The Effect of Talc Powder on Seroma Formation Following Incisional Hernia Repair Surgery with Mesh

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Citation

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Abstract: Background: Seroma formation is one of the complications after incisional hernia repair with mesh. We hypothesized that application of talc powder before skin closure in patients undergoing tension-free incisional hernia repair by mesh would decrease seroma formation after surgery. Method: A multi-centric, double-blind randomized controlled trial of 120 consecutive patients who underwent incisional hernia repair with onlay technique, and randomly assigned into 'mesh' group and 'mesh plus talc' group between 2016 and 2019. Results: Patient demographic characteristics did not differ significantly. Seroma formation was the main complication after surgery. There was statistically significant difference between the groups concerning seroma formation (20% in mesh group vs. 1.6% in mesh plus talc group, p<0.05), and length of drainage (4.08 days in mesh group vs. 2.02 days in mesh plus talc group, p<0.05). Post-operative complications including cellulitis, wound infection, intra-abdominal abscess, nausea and vomiting, and hypersensitivity were significantly different between two groups. Conclusion: Application of talc powder after mesh fixation to the fascia is safe in incisional hernia repair surgery to prevent seroma formation and reduce the duration of drainage.

Key Words: Incisional hernia, Seroma, Talc powder, Mesh repair

Introduction:
Incisional hernia is a type of hernia caused by incomplete wound healing in surgical incision site. Midline incisions are frequently used in abdominal surgeries, and hernias caused by these surgeries are often classified as abdominal hernias due to their location [1]. Incisional hernia is usually caused by a wound weakening at the site of surgery, which may be due to a hematoma, seroma, or infection that interfere with the healing of the wound. Other factors that alter intra-abdominal pressure including chronic obstructive pulmonary disease (COPD), constipation, urinary retention, pregnancy, and ascites may lead to hernia formation [2-4]. Seroma means the accumulation of non-bloody, non-purulent fluid in the wound which usually occurs after surgeries in which skin flaps are made, a number of lymphatic ducts are injured, or due to a cavity formation in surgical site. Seroma delays wound healing and increases the risk of infection. Different methods for reducing complications of seroma have been introduced [5, 6]. One of these methods is application of talc powder. Talc is the most common sclerosant agent, and considered as the safest and most cost-effective agent for recalcitrant pleural effusions [7]. Some studies demonstrated a significant decrease in wound complications and post-operative wound drainage in patients undergoing ventral hernia repair by using aerosolized talc in surgical site [8]. Although the incisional hernias are repaired by tension-free facial closure with mesh, this type of repair has a high recurrence rate. Most recently, new methods like retromuscular mesh placement by open approach, anterior component separation with or without mesh, and posterior component separation with transversus abdominis release are introduced for more complex reconstructions, but still there are significant rates of recurrence and complications [9]. In this study, we hypothesized that application of talc powder before skin closure in patients undergoing tension-free incisional hernia repair by mesh would decrease seroma formation after surgery.

Method
This study was designed as a multi-centric, double-blind randomized controlled trial and approved by the institutional review board of Mazandaran University of Medical Sciences and Imam Khomeini University Medical Center. From January 2016 to February 2019, patients older than 18 years...
diagnosed of incisional hernia following median laparotomy were included. Written informed consent was obtained from all the patients before they entered the study. Patients with ascites, cirrhosis, malignancy, non-healing wound, and patients who did not complete the follow-up were excluded (Figure 1). Data including age, gender, BMI, and concomitant medical complication were collected. Outcomes such as length of the operation, length of the post-operation drainage, seroma formation, cellulitis, wound infection, intra-abdominal abscess, nausea and vomiting, hypersensitivity, and length of stay at hospital were recorded for analysis.

Clinical diagnosis was made by a protrusion in the abdomen at or near the site of a previous incision, and confirmed by further imaging. For all patients, hernia repair using mesh was the treatment of choice. In the operating room, they were placed in supine position. Anesthesia was induced by midazolam (300 micg/kg) and fentanyl (2 micg/kg). Further, anesthesia was maintained by sevoflurane (0.9% with 65% N2O/35% O2), atracurium (0.01 mg/kg/min), and propofol (0.2 mg/kg/min). All patients were mechanically ventilated by endotracheal tube. For all patients, hernia was repaired via onlay technique. Skin was re-incised at the previous laparotomy incision. The weakened area in ventral wall was excised, thereafter the intestinal loops were pushed back to peritoneal cavity. The mesh was placed overlaying the defect made by hernia and was fixed to the fascia using sutures to close the hernia. After that, patients were randomly assigned into 'mesh repair' and 'mesh plus talc' groups. For the first group, the technique mentioned earlier was performed. For the second group, the hernia was repaired as the same and the sterile talc powder was poured on the surgical site before the skin closure. The skin was closed by 4/0 prolene interrupted sutures. During post-operative course the wound was checked for infection and the drained fluids were measured. The drain was removed when there was less than 30 mL of fluid for two straight days or three weeks after surgery. All patients were visited on 15th day after discharge and wounds were checked for any complication.

**Statistical analysis**

Descriptive quantitative data were computed while calculating mean and standard deviation or median and quadratic range as well as qualitative data describing frequency and percentage. Statistical tests of the chi-square and the Mann-Whitney u-test were applied to analyze the data obtained from study groups. Longitudinal changes in the parameters were compared between the two groups by general linear model repeated-measurement analysis of variance (ANOVA). The Statistical Package for the Social Sciences (SPSS, version 21.0; IBM Company, USA) was used for data analysis. Two-sided p-value of <0.05 was considered as the significance level.

### Ethics

Our study was conducted according to the Helsinki Declaration. Furthermore, the study protocol was approved by the Research Ethics Committee of Mazandaran University of Medical Sciences (IR.MAZUMS.IMAMHOSPITAL.REC.1397.106)

### Results

A total of 120 patients (60 in mesh group and 60 in mesh plus talc group) who underwent open incisional hernia repair with mesh were enrolled in this study. The summary of patient characteristics is given in Table 1. According to these data, median age at the time of surgery was 54.03 (SD= 4.71) years for the mesh repair group and 56.46 (SD= 4.11) years for the mesh plus talc group. 26 patients had the history of diabetes. Hypertension was reported in 24 patients. From the anesthesiologist point of view, cardiovascular complications of these patients were such that they had no contraindication for surgery and we did not mention that.

#### Table 1: Demographic data of the patients comparing mesh repair versus mesh plus talc in incisional hernia surgery

<table>
<thead>
<tr>
<th></th>
<th>Mesh repair (N=60)</th>
<th>Mesh plus talc (N=60)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female gender, n (%)</td>
<td>46 (76.6)</td>
<td>50 (83.3)</td>
<td>0.304</td>
</tr>
<tr>
<td>Age, mean (SD), yr</td>
<td>54.03 (4.71)</td>
<td>56.46 (4.11)</td>
<td>0.132</td>
</tr>
<tr>
<td>Body mass index, mean (SD), kg/m²</td>
<td>29.036 (3.780)</td>
<td>29.321 (3.060)</td>
<td>0.615</td>
</tr>
<tr>
<td>Diabetes, n (%)</td>
<td>11 (18.3)</td>
<td>15 (25)</td>
<td>0.579</td>
</tr>
<tr>
<td>Hypertension, n (%)</td>
<td>11 (18.3)</td>
<td>13 (21.6)</td>
<td>0.649</td>
</tr>
</tbody>
</table>

The median length of operation was 118.4 (SD= 15.4) minutes for mesh group versus 123.21 (SD= 20.11) minutes for mesh plus talc group (p = 0.132). Seroma formation was reported in 20% of patients in mesh group versus 1.6% of patients in mesh plus talc group (p <0.05). The median length of drainage was 4.08 (SD = 0.23) days in mesh group and 2.02 (SD = 0.11) days in mesh plus talc group (p <0.05). There was no statistically significant difference in post-operative complications. Post-operative cellulitis was reported 8.33% (n=5) in mesh group and 6.66% (n=4) in mesh plus talc group, respectively. 3.3% (n=2) of patients in each group had post-operative wound infection. No cases of intra-abdominal abscess were reported in any of the patients (p = 0.314). Post-operative hypersensitivity and rash was reported in 5% (n=3) of patients in mesh plus talc group. The length of hospital stay was 5.419 (SD = 0.99) days in mesh group and 5.257 (SD = 0.879) days in mesh plus talc group. There was no statistically significant difference between groups concerning the length of hospital stay (Table 2).

#### Table 2: All post-operative complications, length of operation, length of drainage, and length of stay at hospital

<table>
<thead>
<tr>
<th></th>
<th>Mesh repair (N=60)</th>
<th>Mesh plus talc (N=60)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seroma formation, n (%)</td>
<td>12 (20.0)</td>
<td>1 (1.6)</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Post-op. cellulitis, n (%)</td>
<td>5 (8.33)</td>
<td>4 (6.66)</td>
<td>0.314</td>
</tr>
<tr>
<td>Post-op. wound infection, n (%)</td>
<td>2 (3.3)</td>
<td>2 (3.3)</td>
<td>0.314</td>
</tr>
<tr>
<td>Nausea and vomiting, n (%)</td>
<td>4 (6.0)</td>
<td>3 (5.0)</td>
<td>-</td>
</tr>
<tr>
<td>Intra-abdominal abscess, n (%)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0.314</td>
</tr>
<tr>
<td>Hypersensitivity and rash, n (%)</td>
<td>0 (0.0)</td>
<td>3 (5.0)</td>
<td>0.314</td>
</tr>
<tr>
<td>Total length of operation, mean (SD), min</td>
<td>118.4 (15.4)</td>
<td>123.21 (20.11)</td>
<td>0.132</td>
</tr>
<tr>
<td>Total length of drainage, mean (SD), days</td>
<td>4.08 (0.23)</td>
<td>2.02 (0.11)</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Total hospital length of stay, mean(SD), days</td>
<td>5.419 (0.99)</td>
<td>5.257 (0.879)</td>
<td>0.132</td>
</tr>
</tbody>
</table>
Discussion
In this study, we evaluated the effectiveness of talc powder to prevent seroma formation after open incisional hernia repair with mesh. The results of this study showed that the seroma formation was significantly higher in mesh group than mesh plus tarc group. The mean time of drainage for mesh plus tarc group was 2.02 days versus 4.08 days for group that had mesh repair alone. There were no differences in post-operative complications between the two groups.

Klima et al. demonstrated that application of tarc in to subcutaneous tissue could lead to earlier removal of surgical drain, and could significantly reduce the incidence of post-operative seroma formation and cellulitis [8]. The results of this study, like our study, support the effect of talc powder due to its sclerosant feature in incisional hernia repair by onlay technique. In another study that compared the tarc versus iodopovidone to prevent seroma formation following modified radical mastectomy, using the tarc significantly did not prevent seroma formation. However, the amount of drained fluid was lower than in the control group [10]. One possibility is that the use of electrocautery and other dissecting devices has associated with increased risk of seroma formation. Further, mesh can traumatize the vasculature of the wound and lead to a fibrous reaction which may cause seroma formation. Both of these studies have the potential to support the effect of tarc in reducing seroma formation and duration of drain removal. The result of previous study showed that the application of medical tarc increased the rate of seroma formation and wound infection following onlay repair of large abdominal hernias [11]. This study included small sample size, and tarc was used the same way we did. The rate of seroma formation was reported 76% in this study. They also used higher amount of tarc than previous studies. In the present study, we examined this method with a higher sample size and the rate of seroma formation was 1.6% following onlay repair. Some studies have suggested different methods to prevent seroma formation. Some of them included the closed-suction drains, or using high-pressure gradient in the drain, and using sharp dissecting devices rather than broad energy devices. Other techniques such as closed incisional hernia repair combined with panniculectomy, progressive tension sutures without drain placement during abdominoplasty, and Flap elevation in a plane superficial to the standard suprafascial approach during abdominoplasty have been introduced [5,6,12,13]. Despite the techniques presented in these studies, the incidence of seroma formation remained high.

In the present study, the main complication after incisional hernia repair with onlay technique was seroma formation. Application of tarc on mesh before skin closure significantly reduced the seroma formation. No major side effects were observed for tarc other than hypersensitivity and rash, which was not statistically significant. The differences between two methods of this study in terms of length of stay at hospital and total length of operation were not statistically significant. The authors of this study recommend the use of talc powder after mesh fixation to the fascia in incisional hernia repair surgery to prevent seroma formation and reduce the duration of drainage.

Conflicts of interest: The authors declare that they have no conflicts of interests.

References