CODEN [USA]: IAJPBB ISSN: 2349-7750

INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES
http://doi.org/10.5281/zenodo.3828311

Available online at: http://www.iajps.com Research Article

FRACTURES AFTER TOTAL KNEE ARTHROPLASTY AT TERTIARY CARE HOSPITAL

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Article Received: March 2020 **Accepted:** April 2020 **Published:** May 2020

Abstract:

Purpose. *The present study aims to assess outcome of periprosthetic fractures after TKA in 21 patients.* ***Methods.*** *The present study was conducted from May 2012 to September 2019 at Mayo Hospital Lahore. The records of 21 patients, with age range of 44 to 80 years, were retrieved from the hospital data. These patients operative treatment for periprosthetic fractures of supracondylar femur, tibia and patella due to low velocity injuries or minor falls.* ***Results.*** *There were 11 males and 10 females included in present study with mean age of 70.48 ± 10 (44 to 80 years), who underwent operative (n=21) treatment from for periprosthetic fractures of 20 femoral supracondylar fracture and 1 proximal tibial fracture, due to high-velocity injury (n=3) or minor falls (n=16) and fractures after violent exercise (n=2). The mean time was 42 months (range 13-92 months) from TKA to fracture. The mean range of motion was found to be 93.5º. The mean functional score was 77.14 with a range of 70 to 85, whereas mean knee society knee score was calculated to be 83.66 with a range of 75 to 89.* ***Conclusion.*** *The TKA associated periprosthetic fractures are quite exigent to be managed. They tend to increase with the increasing prevalence of TKA. These fractures can be well managed by revision total knee arthroplasty and some unstable fractures also need open reduction and internal fixation.*

Key words: *arthroplasty, periprosthetic fractures; fractures; total knee arthroplasty*

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Please cite this article in press Moazam Yasin et al, ***Fractures After Total Knee Arthroplasty At Tertiary Care Hospital .,*** *Indo Am. J. P. Sci, 2020; 07(05).*

INTRODUCTION:

The enhancement in life expectancy and quality of life has led towards tremendous increase in total knee arthroplasty (1). Consequently, the probability of post-operative complications has also increased (2). After total knee arthroplasty (TKA), the rate of periprosthetic fractures range from 0.3% to 2.5%, whereas, it may range from 1.6% to 3.8% after revision TKA. After TKA, the risk of periprosthetic fracture is high because majority of the patients undergoing TKA has advanced age and suffer from osteopenia (3).

Majority of periprosthetic fractures occur due to low velocity injuries like fall as a result of unbalanced knee and coronal plane laxity (4). Various risk factors are responsible for increasing probability of periprosthetic fractures such as chronic steroid use, age more than 70 years, inflammatory arthropathies, neurological disorders and poor bone stock (5). The slackening and osteolysis after polythene wear is also sometimes the reason of periprosthetic fractures. Tibial component is more oftenly loosened as compared to femoral part (6).

Periprosthetic fractures can take place in femur, tibia and patella. It can affect up to 15 cm from joint surface and 5cm from intramedullary stem (7). After TKA, most common periprosthetic fractures that occur include supracondylar femoral fractures (0.3–2.5%), patellar fractures (0.15–12%) and tibial fractures (0.4–1.7%) (8). Previous research work has affiliated 30.5% of supracondylar femoral fractures with anterior femoral notching; on the other hand, another study has found that notched femur is rarely associated with femoral fractures (9). In case of patellar fractures, risk factors include mal-alignment, excessive patellar resection, excessive flexion of knee, excessive lateral release, obesity and shorter patellar tendon (10). Majority of periprosthetic fractures are asymptomatic, whereas, diagnosis is based on radiological examination (11). The treatment of periprosthetic fractures is aimed to obtain painless and stable knees with perfect alignment and mobility (12).

Periprosthetic fractures are difficult for surgeon due to patient recovery and fracture treatment. The factors such as preexisting implant, poor bone stock and bone cement can hinder in fracture fixation, which can result in mal-union or non-union (13). Consequently, revision TKA is required due to soft tissue adhesion, vascular damage or instability (14). All these factors delay in healing of wounds and cause necrosis and infection. Moreover, co-morbidities may obstruct postoperative recovery, ambulation and rehabilitation (15). Thus, it is quite important to adequately select fixation devices and surgical techniques to obtain acknowledgeable clinical outcomes (16). For this, proper diagnosis of periprosthetic fractures and selection of accurate prosthesis in treating them are very important (17).

In case of non-displaced fractures, conservative management is recommended which involves immobilization in a brace or cast (18). However, immobilization for longer time period can lead towards decreased walking ability, higher rates of malunion and reduced range of mobility. Thus, revision surgery is the preference (19). The present study aims to assess outcome of periprosthetic fractures after TKA in selected patients.

MATERIALS AND METHODS

The present study was conducted from May 2012 to September 2019 at Mayo Hospital Lahore. The records of 21 patients, with age range of 44 to 80 years, were retrieved from the hospital data. These patients operative treatment for periprosthetic fractures of femoral supracondylar, tibia and patella, due to low velocity injuries or minor falls and due to violent exercise. These periprosthetic fractures were managed by internal fixation through percutaneous technique or open reduction, revision arthroplasty and bone grafting. The patellar fractures were managed with the help of open reduction and internal fixation through tension band wiring. The tibial fracture was managed by revision arthroplasty according to its particular classifications.

After operation, the knee physiotherapy was initiated at once, both actively and passively. The mobilization was preceded from non-weight bearing to full weight bearing within 6 weeks, on the basis of radiographic indication of bone unification. The patients were given follow-ups of 2, 4, 6, and 8 weeks, followed by 3 and 6 months.

The assessment of coronal alignment of the knee was conducted through anteroposterior radiographs. The union of fracture was based on visibility of callus across at least three cortices on both lateral and anteroposterior radiographs. If a fracture united after period of 6 months, without any supplementary surgical intervention, it was termed as delayed healing. In case of no characteristics of progressive healing in 3 successive radiographs taken at time interval of 1 month, after follow-up of 6 months, the case was labeled as non-union of fracture. In non-union, an additional surgical procedure was made necessary. The functional scores and knee society knee were utilized for assessing functional outcome.

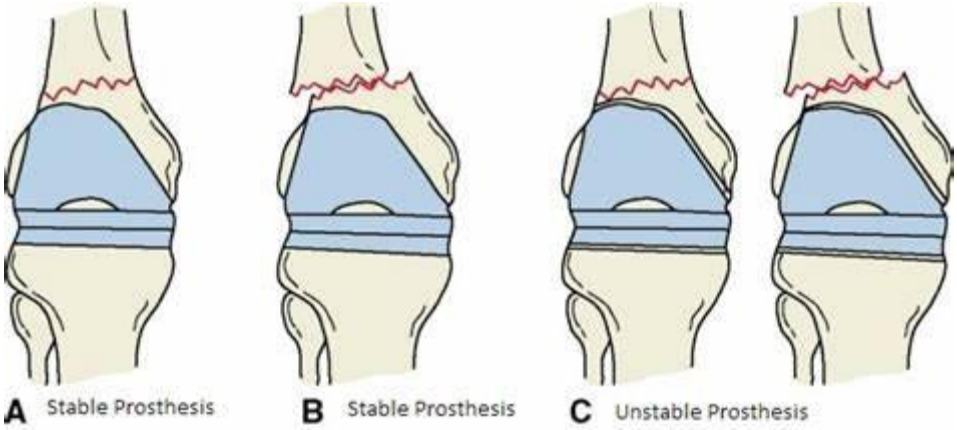

Figure 1: Lewis & Rorabeck & classification for femoral periprosthetic fractures; Type I: undisplaced fracture and prosthesis is well fixed; Type II: displaced fracture and prosthesis is well fixed; Type III: prosthesis is loose, fracture may be displaced or undisplaced

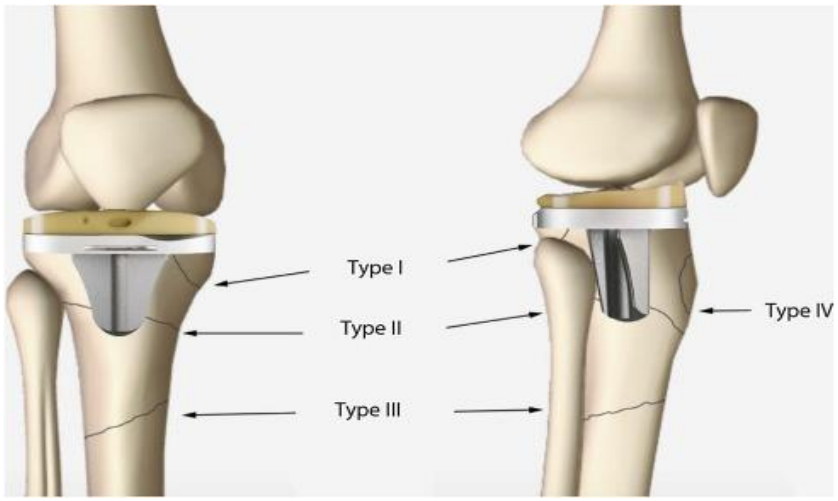

Figure 2: Felix classification for tibial periprosthetic fracture fracture; Type I fractures are located at the tibial plateau; Type II fractures occur inferior to the tibial plateau adjacent to the prosthetic stem; Type III fractures occur distal to the tibial stem; Type IV fractures involve the tibial tubercle.

RESULTS:

There were 10 males and 11 females included in present study with mean age of 70.48 ± 10 (44 to 80 years), who underwent operative (n=21) treatment from May 2012 to September 2019 for periprosthetic fractures of supracondylar femur (n=20), and tibial fractures (n=1), due to low-velocity injury (n=3) or minor falls (n=16) and due to violent exercise (n=2). The mean time was 42 months (range 13-92 months) from TKA to fracture. Out of 21 supracondylar femoral fractures, 2 were Rorabeck type 1, which are the undisplaced fractures with integral prosthesis-bone interface. Rorabeck type 2 were 14, which are displaced fractures with integral prosthesis-bone interface. Two of them were managed with the help of internal fixation with a distal femoral locked compression plate through fluoroscopy. There were 4 cases of Rorabeck type 3, which are displaced fractures with loose femoral component. All the cases underwent TKA revision surgery. Only 1 tibial fracture with Felix type 2 was present, which was adjacent to the stem with a loose implant and managed with TKA revision. The mean follow up time was 38 months with a range of 30 to 48 months. The mean time for healing of fractures was 13 weeks with a range of 12 to 16 weeks as shown in the Table 1. No delayed union took place. Post-operative alignment was adequate for all the individuals. 2 patient were found with problems of deep vein thrombosis which was treated by oral anticoagulants. There were no deep infection, loss of reduction, implant failure or pulmonary embolism. However, two patients developed superficial infection, which were treated with the help of debridement. The mean range of motion was found to be 93.5º. The mean functional score was 77.14 with a range of 70 to 85, whereas mean knee society knee score was calculated to be 83.66 with a range of 75 to 89.

Table 1: Patient characteristics

Gender (M/F)	Age (yrs)	Classification	Treatment	Time to union (wks)	Range of motion	Knee score	Functional score	Follow up (months)
M	72	RORABECK 1	TKA revision	12	$0^0 - 90^0$	75	70	30
M	44	RORABECK 2	TKA revision	12	$0^0 - 95^0$	89	70	34
F	68	RORABECK 3	TKA revision	12	$0^0 - 90^0$	80	75	30
F	64	RORABECK 2	TKA revision	14	$0^0 - 100^0$	75	70	38
M	79	FELIX 2	TKA revision	12	$0^0 - 100^0$	83	80	40
M	74	RORABECK 2	TKA revision	14	$0^0 - 100^0$	89	80	48
F	71	RORABECK 2	TKA revision	14	$0^0 - 105^0$	85	70	42
F	74	RORABECK 2	LISS plate	12	$0^0 - 105^0$	89	70	34
M	72	RORABECK 1	TKA revision	12	$0^0 - 100^0$	75	75	30
F	71	RORABECK 2	LISS plate	16	$0^0 - 90^0$	85	75	48
F	68	RORABECK 2	TKA revision	16	$0^0 - 90^0$	87	80	44
M	62	RORABECK 2 +GOLDBERG2	LISS plate+ TBW	12	$0^0 - 95^0$	89	85	30
M	59	RORABECK 3	TKA revision	16	$0^0 - 100^0$	89	85	36
M	45	RORABECK 2	TKA revision	14	$0^0 - 105^0$	85	80	38
F	71	RORABECK 3	TKA revision+ LISS plate	12	$0^0 - 110^0$	83	85	48
F	73	FEMORAL SHAFT	TKA revision+ CAGE	12	$0^0 - 100^0$	80	75	44
M	78	RORABECK 2	TKA revision	14	$0^0 - 110^0$	83	75	42
M	80	RORABECK 3	TKA revision	16	$0^0 - 105^0$	83	70	40
F	76	RORABECK 2	TKA revision	16	$0^0 - 90^0$	83	85	38
F	80	RORABECK 2	TKA revision	12	$0^0 - 90^0$	85	85	36
F	73	RORABECK 2	TKA revision	12	$0^0 - 95^0$	85	80	36

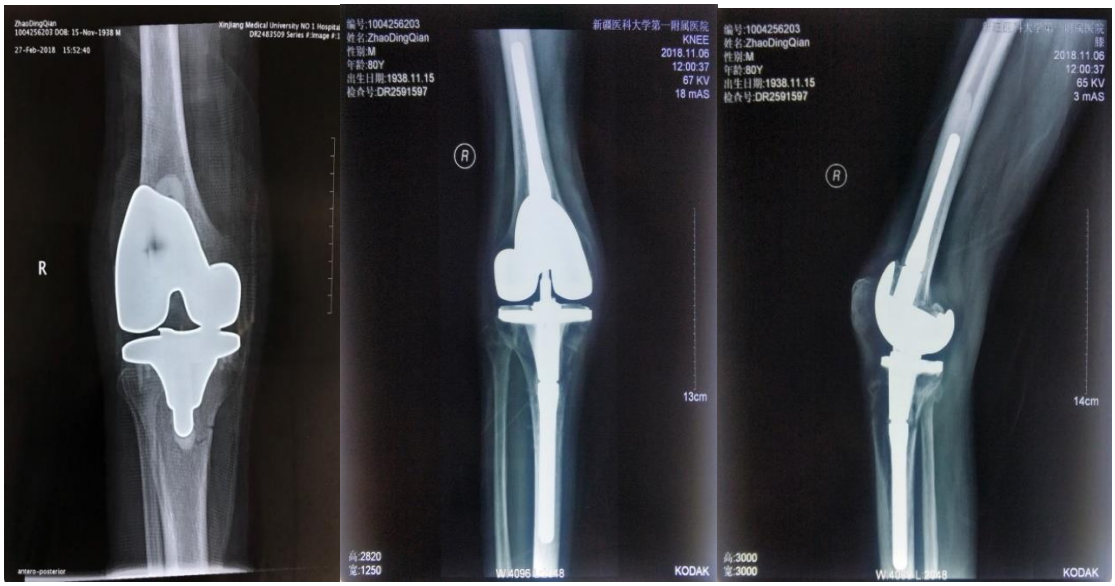

Figure 3: Male, 80yrs (a) Felix fracture (b&c) revision surgery done long long stemmed TKA

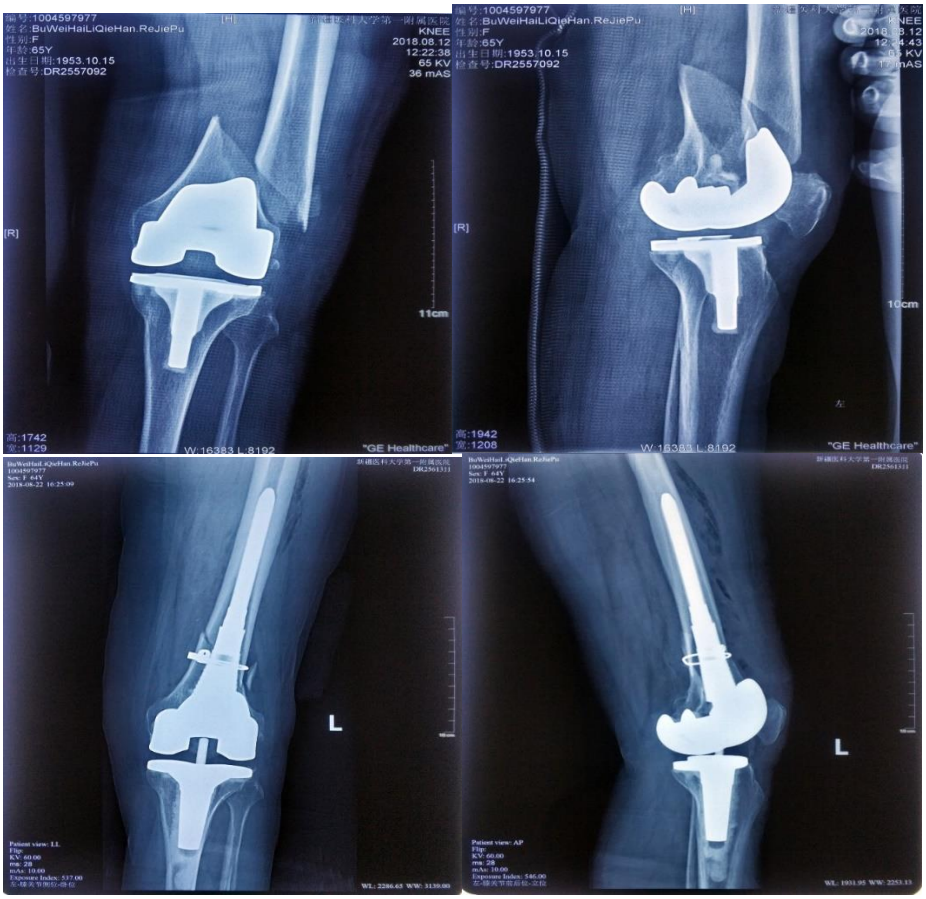

Figure 4: 65 yrs Female with Rorabeck type 3 (fig a & b)treated by revision surgery (fig c&d).

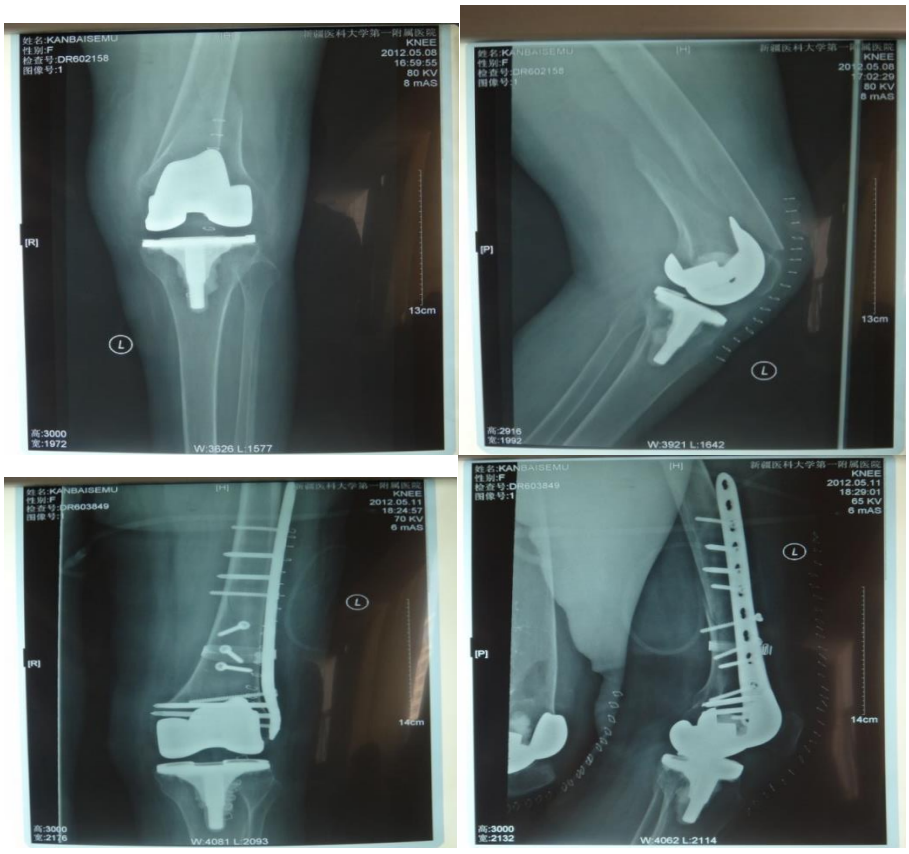

Figure 5: Female, 71 yrs, Rorabeck type 2 (fig a&b), treated by Locking plate and cerclage (fig c&d)

Figure 6: Male, 77yrs, Rorabeck type 3 (fig a&b) , Revision surgery for femoral component with long stem (fig c&d)

DISCUSSION:

It is important to avoid occurrence of periprosthetic fractures after TKA as they are linked with implant loosening and bone loss that can result into instability around knee and fall. By improving bone loss before revision arthroplasty can reduce cost of managing periprosthetic fractures (20). Usually, bisphosphonates are administered to individuals undergoing TKA in order to prevent periprosthetic osteolysis. The occurrence of periprosthetic fracture is associated with the extent of bone loss. It has been noted that use of periarticular locked compression plates ad retrograde intramedullary nails are better than any other method including external fixation, cast immobilization, dynamic condylar screw fixation and dynamic compression plate fixation (21).

In the present study, preference was given to the use of revision TKA with extended rods. By utilizing somewhat invasive method, insertion of locked compression plate can be accomplished through minor slit in sub muscular periosteal plane. This helps in reducing harm to periosteal blood supply and enhances healing process.

In the present study, 100% union rate was achieved for periprosthetic supracondylar femoral fractures. No patient required bone grafting. Good alignment and speedy recovery to functional status was accomplished with good bone stock. However, no serious complications were noted in present study. Only two patients suffered from superficial infections, which were treated at once. 2 patients were found with problems of deep vein thrombosis which was treated by oral anticoagulants. The problems such as non-union, delayed union, implant failure or deep infections were not observed.

CONCLUSION:

Knee revision surgery for periprosthetic fracture of distal femur after knee arthroplasty is a difficult problem for joint surgeons, and it is also one of the complex operations. Only surgeons with rich clinical experience can successfully complete the operation after detailed and comprehensive preoperative planning. According to the

classification of periprosthetic fracture of distal femur, the stability of knee joint was measured during operation to judge whether internal fixation was needed to achieve the best results. The revision of knee joint for the treatment of distal femoral periprosthetic fracture after TKA can achieve good surgical results, good follow-up results and satisfactory clinical results.

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