



CODEN [USA]: IAJPBB

ISSN: 2349-7750

**INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES**<http://doi.org/10.5281/zenodo.1241495>Available online at: <http://www.iajps.com>

Research Article

**COMPARISON OF SOLID INTERLOCK
INTRAMEDULLARY NAIL WITH CANNULATED OPEN
INTERLOCK INTRAMEDULLARY NAIL FOR
MANAGEMENT OF ISOLATED FEMORAL FRACTURE**¹Amna Arshad, ²Salman Agha, ³Tahreem Akram¹Punjab Medical College Faisalabad, Pakistan²Independent Medical College Faisalabad, Pakistan³King Edward Medical University Lahore, Pakistan**Abstract:**

Objective: compare the frequency of post-operative surgical site infection of solid interlock intramedullary nail with cannulated open interlock intramedullary nail for management of isolated femoral fracture.

Methodology: A total of 100 cases (50 in each group) with Isolated femoral shaft fracture, closed femoral shaft fractures or Gustilo and Anderson classification type I open femoral shaft fractures, Solid and cannulated open interlock fixation for femur shaft fractures between 20-60 years of age of either gender were enrolled in the study. Patients with bilateral femur fractures, Ipsilateral fracture of any other bone of involved side, unfit for surgery or anesthesia with comorbid condition, conversion to intramedullary nailing from external fixator of femur and presented after 30 days of fracture were excluded from the study.

Results: In our study, out of 100 cases, (50 in each group), 18%(n=9) in Group-A and 16%(n=8) in Group-B were between 20-40 years of age while 82%(n=41) in Group-A and 84%(n=42) in Group-B were between 41-60 years of age, mean \pm sd was calculated as 46.78 \pm 7.53 years in Group-A and 47.76 \pm 6.49 years in Group-B, 62%(n=31) in Group-A and 60%(n=30) in Group-B were male while remaining 38%(n=19) in Group-A and 40%(n=20) in Group-B were females, surgical site infection was compared in both groups and it was recorded in 26%(n=13) in Group-A and 56%(n=28) in Group-B while remaining 74%(n=37) in Group-A and 44%(n=22) in Group-B had no findings of the morbidity, p value was calculated as 0.00 showing a significant difference between the two groups.

Conclusion: We concluded that the frequency of post-operative surgical site infection of solid interlock intramedullary nail is significantly lower when compared with cannulated open interlock intramedullary nail for management of isolated femoral fracture. However, our results may create awareness regarding use of solid interlock intramedullary nail for the management of femoral shaft fracture.

Keywords: Femoral fracture, solid interlock intramedullary, with cannulated open interlock intramedullary nail, surgical site infection

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Please cite this article in press Amna Arshad et al., *Comparison of Solid Interlock Intramedullary Nail with Cannulated Open Interlock Intramedullary Nail for Management of Isolated Femoral Fracture*, Indo Am. J. P. Sci, 2018; 05(05).

INTRODUCTION:

Fractures of shaft of femur are the commonest fractures encountered in orthopedic surgery. Femur is the largest bone of the body and one of the major loadbearing bones of lower extremity, fractures may cause prolonged morbidity and severe disability until treatment is appropriate [1]. The annual rate of shaft femur fractures is around 10 per 100,000 individuals-years [2]. Intramedullary nailing has become the gold standard of treatment for femoral shaft fractures [3].

Postoperative surgical site infection (PSSI) is one of the most frequent and challenging complications faced by Orthopaedicians and patients. Surgical site infection (SSI) is always a possibility in correlated with any surgical intervention, especially in the setting of musculoskeletal trauma, where various factors make the treatment and prevention of these infections complex. Wound infection in presence of implant after open reduction and internal fixation (ORIF) presents clinical dilemma. The development of a wound infection in the presence of hardware after open reduction and internal fixation (ORIF) while the literature is scant to aid in decision-making [4,5].

Intramedullary nailing (IMN), with proper soft-tissue treatment, gives good results in the management of open long bone fractures.⁵ This study was designed to compare the post-operative surgical site infection of solid interlock intramedullary nail with cannulated open interlock intramedullary nail for management of isolated femoral fracture. In literature it was observed that solid IMN are more beneficial than cannulated IMN. But there is some controversy in literature. Solid IMN are new method of femoral fracture management and more effective but cannulated IMN are still in use. We want to implement the use of solid IMN but due to lack of local data as well, we are unable to implement the use of solid IMN for management of shaft femoral fracture.

OBJECTIVE:

The objective of this study was to: compare the frequency of post-operative surgical site infection of solid interlock intramedullary nail with cannulated open interlock intramedullary nail for management of isolated femoral fracture.

METHODOLOGY:

A total of 100 cases (50 in each group) with Isolated femoral shaft fracture, closed femoral shaft fractures or Gustilo and Anderson classification type I open femoral shaft fractures, Solid and cannulated open interlock fixation for femur shaft fractures between 20-60 years of age of either gender were enrolled in the study. Patients with

bilateral femur fractures, Ipsilateral fracture of any other bone of involved side, unfit for surgery or anesthesia with comorbid condition, conversion to intramedullary nailing from external fixator of femur and presented after 30 days of fracture were excluded from the study. After approval from hospital ethical committee, these cases were enrolled from department of Orthopedic surgery, Allied Hospital, Faisalabad admitted via emergency. An informed consent was obtained from the patients. Demographic profile (name, age, gender and contact) was also obtained. Then patients were randomly divided in two groups by using computer generated random number table. In group A, Patients underwent operative management with solid interlock IMN. In group B, Patients underwent operative management with cannulated interlock IMN. All surgeries were performed by senior surgeons. Patients were discharged at 3rd post operative day and stitches were removed at 10th post operative day. Patients were followed-up in OPD for 4 weeks for presence of surgical site infection as per operational definition. Contact was done by taking contact numbers.

All the collected data was entered and analyzed through SPSS version 16. The quantitative variable like age was presented as mean & standard deviation. The qualitative variable like gender, and surgical site infection was presented as frequency and percentages. Chi-square test was used to compare frequency of surgical site infection in both group. P-value ≤ 0.05 was considered as significant. Effect modifiers like age, gender was controlled by stratification. Post stratification chi-square test was applied. P value ≤ 0.05 as significant.

RESULTS:

A total of 100 cases (50 in each group) fulfilling the inclusion/exclusion criteria were enrolled to compare the frequency of post-operative surgical site infection of solid interlock intramedullary nail with cannulated open interlock intramedullary nail for management of isolated femoral fracture.

Age distribution of the patients was done showing that 18% (n=9) in Group-A and 16% (n=8) in Group-B were between 20-40 years of age while 82% (n=41) in Group-A and 84% (n=42) in Group-B were between 41-60 years of age, mean \pm sd was calculated as 46.78 \pm 7.53 years in Group-A and 47.76 \pm 6.49 years in Group-B. (Table No. 1)

Patients were distributed according to gender showing that 62% (n=31) in Group-A and 60% (n=30) in Group-B were male while remaining 38% (n=19) in Group-A and 40% (n=20) in Group-B were females. (Table No. 2)

Surgical site infection was compared in both groups and it was recorded in 26% (n=13) in

Group-A and 56%(n=28) in Group-B while remaining 74%(n=37) in Group-A and 44%(n=22) in Group-B had no findings of the morbidity, p

value was calculated as 0.00 showing a significant difference between the two groups. (Table No. 3).

TABLE 1: AGE DISTRIBUTION
(n=100)

Age (in years)	Group-A Solid interlock IMN (n=50)		Group-B cannulated interlock IMN (n=50)	
	No. of patients	%	No. of patients	%
20-40	9	18	8	16
41-60	41	82	42	84
Total	50	100	60	100
mean±sd	46.78±7.53		47.76±6.49	

TABLE 2: GENDER DISTRIBUTION
(n=100)

Gender	Group-A Solid interlock IMN (n=50)		Group-B cannulated interlock IMN (n=50)	
	No. of patients	%	No. of patients	%
Male	31	62	30	60
Female	19	38	20	40
Total	50	100	50	100

TABLE 3: COMPARISON OF SURGICAL SITE INFECTION IN BOTH GROUPS
(n=100)

Surgical site infection	Group-A Solid interlock IMN (n=50)		Group-B cannulated interlock IMN (n=50)	
	No. of patients	%	No. of patients	%
Yes	13	26	28	56
No	37	74	22	44
Total	50	100	50	100

DISCUSSION:

Fractures of the femoral shaft are among the top causes of orthopedic consults and mostly are caused by high-energy trauma. Surgical planning and documentation of these fractures have been guided by classification systems such as those from Winquist–Hansen and the AO/Orthopedic Trauma Association. Several treatment options are available for femoral shaft fractures depending on fracture pattern, degree of comminution, fracture location, and soft tissue involvement. With the advent of Interlock Intramedullary nailing, there is

better angular and rotational control of fractures fragments especially for comminuted and oblique fractures of the femoral shaft. Surgical site infection is always a possibility in association with any surgical intervention, particularly in the setting of musculoskeletal trauma, where multiple factors make the prevention and treatment of these infections complex. The development of a wound infection in the presence of hardware after open reduction and internal fixation (ORIF) presents a clinical dilemma, and there is scant literature to aid in decision-making. We planned this study to

compare the frequency of post-operative surgical site infection of solid interlock intramedullary nail with cannulated open interlock intramedullary nail for management of isolated femoral fracture.

In our study, out of 100 cases, (50 in each group), 18%(n=9) in Group-A and 16%(n=8) in Group-B were between 20-40 years of age while 82%(n=41) in Group-A and 84%(n=42) in Group-B were between 41-60 years of age, mean±sd was calculated as 46.78±7.53 years in Group-A and 47.76±6.49 years in Group-B, 62%(n=31) in Group-A and 60%(n=30) in Group-B were male while remaining 38%(n=19) in Group-A and 40%(n=20) in Group-B were females, surgical site infection was compared in both groups and it was recorded in 26%(n=13) in Group-A and 56%(n=28) in Group-B while remaining 74%(n=37) in Group-A and 44%(n=22) in Group-B had no findings of the morbidity, p value was calculated as 0.00 showing a significant difference between the two groups.

The findings of our study are in agreement with Horn J and others who reported that surgical site infection was 23% with solid IMN and 61% with cannulated IMN which was statistically significant ($p<0.02$) [6].

Another study by Panti JPL⁷ found that infection was 6.25% with solid IMN and 5% with cannulated IMN which was statistically insignificant ($p=0.8$) and authors concluded that there are no significant differences between patients with isolated femoral shaft fractures treated with solid interlock IMN versus Cannulated Interlock IMN,⁷ our findings are in contrast with their results.

Epidemiologic investigations of infectious diseases can lead to a better understanding of the pathogenesis of infection, and ultimately to improved and evidence-based prevention and control strategies. The rates of SSI following various orthopedic procedures appear to be increased when certain risk factors are present. Risk factors can be either patient- or procedure-specific, and may be modifiable or non-modifiable.

Edwards, in a 2008 study [8] conducted in England, found no statistically significant preoperative risk factors for infection following hip surgery. Various researchers have studied infection rates in both hip and knee procedures. The factors identified that are associated with increased risk of infection in either of these procedures are diabetes and greater number of medical comorbidities (at least three) [9,10]. A 2010 study of orthopedic procedures in general demonstrated that nasal carriage of *Staphylococcus aureus* increases the risk of *Staphylococcus aureus* wound infection following

orthopedic surgery [11] and that admission from a healthcare facility increases the risk of orthopedic SSI [12].

Being the limitation of the study we could not differentiate any history of diabetes mellitus in our patients but other co-morbid conditions were excluded from our study.

The results of our study justify the hypothesis that **“Solid interlock IMN has less frequency of postoperative surgical site infection than cannulated open interlock IMN for management of isolated femoral fracture”**.

Solid IMN are new method of femoral fracture management and more effective but cannulated IMN are still in use. Our results may create awareness regarding the use of solid IMN for the management of femoral fracture.

CONCLUSION:

We concluded that the frequency of post-operative surgical site infection of solid interlock intramedullary nail is significantly lower when compared with cannulated open interlock intramedullary nail for management of isolated femoral fracture. However, our results may create awareness regarding use of solid interlock intramedullary nail for the management of femoral shaft fracture.

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