

# Comparison of Surgical Site Infection in Hip Surgery with Closed Suction Drain and without Drain

Ihsanullah, Salik Kashif, Bahadar Ali Khan, Fazle Subhan, Muhammad Siraj

## ABSTRACT

**Background:** Surgical Site Infection (SSI) is one of the common and increases patient morbidity, hospital stay and treatment cost.

**Objective:** To determine the risk of SSI with and without the use of closed suction drain in clean hip.

**Material & Methods:** This randomised controlled trial of 314 patients was carried out from May 2012 to April 2013, were randomly allocated into two groups "A" and "B". In-group "A" operated with closed suction drain placed at surgical site while group "B" operated without placement of a closed suction drain. Patients followed on 2<sup>nd</sup>, 7<sup>th</sup>, 14<sup>th</sup> and 30<sup>th</sup> postoperative days to look for any signs of infection like redness, discharge of pus or collection.

**Results:** Among 314 patients, total 7(2.2%) patients developed surgical site infection, 4 patients (2.5%) in group A and 3(1.9%) in group B. Age of patients in group A range from 4 to 90 while in group B the age ranged from 5 to 90 years. In-group A 110(70.1%) male, 47(29.9%) were female. Male to female ratio was 2.34:1. While in-group B 100(63.7%) male and 57(36.3%) were female. Male to female ratio was 1.75:1. One patient in each group (0.63%) developed SSI and it was superficial on 2<sup>nd</sup> postoperative day. Four patients, 2 in each group presented with SSI on 7<sup>th</sup> postoperative day. One patient in-group "A" developed SSI on 30<sup>th</sup> postoperative day.

**Conclusion:** There is statistically no significant difference in the rate of SSI whether a closed suction drain is placed or not placed in clean hip surgery.

**Key words:** Surgical site infection, Closed suction drains, Hip surgery

## INTRODUCTION

Hip fractures, generally referred to as proximal femur fractures include lesser/greater trochanteric, intertrochanteric, subtrochanteric and neck of femur fractures and are common in older patients.<sup>1</sup> Hip fractures can also occur in young individuals but generally require high-energy trauma. It is a debilitating event that leads to major limitation of patient function.<sup>2</sup>

The incidence increases with advancing age.<sup>1</sup> Surgical site infection (SSI) is defined as infections occurring within 30 days of surgery if no implant is used or within one year if an implant is used. It affects either the incision or deep tissue at the surgical site.<sup>3,4</sup> SSI is a complex process and influenced by many host, local and surgical actors but the level of bacterial

contamination is the most Research Council classified surgical wounds into clean, clean-contaminated, contaminated and dirty significant risk factor.<sup>5</sup> On the basis of microbial contamination and risk for SSI, The US National wounds with infection rates for them is 1-2% or less, 6-9%, 13-20% and 40% respectively. The incidence of surgical site infection is 2.27% in orthopaedic surgery.<sup>6</sup> Surgical site infections lead to increased morbidity, mortality and increased health care cost.<sup>3</sup> Aseptic measures are needed to decrease the incidence of SSIs.<sup>3</sup> One of such method is the use of closed suction drainage.<sup>4</sup> In orthopaedics these devices have been used to decrease local edema, lessen the potential for hematoma or seroma formation, and to aid in the efflux of infection.<sup>7,8,9</sup> However, the role of postoperative surgical drains in clean, elective cases of hip fracture surgery has not been firmly established.<sup>7-9</sup> In fact, most studies fail to show a statistical difference in outcome between drained and un drained patients and even then drains continue to be placed after elective orthopaedic surgery.<sup>9</sup> However, because of the poor trial methodology of many of the studies and the

Department of Orthopaedics and Spine Surgery,  
Hayatabad Medical Complex, Peshawar  
Correspondence: Dr. Salik Kashif  
Email: salikkashif@gmail.com

inadequate reporting of outcomes, further randomized trials on this topic are justified.<sup>7</sup>

## MATERIAL & METHODS

We conducted a randomised controlled trial of 314 patients at Orthopaedics and Spine unit of Hayatabad Medical Complex Peshawar, from May 2012 to April 2013. Patients were randomly allocated into two groups "A" and "B" by lottery method. Patients' in-group "A" were operated with closed suction drain placed at surgical site while group "B" patients were operated without placement of a closed suction drain. All those patients were included in the study who underwent clean orthopaedic procedures around the hip with some sort of implant placed at surgical site, such as Total Hip Arthroplasty, Hemiarthroplasty, Plating, Intramedullary Nailing, open Interlocking Nails, Dynamic Hip Screws, Dynamic Compression Screw irrespective of age and gender. To avoid bias in the study, open fractures, diabetic patients, HIV positive patients, smokers, patients taking steroids or having infection elsewhere locally or systemically were excluded from the study. Patients from both genders were included in the study irrespective of the age. Those admitted through OPD (out patients department) & Emergency, fulfilling the inclusion and exclusion criteria was included in this study. Patients in both groups received the same single dose of broad spectrum antibiotics intravenously i.e. 2<sup>nd</sup> generation cephalosporins one hour before the induction of anesthesia and two more doses of same antibiotic post-operatively. All these patients were followed on 2<sup>nd</sup>, 7<sup>th</sup>, 14<sup>th</sup> and 30<sup>th</sup> postoperative days to look for any signs of infection like redness, discharge of pus or collection. Any discharge from the wound was sent for WBC count and Culture sensitivity. Those who were found to have SSIs were managed according to the standard protocols with culture and sensitivity of pus discharge, antibiotics and surgical management like debridement or implant removal when needed. To assess healing of wound in a better way, Southampton wound scoring system was used. Data was collected on a Performa and analyzed in SPSS version 10.0. Chi square test was performed and P-value  $\leq 0.05$  was considered significant.

## RESULTS

Total of 7 (2.2%) patients out of 314 developed surgical site infection, 4 patients (2.5%) in-group A (drain group) and 3 (1.9%) in-group B (non-drain group). Age

of patients in group A range from 4 to 90 while in group B the age ranged from 5 to 90 years (Table 1). In-group A 110 (70.1%) patients were male whereas 47 (29.9%) patients were female. Male to female ratio was 2.34:1. While in-group B 100 (63.7%) patients were male and 57 (36.3%) patients were female. Male to female ratio was 1.75:1 in this group of patients (Table 2). The SSI rate was 0.63% in both groups A and B on 2<sup>nd</sup> postoperative day. One patient in each group (0.63%) developed SSI and it was superficial SSI (Table 3). They were complaining of pain at surgical site along with fever. On removing the dressing surgical site was found erythematous. Total leucocyte count was raised i.e. 13,564 in group A and 11,400 in-group B patient. CRP was raised as well. No pus or discharge was pouring from the surgical site on pressing. They responded well to intravenous antibiotics initially and then oral antibiotics. On re-examination 7<sup>th</sup> post-operative day no sign/symptom of surgical site infection was found. Infection rate was 1.27% on 7<sup>th</sup> postoperative day. Four patients, 2 in each group presented with surgical site infection on 7<sup>th</sup> postoperative day. Group "A" patients presented with complaints of pain and discharge from the surgical site. It was deep infection involving fascia and muscle layers. Culture was taken and both of them underwent debridement of the surgical site along with I/V antibiotics. They responded to it and no need for implant removal was necessary. Growth of *S. aureus* was noted and was sensitive to multiple antibiotics including Ciprofloxacin, Fusidic acid, Linezolid. Group B patients also needed debridement and I/V antibiotics. They were followed on 14<sup>th</sup> postoperative day, examined and investigated. The infection was well within control. No implant was removed in either of these two patients as well. One patient in group B who developed superficial surgical site infection was admitted but he refused treatment and went against medical advice. This patient was excluded from the study (Table 4). No patient in either group reported surgical site infection on 14<sup>th</sup> postoperative day. The only patient in-group "A" who developed surgical site infection on 30<sup>th</sup> postoperative day was a 51-year-old male in whom Austin Moore Hemiarthroplasty was done for his neck of femur fracture. Post-operatively the infection was found extending all the way into the prosthesis. Pus as well as tissue was taken for culture and sensitivity, it showed growth of MRSA, sensitive only to Imipenem. This patient underwent debridement three times along with I/V antibiotics but he didn't respond to it and ultimately implant had to

be removed. No patient in-group "B" developed surgical site infection on 30<sup>th</sup> postoperative day. SSI rate was 0.6 % on day 30<sup>th</sup> with 0.3% in-group "A" and 0% in group "B". Six out of 7 SSI (85.71%) were found in patients aged above 40 years. One patient with surgical site infection (14.28 %) had age of 25 years. The SSI rate between two groups was statistically insignificant. (p value 0.45). Surgical site infection in patients where closed suction drain was placed was 2.54%, while in those where drain was not placed was 1.91%. P-value was 0.45, which is statistically not significant.

**Table 1:** Distribution of patients according to age in both groups (n = 314)

| Age (years) | Group A (n = 157) |      | Group B (n = 157) |      |
|-------------|-------------------|------|-------------------|------|
|             | No.               | %    | No.               | %    |
| ≤20         | 27                | 17.2 | 23                | 14.6 |
| 21-40       | 36                | 22.9 | 40                | 25.5 |
| 41-60       | 59                | 37.6 | 53                | 33.8 |
| ≥61         | 35                | 22.3 | 41                | 26.1 |
| Mean±SD     | 45.41±20.81       |      | 45.89±21.23       |      |

**Table 2:** Gender distribution in both groups

| Gender | Group A |      | Group B |      | Total |      |
|--------|---------|------|---------|------|-------|------|
|        | No.     | %    | No.     | %    | No.   | %    |
| Male   | 110     | 70.1 | 100     | 63.7 | 210   | 66.8 |
| Female | 47      | 29.9 | 57      | 36.3 | 104   | 33.2 |

**Table 3:** Surgical site infection (SSI) day 2

| SSI | Group A (n = 157) |       | Group B (n = 157) |       |
|-----|-------------------|-------|-------------------|-------|
|     | No.               | %     | No.               | %     |
| Yes | 1                 | 0.63  | 1                 | 0.63  |
| No  | 156               | 99.37 | 156               | 99.37 |

**Table 4:** Surgical site infection (SSI) day 7

| SSI | Group A (n = 157) |       | Group B (n = 157) |       |
|-----|-------------------|-------|-------------------|-------|
|     | No.               | %     | No.               | %     |
| Yes | 2                 | 1.27  | 2                 | 1.27  |
| No  | 155               | 98.73 | 155               | 98.73 |

## DISCUSSION

According to Bennet<sup>10</sup> the data from quality research is subjective and incorporate the perceptions, beliefs of the researcher and the participants. Surgical site infection is one of the common and feared complications of surgical procedure. Different

measures are recommended and are in practice to reduce this fearful complication. One of them is placement of closed suction drain at surgical site. They are placed with the concept to prevent hematoma formation at surgical site, which by itself is thought to impair wound healing. A significant fluid collection below the wound results in an increase in wound tension, thus reducing tissue perfusion. Haematoma is also thought to be an excellent culture medium; low in opsonins, with an increased susceptibility to infections.<sup>11</sup> Removal of wound haematoma would therefore appear desirable. However, literature review failed to show any significant support for the widespread use of drains at surgical site in clean orthopaedic surgeries.

In spite of no clinical evidence that could demonstrate the benefit of their use, drains are still placed at surgical site after elective orthopaedic surgeries. In our study, a total of 314 patients underwent hip surgeries in which metallic implants were placed. They were divided into two groups with 157 patients in each group, and were subsequently followed on 2<sup>nd</sup>, 7<sup>th</sup>, 14<sup>th</sup> and 30<sup>th</sup> postoperative days for the effect of closed suction drain on SSI. In group A closed suction drain was used while group B were operated without placing a drain at the surgical site. The patients included in the study contained almost equal number of young and old patients. It was found that mean age for Group A was 45.41 years (range 4-90 years) while for Group B it was 45.89 years (range 5-90 years). RTA (road traffic accidents) was accounted for most of the young patients, while osteoporoses resulting in neck of femur and inter trochanteric fractures were common in old patients. Surucuoglu et al<sup>12</sup> and Horan et al<sup>13</sup> also noted the similar findings.

Because female live more sedentary life style they were less affected as compared to males, with a ratio 2.34:1 in group A and 1.75:1 in group B. Overall male to female ratio was 2.02:1 in both groups. Berard et al<sup>14</sup> and Culver et al<sup>15</sup> noted the same findings. Surgical site infection is the most common complication of any surgical procedure. In this study the overall rate of SSI in both groups was 2.22%. This is comparable with other studies in which the average rate of SSI was 2.6%,<sup>16</sup> and ranged from 0.26-2.8%.<sup>17</sup> Closed suction drains are used by most of the orthopaedic surgeons at surgical site despite having no statistically significant benefits. They are considered to increase the cost of surgery and prolong hospital stay. In this study the SSI rate in-group A was 2.5% and 1.91% in group B with P

value of 0.45. Thus the use of closed suction drains has no significant benefit in reducing infection at surgical site.

Similar results have also shown by other authors as well. In Cobb's study 20 patients were infected in un-drained group and 21 in drained group.<sup>18</sup> Although Cobb<sup>18</sup> and Varley<sup>19</sup> in their study on closed suction drains showed higher infection rate than usual. The study of Varley<sup>19</sup> showed infection rate i.e. 10.2% in the group with no drains. He admitted this to be higher than expected. Total of 18 patients came out to be culture positive primary wound infection. He relates this higher rate with the trial being involved elderly patients and the infection rate includes all infections occurring within 6 months postoperatively. Another study that included elderly population by Cobb<sup>18</sup> also showed higher infection rate. Infection rate in un-drained group in his study was 13.2% as compared to 7% infection rate in drained group. But their study also failed to reach statistically significant difference due to patients ages and comorbidities. The organism isolated was mostly Staph. aureus with contribution by E. coli, Staph. Epidermis and enterococci. Tjeenk et al<sup>20</sup> also found no significant difference in wound infection rate between drained and non-drained group ( $p = 0.36$ ).

Despite the paucity of showing any benefit of closed suction drain orthopaedic surgeons are still using them. A survey of British Orthopaedic association member revealed 87% surgeons use drains.<sup>21</sup> Widman<sup>22</sup> showed that even when two drains are used one superficial and one deep they have no effect in reducing postoperative hematoma volume. Similarly Holt et al<sup>23</sup> found the need for more dressing changes, increase in areas of ecchymosis and nursing discomfort with the use of drains. Contrary to this Kim et al<sup>24</sup> recommended the use of drains as they found a repeated need to change dressings in patients without drain, which resulted in discomfort for the patient and nursing staff even though there was no increase in infection rate with closed suction drain. Waugh & Stinchfield<sup>25</sup> and Parrini et al<sup>26</sup> supported the use of suction drains to prevent hematomas and thereby decrease the chances of infection. Alexander et al<sup>27</sup> also supported the use of suction drainage as the fluid removed was deficient in opsonic proteins, which are important for defensive action. Cerise et al<sup>28</sup> and Nora et al<sup>29</sup> showed experimentally and clinically the increased bacterial colonization with the use of drains. Minnema et al<sup>30</sup> and Willett et al<sup>31</sup> showed 6% positive cultures in hip arthroplasties with closed suction

drainage. Many studies have shown the use of drainage increasing the infection rate by providing a portal of entry for bacteria.<sup>24,28</sup> Kumar et al<sup>32</sup> found edematous and oozy wounds in 6 patients (2 in total hip replacements and 4 in total knee replacements) in the no drainage group until the fifth postoperative day. None of the patients ended up with infection or a prolonged hospital stay in their study. Microbiology results of all these swabs showed no growth of organisms.

There is also a divergence of opinion about the transfusion requirements, postoperative pain and rehabilitation with the use of drains.<sup>23,26</sup> Some studies have shown increased transfusion requirements with drains, while others have shown no differences following uncomplicated joint arthroplasty.<sup>33,35</sup> Walmsley et al<sup>35</sup> showed a 7% lower rate of transfusion in patients without drains. These reports differ in their assessment of surgical techniques; implant usage, blood loss and units transfused. On splitting into homogenous groups, the group sizes are too small to detect significant differences in blood loss or fall in haemoglobin levels. However, none of the studies provides a compelling reason to use drains. All patients were optimized before being considered for surgery. Blood loss calculation during operation and afterwards is subjective and variable. Therefore, changes in haemoglobin levels are a reliable means of assessment of blood loss. Even though Kumar et al<sup>33</sup> found increased transfusion requirements in patients with drains, this was not statistically significant ( $p > 0.05$ ). There was no significant fall in haemoglobin levels in either of the two groups postoperatively. This was a retrospective study and therefore has certain limitations. Yet another issue about the drain is when to remove it. Many research workers have studied this concept. They recommend that drain should not be retained at the surgical site for more than 24 hours. Keeping suction drain catheter beyond this period increases the incidence of bacterial migration to the surgical site and hence increased risk of infection. In practice, the majority of surgeons (69%) continue drainage for 24 h or more.<sup>36</sup> To sum up, neither this randomized controlled trial nor other literature showed the benefits of closed suction drains in clean orthopaedic surgeries.

## CONCLUSION

We suggest that orthopedic surgeons should reconsider the use of drains in their practice.

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