, days       | 8.3 ± 1.1      | 8.4 ± 3.7         | 0.760|
| Superficial wound infection   | 6 (6.2)        | 7 (6.1)           | 0.775|
| Mild wound separation         | 2 (1.7)        | 1 (0.9)           | 0.561|
| Normal skin integrity         | 106 (92.2)     | 107 (93.0)        | 0.801|

Figures in parentheses are percentages. LOS = Length of hospital stay.
nal surgery, there was no difference in the incidence of surgical site infection between long dressing (dressing change and reapplication every 2 days) and short (<48 h) dressing group [8]. In a nonrandomized trial in patients who underwent foot or ankle procedures, undress of wounds on the 4th postoperative day was associated with a wound infection rate of 1.0% [9].

Conclusion

This randomized clinical trial has shown that removal of wound dressing 48 h after thoracic surgery was not associated with increased risk of surgical site infection. Therefore the early removal of wound dressing did not appear to have an adverse impact on wound healing.

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