

Frequency of pin tract infection in open tibia fracture treated with uniplaner external fixator

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Abstract:

Objective: To determine the frequency of pin tract infection in open tibia fracture treated with uniplaner external fixator.

Study design: Descriptive cross sectional study.

Place and duration of study: Study was conducted at Department of Orthopedics and Trauma Unit, PGMI/Lady Reading Hospital, Peshawar from 19th November 2016 to 18th May 2017.

Material and methods: Sample size was 152. All patients meeting the inclusion criteria were included in the study. The diagnosis of open fracture tibia was made on the basis of examination of the wound and radiograph of the leg both AP and lateral views. The patients were subjected conventional treatment and uniplaner external fixator. Pre-operative radiographs were evaluated to determine the type of fracture. Patients were reviewed after 6 weeks for any signs of pin tract infection and noted in the proforma.

Results: Mean age was 28 years with $SD \pm 2.33$. 77% patients were male while 23% patients were female. 47% fractures on left side and 53% patients had fracture on right. 28% patients had pin tract infection while 72% patients did not have pin tract infection.

Conclusion: Our study concludes that the incidence of pin tract infection was 28% in open tibia fracture treated with uniplaner external fixator.

Keywords: Open tibial fracture, uniplaner external fixator, pin track infection, gustilo type III fracture

Introduction:

Fractures of the tibial shaft have an incidence of 17-21 per 100,000 population, represent 2% of all fractures and 36.7% of all long bone fractures in adults. Due to the specific anatomical features of the tibia (exposed position in body and limited soft tissue coverage), more than 15% of its fractures are classified as open, representing the most common 44.4% of open long bone injuries.^{1,2} External fixation is an essential component of the modern orthopaedic surgeon's armamentarium and is widely used in traumatology and reconstructive surgery. This treatment modality is unfortunately associated with the almost universal complication of pin track infection.^{3,4} Metal pin are used to apply skeletal traction or external fixation devices in

the management of orthopedic fractures. These percutaneous pins protrude though the skin and the way in which they are treated after insertion may affect the incidence of pin site infection.^{5,6}

The management of open tibial fractures continues to be major therapeutic problem because the poor soft tissue coverage and blood supply of the tibial shaft which make these fractures vulnerable to nonunion and infection.⁷⁻⁹ Treatment of open tibial fractures includes stabilization of fractures to facilitate early mobilization and taking care of the soft tissues to achieve healing without infection. Bony stabilization can be done in open fractures in variety of ways such as un-dreamed intra-medullary solid nail, pain plasters and external fixation.¹⁰ Most common

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Table-1: Age distribution (n= 152)

Age	Frequency	Percent
15-30 years	65	43%
31-40 years	49	32%
41-50 years	38	25%
Total	152	100%

Mean age was 28 years with SD \pm 2.33

method of stabilization for type III gustilo open fractures in our hospital is external fixation using A.O tubular external fixator. It is technically easy to apply and safe method, less time consuming, requiring minimum instrumentation and least expensive. The reported incidence of pin tract infection is 26.15%.¹¹

Pin track infection decreases the stability of the pin bone interface. Conversely instability of fixator pin bone construct can lead to half pin loosening and infection. It is a common misconception that pin loosening only results from pin track infection, while in fact loosening is often the initiating event resulting in pin track sepsis.^{12,13}

The aim of this study was to determine the rate of pin tract infection in the external fixator being applied for open fracture tibia because in our hospital majority of the patients with motorcycle accidents and gun shot injuries present with open tibia fractures and are treated with external fixator. Focusing on the procedure pertained frequently the results of this study will guide orthopedic surgeons about rate of pin tract infection in open fracture tibia in our setup and also future strategies may be devised in light of this study.

Study design: It was a Descriptive cross sectional study.

Material and Methods:

Study was conducted at Department of Orthopedics & Trauma PGMI/ Lady Reading Hospital, Peshawar from 19th November 2016 to 18th May 2017. The sample size was 152, using WHO sample size calculator, proportion of pin tract infection in open tibia fracture treated with uniplaner external fixator 26.15%, margin of error of 7% and confidence interval of 95%.

Non probability consecutive sampling technique was used for sampling. All patients with Gustilo III open fractures with 15 to 50 years of age and both gender were included. Patients having Gustilo type I and type II open fractures, with diabetes mellitus and patients with associated life threatening emergencies were excluded from the study. The diagnosis of open fracture tibia was made on the basis of examination of the wound and radiograph of the leg both AP and lateral views. The patients meeting the inclusive criteria were subjected conventional treatment and uniplaner external fixator. Pre-operative radiographs were evaluated to determine the type of fracture. Patients were reviewed after 6 weeks for any signs of pin tract infection and noted in the proforma. The data was analyzed in SPSS version 15. Descriptive variables like age were presented as mean \pm standard deviation. Frequency and percentages were calculated for categorical variables like gender, side of fracture, pin tract infection. Pin tract infection was stratified among age, gender and side of fracture. Post-stratification was done through chi square test. P-value of less or equal to 0.05 was considered as significant. All the results were presented in the form of tables and charts.

Results:

This study was conducted at Department of Orthopedics & Trauma, PGMI/ Lady Reading Hospital, Peshawar in which a total of 152 patients were observed to determine the frequency of pin tract infection in open tibia fracture treated with uniplaner external fixator and the results were analyzed as:

Age distribution among 152 patients was analyzed as 65(43%) patients were in age range 15-30 years, 49(32%) patients were in age range 31-40 years, 38(25%) patients were in age range 41-50 years. Mean age was 28 years with SD \pm 2.33. (as shown in Table No 1.)

Gender distribution among 152 patients was analyzed as 117(77%) patients were male while 35(23%) patients were female. (as shown in table no 2.)

Table-2: Gender distribution (n= 152)

Gender	Frequency	Percent
Male	117	77%
Female	35	23%
Total	152	100%

Table-3: Site of fracture (n= 152)

Site of fracture	Frequency	Percent
Left	71	47%
Right	81	53%
Total	152	100%

Table-4: Pin Tract Infection (n= 152)

Pin tract infection	Frequency	Percent
Yes	43	28%
No	109	72%
Total	152	100%

Table-5: Stratification of pin tract infection with age (n= 152)

Pin tract infection	15-30 years	31-40 years	41-50 years	Total
Yes	18	14	11	43
No	47	35	27	109
Total	65	49	38	152

Chi square test was applied in which P value was 0.003

Table-6: Stratification of pin tract infection with gender (n= 152)

Pin tract infection	Male	Female	Total
Yes	33	10	43
No	84	25	109
Total	117	35	152

Chi square test was applied in which P value was 0.002

Table-7: Stratification of pin tract infection with site of fracture (n= 152)

Pin tract infection	Left	Right	Total
Yes	20	23	43
No	51	58	109
Total	71	81	152

Chi square test was applied in which P value was 0.003

Site of fracture among 152 patients was analyzed as 71(47%) fracture on left site while 81(53%) patients had fracture on right. (as shown in Table No 3.)

Status of pin tract infection was analyzed as pin tract infection was found in 43(28%) patients while 109(72%) patients did not had pin tract infection. (as shown in table no 4.)

Stratification of pin tract infection with age, gender and site of fracture is given in (as shown in

table no 5,6,7)

Discussion:

The external fixator in open tibial fractures not only solves the problem of managing soft tissue injuries but at the same time provides a reasonable fixation for the bone to heal. With the AO external fixator it is possible to adhere to safe and effective external fixation techniques, avoid damage to vital structures, have access to wound and adopt the fixator so that it is bio-mechanical compatible with the fractures.¹⁴

Our study shows that mean age was 28 years with SD±2.33. Seventy seven percent patients were male while 23% patients were female. 47% fracture on left site and 53% patients had fracture on right. 28% patients had pin tract infection while 72% patients did not had pin tract infection.

Similar results were observed in another study conducted by Shtarker H et al¹⁵ in which mean age was 30 years with SD±1.81. 70% patients were male while 30% patients were female. The higher male to female ratio of 6.14:1 could be attributed to their increased activities. Females in society are held back at home whereas males being bread-winner (in majority of cases) for the family spend more time outside and are thus more prone to bomb blasts, fire arm injuries and vehicular accidents

Gustilo RB et al¹⁶ recorded PTI of 28% respectively in his studies. However, when compared to Mc' Graw et al¹⁷ studies the rate of PTI is much less in our study. This can be attributed to the fact that we did not apply any external fixator in emergency room. We did all this in the operation theatre only after complete pre-operative preparation of the patient. We also tried to keep our drilling velocity low. Moreover though we used I.V. antibiotics while the patients were in the ward, we sent them home on oral antibiotics. Thus antibiotics were for a reasonably longer time. We also taught every patient in detail how to take care of the pins' (Shanz screw) insertion sites.¹⁸

Some study shows that the deep infection rate was 6%. This is comparable to international studies. Although Lee YS et al¹⁹ reported a 0% deep infection rate using the Hoffmann a 30% rate with the Ports-mouth frame, most authors have reported an infection rate of between 2% and 8%. Siebenrock AK and Wheelwright EF reported a 4.2% deep infection in their study.^{20,21}

Bernat M et al²² had shown that pin tract infection (PTI) is a frequent complication of external fixation; according to some literature its frequency ranges from 2-30%.

Similar results were observed in another study conducted by Khan TB et al²³ in which It is technically easy to apply and safe method, less time consuming, requiring minimum instrumentation and least expensive. The reported incidence of pin tract infection is 26.15%.

Pin tract infection (PTI) is a frequent complication of external fixation; In another study conducted by Masse A et al²⁴ the rate of PTI was 26%. While the very similar findings were observed by Edge AJ et al 108 in which PTI of 25.5%.²⁵

Conclusion:

Our study concludes that the incidence of pin tract infection was 28% in open tibia fracture treated with uni-planer external fixator.

Conflict of interest: None

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Role and contribution of authors:

Dr Aimal Sattar, collected the data and references and did the initial write up.

Dr Wali Muhammad, collected the data and references, went through the article, and made some changes

Dr Muhammad Ayaz Khan, critically review the article and did changes

Dr Faiz ul Aziz, helped in collecting the data and

references and helped in discussion writing

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