

## Wound infection after type ii open tibial fracture managed by unreamed nail

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### Abstract

**Background:** Type II open tibial fractures are usually managed by unreamed nails.

**Objective:** To determine frequency of infection in Gustilo and Anderson type-II open tibial fracture presenting to Accident and Emergency department, Sheikh Zayed Medical College/Hospital, Rahim Yar Khan using unreamed nail.

**Methodology:** This was a cross sectional study, all the patient presented in accident and emergency department Sheikh Zayed Medical College/Hospital, Rahim Yar Khan during the period from 15<sup>th</sup> July 2016 to 15<sup>th</sup> January 2017 were included in the study. The patients having open tibial fracture having gustilo and Anderson type II were included in study. The frequency of wound infection was noted. Data was analyzed by using SPSS 16.

**Results:** In this study, there were total 100 cases out of which 58 (58%) were males and 42 (42%) females. The mean age was 29.47±9.34 years while mean duration of fracture was 25.25±11.63 hours. Wound infection was seen 10 (10%) out of 100 cases. Infection was seen in 6 (10.34%) out of 58 males and 4 (9.52%) out of 42 females with p= 0.89. Infection rate was higher in cases with BMI more than 30 affecting 5 (17.86%) out of 28 cases with p= 0.10. The infection was significantly seen high in cases with DM affecting 6 (25%) out of 24 cases with p= 0.005.

**Conclusion:** Type II open tibial fracture is commonly reported in the emergency settings and are managed by unreamed intra medullary nailing. The infection rate was low in our study. Wound infection was significantly higher in cases with DM.

**Key Words:** Intramedullary, Unreamed interlocking, Nail, Gustilo and Anderson type-II, Open Tibia fibula Fractures

### Introduction

For both primary care physicians and orthopedic surgeons a sound understanding of the diagnosis and treatment of tibial shaft fractures is of utmost importance.<sup>1</sup> It is seen that often, the person who provides initial care to the patients with tibial shaft fractures is the primary care physician and he must make the proper diagnosis and institute early treatment decisions.<sup>2</sup>

With the advent of high-speed lifestyles with motor vehicles, motor sports, ice sliding, and motorcycles, as well as the growing popularity of extreme sports, contribute to the increasing occurrence of tibial shaft fractures in today's society.<sup>3</sup> It is fact that tibia is currently the most commonly fractured long bone in the body.<sup>4</sup>

Many years ago, open reduction and internal fixation with DCP was the treatment of choice in close tibial shaft fractures.<sup>5</sup> With advancement in fracture treatment now new options are available including intramedullary nailing and external fixation, which have replaced plating because they are associated with decrease in technical difficulty, decrease infection rates, and less damage to local soft tissues.<sup>6</sup>

A lot of controversies still exist for the treatment for open tibial fractures.<sup>1</sup> Various techniques had been utilized including Plaster cast immobilization.<sup>2</sup> Tibial fractures can also be treated with functional cast brace utilized by Sarmiento.<sup>3,4</sup> Different types of external fixators either uniplanar or multiplanar fixators can also be used.<sup>5</sup> Also, circular fixators utilized for fractures of the periarticular region, either proximal or distal were proved to be effective to provide good stability.<sup>6</sup> Open reduction and internal fixation utilizing plates and screws provide rigid fixation for unstable fractures and so, reducing the problem of non-union.<sup>6,7</sup> By open reduction and internal fixation however, stripping of soft tissues had increased the rate of infection.<sup>8</sup> That problem was solved by development of Intramedullary fixation techniques using Lottes and Ender nails<sup>9</sup> had been used successfully though they were not preferred in comminuted fractures as they might lead to shortening or redisplacement.<sup>10</sup> Interlocking nailing without reaming resulted in lower incidence of mal union, non-union and rate of infection and allows early patient rehabilitation especially for unstable fractures.<sup>11</sup> High Gustilo and AO classification injuries positively correlate with high non-union and

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infection rates, requiring multiple operations and long hospital stay. There is no benefit in performing surgery on open tibial fractures within six hours of presentation. A significant proportion of these patients would be polytraumatized, indirectly affecting fracture union.<sup>12</sup>

According to a study done by Mohamed A on 55 patients with tibial fracture who were treated by undreamed interlocking nail, the infection was seen in 12.7% of the cases.<sup>13</sup> Similarly in another study conducted by Yokoyama K et al in India reported infection in 6.1% of the cases.<sup>14</sup> The objective of this study was to determine the frequency of infection in Gustilo and Anderson type II open tibial fractures managed by undreamed nails.

### Methodology

This was a cross sectional study. All the patients presented with type –II open fracture of tibia at accident and emergency department, Sheikh Zayed Medical College/Hospital, Rahim Yar Khan during the period of 15<sup>th</sup> July 2016 to 15<sup>th</sup> January 2017. Data on age, Sex, etiology, anatomical location of the fracture, associated injuries and co-morbidities were noted and analyzed using descriptive statistics, follow up was up to six months. The Ethical clearance was obtained from the ethical committee of the hospital.

### Surgical Technique:

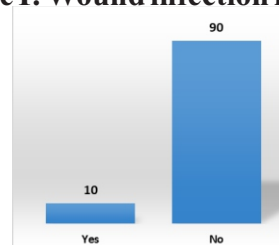
After permission from Anesthetist, inflated tourniquet up to 350mmHg after 5 minutes evaluation of the lower limb. The good position for this procedure is supine so we operated in this position. We initially washed the wound with 10-15 liter of normal saline without pressure. We scrubbed the wound and then again washed it with Normal saline then painting and draping was done and we operated by hanging the leg on the side of the table. We made incision from inferior pole of patella to tibial tuberosity deep to the subcutaneous tissue and extended the incision through the patellar tendon. Then we put small retractors on both side of patellar tendon and made entry portal at the center on anterior aspect of tibial plateau. Confirmed it through image intensifier by putting the leg on the table after confirmation of the entry. We put small reamer in the proximal fragment for entry of the guide wire after

confirmation of the through image intensifier. We removed reamer and put guide wire in the medullary canal and manually manipulated the distal fragment of the bone to reduce the fracture and advance the guide wire in the distal fragment through proprioception. When we were confident that the guide wire is in correct place in the medullary canal then we again confirmed it through image intensifier. After that we assembled the nail according to the size required and advanced the nail on the guide wire and hammered it, and once again confirmed through image intensifier, when the nail entered in the distal fragment. So whole the procedure was carried out under the guidance of image intensifier. We locked the proximal fragment through the jig guidance and the distal lock through image control. After that deflated the tourniquet and closed the surgical wound. We don't put drain in surgical wound if required, we put drain at the already wound site. Data was analyzed by using SPSS version 16.

### Results

In this study, there were total 100 cases out of which 58 (58%) were males and 42 (42%) females. The mean age was  $29.47 \pm 9.34$  years while mean duration of fracture was  $25.25 \pm 11.63$  hours. There were 24 (24%) cases with DM. Wound infection was seen 10 (10%) out of 100 cases. (Figure I) Infection was seen in 6 (10.34%) out of 58 males and 4 (9.52%) out of 42 females with  $p = 0.89$ . It was seen in 4 (11.43%) out of 35 cases with age group 35-50 years as compared to 6 (9.23%) out of 65 cases with age less than 35 with  $p = 0.72$ . Infection rate was higher in cases with BMI more than 30 affecting 5 (17.86%) out of 28 cases with  $p = 0.10$ . Wound infection affected 9 (11.54%) cases out of 78 with duration of fracture more than 12 hours and 4 (11.11%) out of 36 cases with surgery more than 40 minutes with  $p$  values of 0.33 and 0.72 respectively. The infection was significantly high in cases with DM affecting 6 (25%) out of 24 cases with  $p = 0.005$ . The mean time taken to develop infection was  $8.50 \pm 2.95$  days.

**Figure I: Wound infection in patients**



## Discussion

The prognosis of open tibial shaft fractures which result after application of high-energy trauma depends mostly on the intensity of the injuries to soft tissues, the degree of contamination of wound, the configuration of the tibial shaft fracture, and the magnitude of comminution.<sup>14</sup>

The prevalence of complications of tibial shaft fractures has decreased in recent years due to improvements in the techniques of wound covering as well as application of fixation devices, but there still is ample room for optimal management of open fractures of tibial shaft.

Wound infection was seen 10 (10%) out of 100 cases in this study. In a study done by Uchiyama Y et al, they used intramedullary nailing in different degrees of fracture and they found almost no cases with infections with type I and II fracture and if they found, they were only with superficial infection and none of the cases had deep infection.<sup>15</sup> About 11% of the infection in their study was seen only in cases where there was IIIb sub type of Gustilo fracture and there was significant difference of infection in terms of different degrees of fracture with p value of 0.004. The results of our study was similar to a study done by Sander et al,<sup>16</sup> that found almost similar number of infection cases affecting around 13% of cases with open tibial fracture. In another study by Kakar et al done on 161 cases, the infection rate was also very low and was observed only in 5(3%) of cases and out of this 4 had deep while one had superficial infection.<sup>17</sup>

In contrast to this a higher degree of infection rate was seen in grade II open tibial fracture in a study done by Wiss et al<sup>18</sup> where it was seen in 24% of the cases in their study and according to their recommendation it was stated that intramedullary nailing should be contraindicated in cases managed with open tibial fracture. The reason of higher infection rate in their study was explained due to the reaming which results in local necrosis of the bone and interference to the cortical blood supply of the bone due to nutrient artery injury. In their comparative study the cases with deep infection were reported less than those, that were managed by nailing without reaming.

The infection was significantly high in cases with DM affecting 6 (25%) out of 24 cases with p= 0.005. This was also seen by studies done in the past that the cases that had DM had higher chances

of infection, however the difference in their study was not found significant.<sup>19,20</sup> This can be explained by simple pathophysiological mechanism that in cases with DM usually have associated atherosclerosis, which impairs the blood supply of the bone and lead to spread of the infection as well as decrease in the repair and healing process.<sup>21</sup> On the other hand DM is a condition with immunocopromised state that also leads to superimposed infection and decrease in the defense mechanism of the body and leading to higher infection rates as was seen in this study.

Infection was seen in 6 (10.34%) out of 58 males and 4 (9.52%) out of 42 females with p= 0.89. This was also observed by studies done by Glueck DA et al and Brown PW et al.<sup>22,23</sup> However, this difference was not statistically significant. The reason of this higher number can be multifactorial. First of all there is higher incidence of smoking in males which is a cause of atherosclerosis and secondly the males are usually more mobile for social factors and this activity can interfere with the blood supply of the area and leading to higher infection rate.

Infection was also seen in 4 (11.43%) out of 35 cases with age group 35-50 years as compared to 6 (9.23%) out of 65 cases with age less than 35 with p= 0.72. This was also seen by a study done by Puno RM et al that found the higher infection rate in older age groups.<sup>24</sup> The cut off values of the age was not the same as ours. But this reason for higher rate can be due to the co morbid conditions like DM, HTN, arteriosclerosis and atherosclerosis.

Infection affected 9 (11.54%) cases out of 78 with duration of fracture more than 12 hours and 4 (11.11%) out of 36 cases with surgery more than 40 minutes with p values of 0.33 and 0.72 respectively. This was also observed by a study done by Roussigno et al<sup>19</sup> who developed a positive co relation between the chances of infection in cases that were either delayed in surgical selection or took longer time for their surgery. According to their study it was observed that the infection rate was high in cases, which were initially managed by external fixation, and they recommended that these cases should be managed with early nailing to avoid this infection. They found significant reduction in infection rate with early nailing with a p value of 0.017 in their study done over 55 cases. Another mechanism of higher infection rate in cases that presented late can be due to the super added infection as these cases delayed to seek the medical attention and this delay

in such cases open fracture led to invasion of the bacteria and other infected agents and led to higher number of infection rate. Secondly, due to overburden of the patients at this tertiary care hospital also leads to delays in surgical procedure and increased time of interrupted blood supply, which is also another factor associated with higher infection rate.

There were few limitations in this study as this study was done to look for only a one-sub set of fracture and the other groups with lesser or higher degrees were not studied. Secondly, this study was not done to compare this modality with reamed nailing and the other procedures to see the infection rate with those as well to look for its safety profile.

However, there were many strengths too. This study was done to document the infection rates and it described that the rate is almost equal or near to the international data. Furthermore, in this study the stratification was done on wide range of variables ranging from gender, age, BMI and duration of surgery and fracture to elaborate its importance in various directions.

## Conclusion

Type II open tibial fracture managed by unreamed intra medullary nailing has low infection rate. Wound infection is significantly higher in cases with DM. Unreamed interamedullary nail is very good option with minimum infection rate in type-II open fracture if fixed early at accident and Emergency department.

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