

## Research Article

# Comparison of Pin Site Infection Rate between Schanz Screws and K-Wires in Ilizarov Fixator for Tibial Fracture

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## Abstract:

**Objective:** Comparison of pin site infection rate between schanz screws and k-wires in ilizarov fixator for tibial fracture

**Methodology:** It was a randomized control trial, conducted at department of Orthopedics, Khyber Teaching Hospital, MTI, and Peshawar from July 2021 to June 2022. Sampling Technique was Non-probability consecutive sampling. Patients were divided into two groups using computer generated random sequence number. Patients in group A were stabilized using K-wires and patients in group B were stabilized using k-wire and schanz screws. Data were entered in specially designed proforma.

**Result:** Mean age in group A patients was  $35 \pm 2.77$  years, while in group B it was  $38 \pm 3.12$  years. Gender distribution between two groups was analyzed. In Group A 72.3% were males and 27.7 % females while in Group B patients, 70% were males and 30% were females. Mean duration from injury to surgery was 5 days with  $SD \pm 2.12$  in group A, while  $5.5 \pm 2.37$  days in Group B. Analysis of PSI among both groups shows that Group B, in whom Schanz pins technique was used, had significantly high rates of pin site infection (24.1%) compared to group A (9.6%) in whom K-wires technique was used (p 0.012).

**Conclusion:** Our study concludes that the frequency of pin site infection is significantly less in Ilizarov fixator using K-wires (9.6%) as compared to Ilizarov fixator using Schanz pins(24.1%).

**Key word:** orthopedics, ilazorav, pin site infections

## Introduction

In the mid-1960s, Dr. Gavril Ilizarov revolutionised Orthopaedic management of difficult fractures, with his invention of ring external fixator, by treating his first patient with this technique in 1950s. Many have adapted and modified this fixator, but the principles remain the same.

Ilizarov fixator is an external fixator use for the treatment of variety of bone conditions; to lengthen bones, fix fractured bones, to correct different angular deformities height increase, to treat infected non-union or mal-union of bones and comminuted fractures even with skin loss by using circular rings 1-3 attached to bone with tightened Kirshner wires and schanz screw. <sup>[1]</sup> Pin site infection undoubtedly is the commonest complication associated with Ilizarov external fixation. Reported pin site infection rates vary from 2% to 35%. <sup>[2]</sup>

Though antiseptics are used by many surgeons to prevent pin site infections, clear-cut evidence to support their use remains uncertain. Also the recommendation for the frequency of pin site care varies from four times a day to as much as once in a week. Some studies have gone to the extent of recommending that pin sites can be just left untouched after application of external fixators. In summary, there are no evidence-based recommendations for routine pin site care in external fixators, including Ilizarov devices. <sup>[3]</sup>

Pin site infections (PSI) results in redness around entry of wire into the skin, tenderness, discharge from same site and

sometimes systemic manifestations of inflammation and may results into drastic complications like osteomyelitis. It's always a challenging condition for surgeons in case of implants. <sup>[4, 5, 6]</sup>

Degrees of infection may vary, some of them need only local wound care, while others may need pin removal and even sequestrectomy. Pin site care remains priority in prevention of infection. <sup>[7]</sup>

Tibial fractures have been reported to represent 17% to 19% of all patients with fracture. <sup>[8,9]</sup> So it is quite easier to study the frequency of pin site infection between schanz screws and k-wires in ilizarov fixator for tibial fracture.

Based on previous published data involving 6130 patients who underwent external fixation since 1980, the pin track infection rate was 27%. <sup>[10]</sup> A descriptive study consisting of 105 patients was

carried out in Combined Military Hospital (CMH) Quetta and CMH Rawalpindi over a period of 3 years showed PSI rate of 16.2% in locally made Ilizarov fixator using Schanz pins. <sup>[11]</sup>

The purpose of this study is to determine the frequency of pin site between Schanz screws versus K-wires in Ilizarov fixator as there hasn't been so much studies on this topic. Current study would provide latest data and updated information about pin site infection in both implants being used routinely in Ilizarov procedure.

## Materials and Methods

It was a randomized control trial, conducted at department of Orthopedics, Khyber Teaching Hospital, MTI, and Peshawar from July 2021 to June 2022. Sampling Technique was Non-probability consecutive sampling

**Sample Size:** Sample size was calculated using WHO calculator keeping 80 % power of study, 5% infection rate in k-wires and 17% in Schanz screws. [6] Sample size will be 83 patients in each group

**Selection Criterion:**

**Inclusion Criteria:**

- Patients aged 20 to 60 years
- Patients of both gender
- Patients undergoing ilizarov fixation with Schanz screw & K-wire for isolated fracture of tibia

**Exclusion Criteria:**

- Patients with chronic disease like renal failure or diabetes causing poor wound healing
- Patients unfit for anesthesia
- Patients with polytrauma requiring fixation of other bones or interventions by other specialties

**Data Collection Procedure:**

After approval from hospital ethical board, patients fulfilling the inclusion criteria were enrolled from orthopedic indoor of KTH. Written informed consents were taken after explaining the purpose of study. Demographic data including age, gender and duration of injury were noted. Complete history was taken and physical examination was done. Baseline labs including CBC, LFT, RFT, and serum electrolyte and chest x ray were done for general anesthesia fitness.

Patients were divided into two groups using computer generated random sequence number. Patients in group A were stabilized using K-wires and patients in group B were stabilized using k-wire and schanz screws. Patients were followed till 12 weeks or earlier removal, for development of pin site infection as per operational definition. Patients were called for follow-up on 2<sup>nd</sup>, 4<sup>th</sup>, 6<sup>th</sup>, 8<sup>th</sup>, 10<sup>th</sup> and 12<sup>th</sup> week. Data were entered in specially designed proforma.

**Data Analysis Procedure:**

Data were entered and analyzed by using SPSS version 22.0. Mean and standard deviation were calculated for quantitative variables like age and duration of disease. Frequency and percentage were calculated for categorical variables like gender and pin site infection. Both groups were compared for pin site infection using chi square test. P value <0.05 was taken as statistical significant. Effect modifiers like age, gender and duration of diseases were addressed through stratification of data. Post stratification chi square was applied. P value <0.05 was taken as statistical significant.

**Results**

Mean age in group A patients was 35±2.77 years, while in group B it was 38±3.12 years. Gender distribution between two groups was analyzed. In Group A 72.3% were males and 27.7 % females while in Group B patients, 70% were males and 30% were females. Mean duration from injury to surgery was 5 days with SD±2.12 in group A, while 5.5±2.37 days in Group B. Baseline characteristics were almost equally distributed among both groups as shown by their P values in **Table 1.**

Analysis of PSI among both groups shows that Group B, in whom Schanz pins technique was used, had significantly high rates of pin site infection (24.1%) compared to group A (9.6%) in whom K-wires technique was used (p 0.012) details given in **Table 2.**

**Table 1. Baseline characteristics of study population.**

Variables		Group A	Group B	P value
Age (years)	20-30	29(35%)	27(33%)	0.90
	31-40	20(24%)	29(35%)	
	41-50	24(29%)	16(19%)	
	51-60	10(12%)	11(13%)	
Gender	Males	60(72.3%)	58(70%)	0.87
	Females	23(27.7%)	25(30%)	
Duration Of injury (Days)	≤6	58(69.9%)	40(48.2%)	0.83
	>6	25(30.1%)	43(51.8%)	
Group A: K-wires technique		Group B: Schanz pins technique		

**Table 2. Pin site infection rate.**

Variables		Group A	Group B	P value
Pin site infection	Yes	8(9.6%)	20(24.1%)	0.012
	No	75(90.3%)	63(75.9%)	

When stratification of efficacy was done between pin site infection rates among different age groups, no significant difference was found i.e. 20-30 years (p=0.14), 31-40 years (p=0.17), 41-50 years (p=0.25) 51-60 years (p=0.59). Stratification with respect to gender also showed no significant relationship between males (p=0.07) and females (p=0.13). Stratification against time of PSI development showed a weak relationship (p=0.04) being more

common in patients of group A in patients who presented till 6th day in whom K-wires technique was used compare to Group B in whom Schanz pins technique was used, although there was no significant difference in PSI rates among both groups after 5 days (p=0.2).

**Discussion**

Pin site infection which is a clinical challenge is among most commonly expected complications of external fixator. It sometime occurs inevitably and if left untreated my results in drastic outcomes. Every effort should be done to prevent its happening by proper antibiotics at time of induction, meticulous surgical techniques while inserting K wire or pins

and proper post-operative care. <sup>[12]</sup> Different techniques have been used to reduce pin site infection and save implants. <sup>[13,14]</sup> Different studies have shown different pin site complications rate ranging from 7.9 to 100%. <sup>[15-17]</sup>

In previous study Fractures in group A patients were stabilized by using K-wires while in group B it was stabilized with Schanz screws. Patients were reviewed after 6 weeks and assessed for pin site infection. In Group A, 5% patients had pin site infection while in Group B, 17% patients had PSI ( $p=0.02$ ). <sup>[18]</sup>

In a prospective observational study of 30 consecutive patients Ramos et al used total of 113 rings and 321 K-wires consisting 642 potential pin infection sites amongst which only sixteen patients had 25(4%) pin tract infections. <sup>[19]</sup>

Similar results were observed in another study conducted by Ali et al in which out of 40 patients 29 patients (72.5%) developed PSI, 91 (10.8%) K wires sites developed infection and out of these 77 (9.14%) had superficial infection and 14 (1.66%)

had deep infection. Thirteen (07.1%) Schanz screw sites had infection and out of these 11 (06.01%) were superficial and 02 (01.09%) were deep infection.

In our study, Group B, in whom Schanz pins technique was used, had significantly high rates of pin site infection (24.1%) compared to group A (9.6%) in whom K-wires technique was used ( $p=0.012$ ).


## Conclusion

Our study concludes that the frequency of pin site infection is significantly less in Ilizarov fixator using K-wires (9.6%) as compared to Ilizarov fixator using Schanz pins(24.1%).

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