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Original Research

Double Plating Fixation vs Distal Femoral Replacement in the Management of Distal Femoral Fractures in Geriatric Patients

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ABSTRACT

Background: Distal femur fractures are considered challenging to manage, particularly in geriatric patients. Double plating (DP) is a technique that helps with earlier rehabilitation and return to preinjury level of activity. Distal femoral replacement (DFR) is an alternative technique in the management of these fractures that may help to solve problems like associated knee osteoarthritis, osteoporosis, and severely comminuted condyles. The current study compares the functional and radiological outcomes of DFR and DP in the management of these fractures among geriatric patients.

Methods: This randomized, comparative, interventional study was performed at a university hospital. A total of 30 patients who underwent DFR or DP after distal femur fractures (AO/OTA 33 A3, 33 C) were analyzed. The primary outcome was Knee Society Score (KSS), whereas secondary outcomes included postoperative complications rate, knee range of motion, reoperation rate, and operative time.

Results: No significant difference was observed between DFR and DP except for the knee component of the KSS at a 12-month interval ($P = .03$) and knee range of motion at a 12-month interval ($P = .001$), both of which were in favor of DP. No significant difference in postoperative complications ($P = .06$), reoperation rate ($P = 1.00$), or operative time ($P = .06$) was noted.

Conclusions: DFR and DP had comparable functional (KSS) and radiological outcomes with no significant difference in postoperative complications, reoperation rate, or operative time.

Introduction

Distal femoral fracture cases have been increasing over the past 30 years [1], with nearly half occurring in persons aged 70 years or older [2]. Moreover, they share the same patient population as well as mortality and morbidity rates as hip fractures. To date, however, there has been a paucity of research concerning these fractures unlike proximal ones [3], with no definite and useable algorithm for the accurate management of such fractures having been established until the present [4]. In geriatric patients, decreased preinjury activity levels, deficient bone quality, and the presence of knee osteoarthritis combined with more medical comorbidities have led to worse outcomes after fixation compared to younger patient populations [5]. Hence the management of these fractures can vary from conservative treatment in limited occasions for nonambulatory patients to fixation using plates or intramedullary nailing [3]. There is currently a tendency toward performing distal femoral replacement (DFR) for these complex fractures, which has the potential benefit of allowing early weight-bearing and avoiding nonunion, the incidence of which has reached up to 20% in some studies [6,7]. DFR has yielded good results in small case series. However, DFR has its own risks, most notably deep infection and loosening, in addition to the higher cost of the implant [8]. The current study therefore aimed to compare the functional and radiological outcomes of fixation using the double plating (DP) technique and replacement using a distal femur tumor prothesis as the primary management for native distal femoral fractures (rather than periprosthetic) in geriatric patients. The investigators

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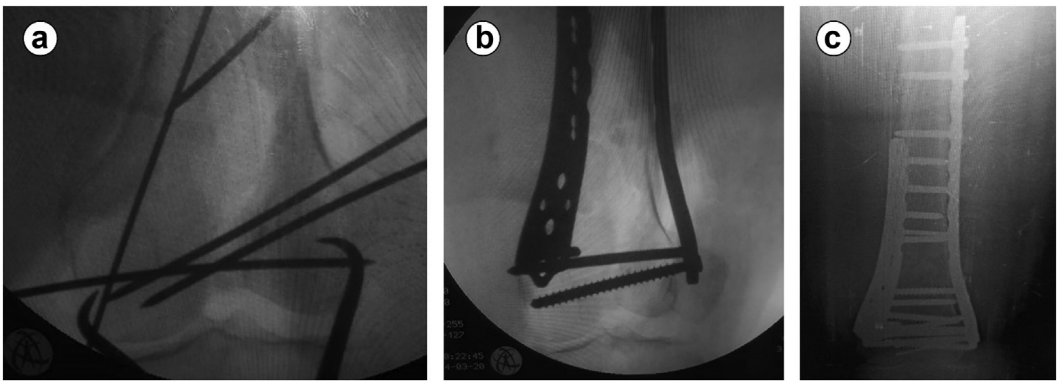

Figure 1. (a) Preliminary fixation by k wires and restoration of the 2-column configuration. (b) Fixation of the 2 plates by alternative screws. (c) Final fixation assembly.

hypothesized that the DFR would yield better functional outcomes and lead to earlier rehabilitation and return to preinjury levels of activity.

Statistical analysis

Analysis of data was done using SPSS program version 23 (IBM, Armonk, NY). Quantitative data were presented as mean and standard deviation while qualitative data were presented as count and percentage. Student *t* test was used to compare quantitative data between 2 independent groups, and 1-way ANOVA test was used to measure changes in quantitative data at different time points. A *P* value less than or equal to .05 was considered statistically significant.

Material and methods

A prospective randomized controlled study was conducted in a university hospital through the period from August 2018 to December 2021. Patients aged 60 years or older with isolated distal femoral fractures were included. All patients were informed regarding their enrollment in the trial, after which consent was obtained from all patients. Open, pathologic, and periprosthetic fractures as well as nonambulatory patients were excluded. The AO/OTA classification was used to differentiate among fractures. Accordingly, 33 A3 and 33 C fractures were included, whereas 33 A1, 33 A2, and partial articular 33 B fractures were excluded.

The patients were then randomized into the following 2 groups using the Random Allocation Software; group A comprised patients who underwent fixation with DP, while group B comprised patients who underwent DFR. The HIPOKRAT Bone Reconstruction System (Hipokrat Tibbi Malzemeler Imalat Ve Pazarlama A.S., İZMİR, Turkey) was used in most of the patients, and MUTARS Distal Femoral Replacement MK (implantcast GmBH, Buxtehude, Germany) was used in 2 patients.

We obtained approval from the hospital's research ethics committee and written informed consents from the patients. A total of 30 patients were enrolled in the study, with 15 patients in each arm. All patients were assessed clinically in the form of history taking and clinical examination. Plain radiography and computed tomography with 3D reconstruction were done in all patients for the assessment of the fracture line orientation and preoperative planning. Preoperative preparation included 1.5 g of ceftriaxone administered 30 minutes before the induction of anesthesia in addition to 1 g of tranexamic acid upon skin incision. The patients received combined spinal and epidural anesthesia. The supine position was used in both groups.

In the DP group, a midline skin incision was made with medial or lateral parapatellar arthrotomy according to whether the more distal fracture extent either extended to the medial or the lateral condyle, respectively. Additional lateral small incisions were made for the insertion of the proximal screws of the lateral plate. Preliminary fixation with k wires was performed to restore the 2-column configuration of the distal femur (Fig. 1a). Thereafter, the medial and lateral plates were applied, with the screws applied alternatively on the 2 plates. The articular surface was controlled with a large, pointed clamp and k wires until fixation by screws through the plates (Fig. 1b and c).

In the DFR group, the same midline incision with an extended medial parapatellar approach was used. The distal femoral fragments were resected via subperiosteal dissection with careful adherence to the bone to avoid injury to the popliteal fossa and its

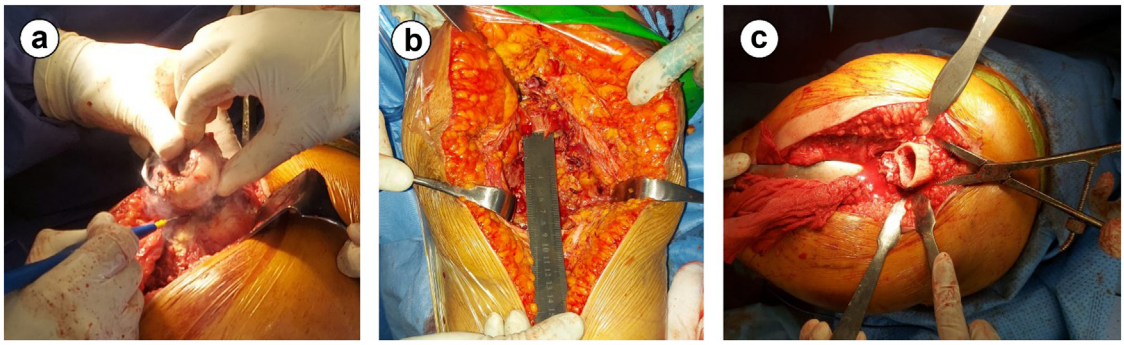

Figure 2. (a) Subperiosteal dissection to excise the femoral condyles. (b) Measurement of the space after removal of the fractured condyles to assess the extra-femoral cut needed. (c) Holding the femur after the cut to prepare the medulla.

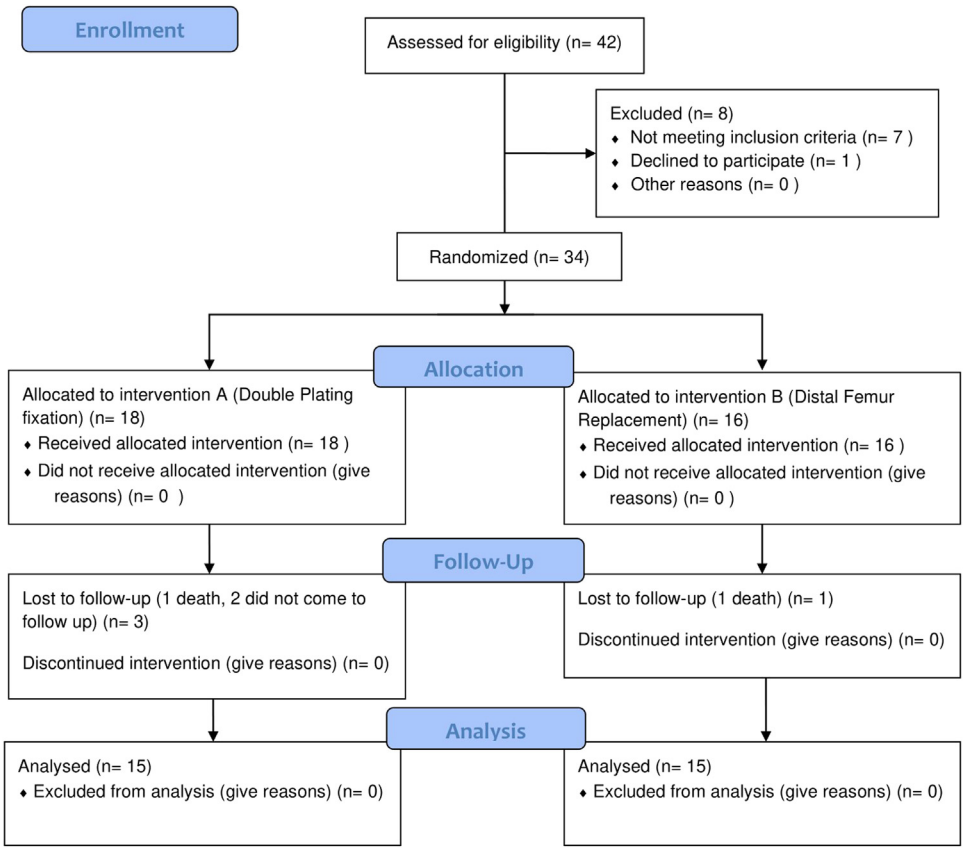

Figure 3. CONSORT flow diagram for enrollment in the study.

contents (Fig. 2a). After removal, the space from the tibial surface to the femoral shaft was measured using a ruler to assess the amount of bone needed to be resected from the femoral shaft (Fig. 2b) (ie, a minimum of 8-9 cm had to be resected). Resection was performed while holding the shaft of the femur up using a bone-holding clamp and 2 retractors beneath the femur to protect the posterior-compartment soft tissue, including the neurovascular bundle (Fig. 2c). After completing the femoral cut, sequential reaming and preparation of the femoral medulla were performed. Thereafter, a proximal tibial cut was created. A full trial was then conducted to assess patellar tracking and rotation. To adjust the rotation of the femoral prothesis, a line opposite to the Linea aspera was drawn via thermal cautery. Meanwhile, the rotation of the tibial component was adjusted using the same method as that for primary knee arthroplasty through the Akagi line technique [9]. After the final assembly, the extensor mechanism was closed in a continuous fashion, followed by wound closure by layer.

Drains were used in all patients, which were removed after 48 hours. All patients received 48 hours of postoperative antibiotics and 4 weeks of anticoagulation therapy according to the hospital protocols. All patients were allowed to perform full range of motion (ROM) and weight-bearing as tolerated with a walker postoperatively. The patients were discharged to their homes after 3-4 days, during which their dressing had been changed and drains removed. Follow-up was conducted at 1-week intervals until the skin staples were removed and then at 6 weeks, 12 weeks, and 24 weeks after the surgery, with the final follow-up conducted 1 year after the surgery. During follow-up, the patients were assessed for ROM, weight-bearing, and KSS in addition to plain radiography to assess full union in the fixation group and exclude early loosening in the replacement group.

Results

Demography

A total of 34 patients satisfied the inclusion criteria. However, 4 patients were excluded from the study, among whom 2 died (due to causes not related to the surgery) and 2 did not complete the follow-up. Thus, 30 patients (24 females [80%] and 6 males [20%]) completed the follow-up, as shown in the consort flow diagram (Fig. 3). The included patients had a mean age of 69 years (range 60-86) at the time of surgery. Regarding medical comorbidities, 12 patients (80%) had comorbidities in the DP group; 10 with diabetes mellitus, 4 with ischemic heart disease, 1 with hypertension, and 3 with chronic liver disease. On the other hand, 10 patients (66.7%) had comorbidities in the DFR group; 9 with diabetes mellitus, 3 with ischemic heart disease, 7 with hypertension, and 1 with rheumatoid arthritis. Some patients in both groups had combined comorbidities. No significant differences in age, sex, and medical comorbidities were observed between the groups (with *P* value .8, .65, and .68, respectively), whereas the difference in demographics did not affect our results.

The average body mass index for the DP group was 32.66 (±9.9), and for DFR group, 32.00 (±7.6); there was no statistically significant difference between groups, with a *P* value of .575.

According to the AO/OTA classification, 19 patients had 33 C2 fractures (Fig. 4), 5 had 33 C1, 3 had 33 A3, and 3 had 33 C3; however, no correlation had been found between the type of

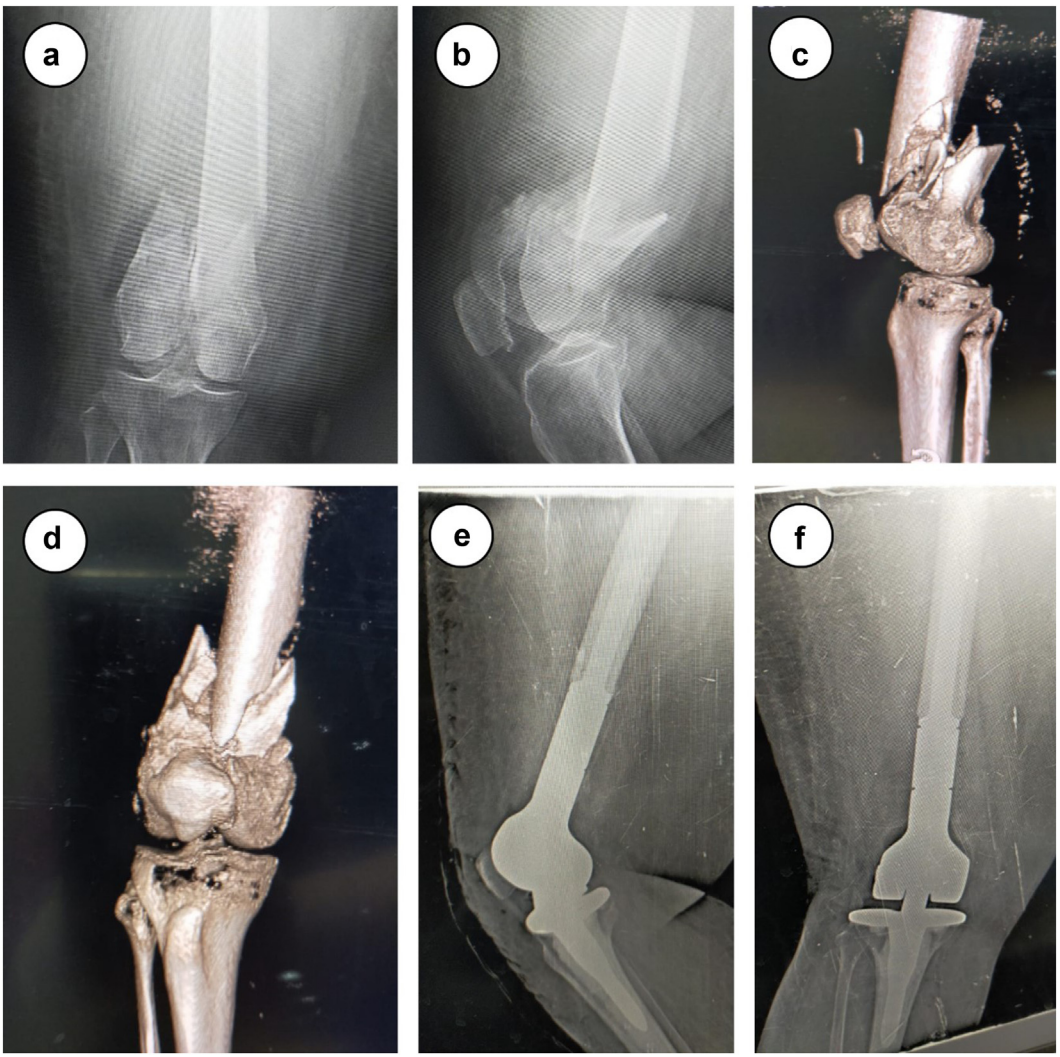

Figure 4. Example of a case with 33 C2 fracture was managed by DFR. (a and b) Anteroposterior and lateral plain radiographs; (c and d) computed tomography with 3D reconstruction; (e and f) postoperative radiographs.

fracture according to the AO classification and union or complication rates (nonsignificant with a *P* value of .07).

Operative time and blood transfusion

The mean operative time was 147 minutes (range 117-193) in the fixation group and 129 minutes (range 90-180) in the replacement group (nonsignificant, $P = .06$). Both groups needed blood transfusions during and after the surgery (80% and 93.3% in the fixation and replacement groups, respectively) without significance ($P = .6$). A highly significant difference ($P = .003$) was observed in the mean packed red blood cell units transfused between the fixation and replacement (0.93 and 1.87, respectively).

Postoperative complications and reoperation

Five patients in each group (33.33%) developed complications (nonsignificant *P* value = .06). In the fixation group, 3 patients (20%) had delayed union and required reoperation with iliac crest bone grafting, 1 (6.7%) had deep venous thrombosis, and 1 (6.7%) had superficial infection that was relieved with antibiotics only. In the replacement group, 1 patient (6.7%) had deep infection and needed debridement with exchange of polyethylene, which unfortunately resulted in arthrofibrosis, 1 (6.7%) developed fixed flexion deformity of 40°, 3 patients (20%) had periprosthetic fractures, 2 patients had femoral fractures managed via revision of the femoral components (Fig. 5), and 1 patient had a patellar fracture treated via open reduction and fixation using k wires (Fig. 6). In the fixation cohort, the average time to full union was 36.4 weeks (range 30 to 47 weeks), with 20% of the patients exhibiting nonunion. The rate of reoperation was 20% (3 patients) in the fixation group and 26.66% (4 patients) in the replacement group; it was nonsignificant ($P = 1.00$) (Table 1).

Functional outcome

Functional outcome was assessed using the KSS [10] recorded at 1, 6, and 12 months. At 1 month, the mean KSS for the knee component was 85 and 88 in the fixation and replacement groups, respectively ($P = .08$), whereas both groups had a score of 45 for the function component ($P = .95$), with no significant difference observed. At 6 months, the mean score for the knee component was 90 in both groups ($P = .99$), whereas that for the function component was 73 and 75 in the fixation and replacement groups,

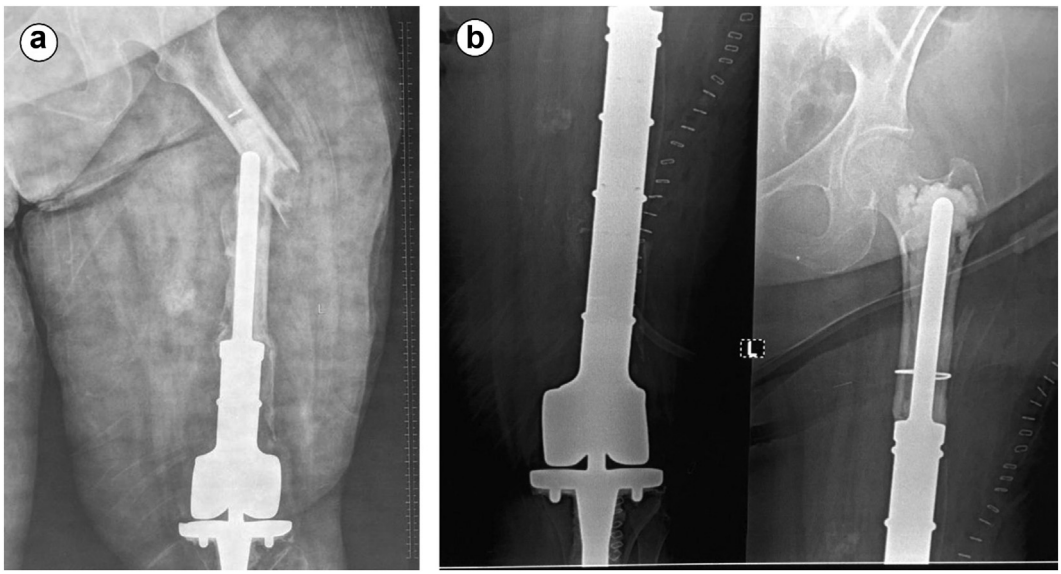

Figure 5. (a) Proximal femoral periprosthetic fracture. (b) Exchange of the femoral component with a longer distal piece and a longer stem.

respectively ($P = .82$), with no significant difference observed. After 12 months, no significant difference in the function score was observed (96 and 83 in the fixation and replacement groups, respectively) ($P = .06$). A significant difference in the knee component was noted in favor of the fixation group (98 and 91 in the fixation and replacement groups, respectively) ($P = .03$) (Table 2). Knee ROM was assessed independently. We found that the mean ROM for the replacement group (102°) early after 1 month was greater than that for the fixation group (87°) (highly significant P value < .001). After 12 months, the fixation group had a greater ROM than the replacement group (116° vs 108°, respectively) (highly significant P value < .001). The functional outcome was exceedingly close between the 2 groups except for ROM, which was in favor of the fixation group only after 1 year. From another aspect, the progress or change in knee and function scores in the fixation group also supports the forementioned data, suggesting a highly significant difference for the 1-, 6-, and 12-month results ($P < .001$). Conversely, in the replacement group, only the function component of the KSS showed a highly significant difference throughout the follow-up period ($P < .001$), whereas changes in the knee score were not significant ($P = .18$) (Tables 3 and 4). The association between the progress of the knee and function components of the KSS in both groups is plotted in Figures 7 and 8.

Discussion

Only a few studies have compared knee replacement with fixation among geriatric patients with distal femoral fractures. To the best of our knowledge, the first case series to use replacement as a primary management for geriatric distal femoral fractures was reported in 1995 by Freedman et al., who included only 5 patients (2 had acute fractures, and 3 had nonunited fractures) [11]. In 2016, Hart et al. published a retrospective study with a total of 38 patients, among whom 28 underwent fixation with a lateral locked

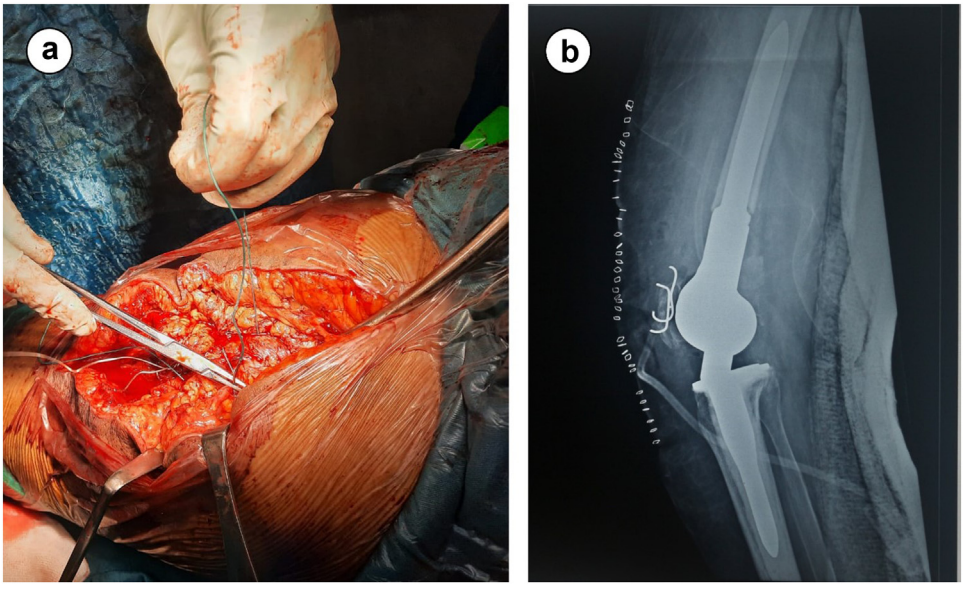

Figure 6. (a) Intraoperative picture showing the transosseous sutures used, in addition to the fixation with k wires. (b) Postoperative radiograph.

Table 1
Postoperative data.

Post-operative data		Fixation (N = 15)		Replacement (N = 15)		χ^{2a}	*P* value
		N	%	N	%		
Complications	No complications	10	66.7	10	66.7	8.97	.06
	Nonunion and need for grafting	3	20	0	0.0		
	Deep infection and stiffness	0	0.0	1	6.7		
	Deep venous thrombosis	1	6.7	0	0.0		
	Fixed flexion deformity	0	0.0	1	6.7		
	Superficial infection	1	6.7	0	0.0		
	Periprosthetic fractures	0	0.0	3	20.00		
Secondary operation	Yes	3	20	4	26.66	0.19	1.00
	No	12	80	11	73.34		

[a] Chi-square test.

plate and 10 underwent replacement [12]. In 2019, Hull et al. published a feasibility study comparing 11 patients who underwent replacement to 11 patients who underwent fixation using plates or retrograde nail [8]. However, to the best of our knowledge, the current study has been the first to compare DP vs DFR. Moreover, a few cases series have been published on patients who underwent DFR, but these were limited by the absence of a comparison group and the retrospective collection of data. Notably, Rosen and Strauss published a series including 24 patients who underwent DFR [13]. In 2006, Appleton et al. studied a case series involving 52 patients who were managed using hinged knee prothesis [14]. In 2016, Bettin et al. published a case series including 18 patients [5].

The mean operative time was slightly higher in the fixation group (147 minutes) than that in the replacement group (129 minutes) although statistically nonsignificant. This was opposite to that reported by Hull et al., who reported mean time of 137 and 151 minutes in the fixation and replacement groups, respectively [8]. This could have been attributed to the use of only lateral locked plates or retrograde nails in the study by Hull et al. and the use of the DP technique in this study, which causes longer operative time due to anatomical reduction and application of 2 plates [8].

In this study, the complication rate was 33.33% (5 patients) in each group; no significant difference in the overall complication rate was found between the 2 groups, which was consistent with the results of Hart et al. who also showed no statistical difference between the 2 groups (the overall complications rate, including nonunion in the open reduction and internal fixation (ORIF) group, was 25% and 30% in ORIF and DFR, respectively) [12]. Also, there was no significant difference reported in the study by Hull et al. who showed a rate of 9% and 27% for the ORIF and DFR groups, respectively, but the nonunion rate was not included in the ORIF group [8,12,15].

The rate of nonunion in the current study was comparable to that of Hart et al. (18%) and was not too far from the rates in many studies like those of Lujan et al. and Henderson et al., which ranged from 17% to 21% [12,16,17]. However, the mean time for union in the fixation group was 36.4 weeks (30-47 weeks) in the current study, but 24.2 weeks in the study by Hart et al. and 13.5 weeks in in the study by Doshi et al. who used the minimally invasive plate osteosynthesis technique [12,18]. In another study by Wong et al., who also used the minimally invasive plate osteosynthesis technique, the average time was 30 weeks [19]. This prolonged union time in our cases would be attributed to the rigidity that occurred due to the DP technique in addition to the disruption of the fracture hematoma, possibly affecting amount of callus. However, this stiff construction allowed for early mobility and partial weight-bearing with early knee ROM, which we believe that it outweighs this increase in time needed for complete union.

Regarding the rates of infection, only 1 patient (6.7%) had superficial infection in the fixation group, which was managed using only intravenous antibiotics with no effect on radiological or functional outcomes. However, no deep infection occurred in any of the patients, a finding comparable to that of Hull et al., who showed no deep infection, by contrary to that of Hart et al., who showed that 1 patient (3.5%) developed deep infection necessitating debridement [8,12].

For the replacement group, 1 patient (6.7%) developed a deep infection 10 days after the surgery, which necessitated surgical debridement and exchange of all polyethylene components. Unfortunately, the patient was later diagnosed with arthrofibrosis and refused subsequent surgical intervention, for which she remained nonambulatory. In the study by Hart et al., 1 patient (10.0%) had deep infection, necessitating surgical debridement, whereas in the study by Bettin et al., 1 patient (5.5%) developed deep infection requiring debridement and exchange of the components [5,12]. In the study by Appleton et al., only 1 patient (1.9%) exhibited deep infection; however, the infection was disastrous and resulted in above-the-knee amputation [14]. Both Hull et al. and Rosen and Strauss had 1 patient (each 9% and 4%, respectively) who developed superficial infection; both of whom were managed using antibiotics [5,8,13].

Table 2
Knee society Score (KSS).

Knee Society Score (KSS)	Fixation group (N = 15)		Arthroplasty group (N = 15)		t[a]	*P* value
	Mean	SD	Mean	SD		
KSS 1 m knee score	84.87	5.15	88.33	5.37	1.80	.08 NS
KSS 1 m function score	44.67	14.94	45.00	14.27	0.06	.95 NS
KSS 6 m knee score	90.47	13.74	90.40	10.11	0.02	.99 NS
KSS 6 m function score	73.00	22.42	75.00	24.64	0.23	.82 NS
KSS 12 m knee score	98.73	2.63	91.73	10.59	2.49	.03 S
KSS 12 m function score	96.33	8.76	83.00	24.63	1.98	.06 NS

NS, nonsignificant; S, significant; SD, standard deviation.
[a] Student *t* test.

Table 3
Change in KSS in Fixation group.

KSS in DP group	Mean	SD	F[a]	*P* value
KSS 1 m knee score	84.87	5.15	12.46	<.001 HS
KSS 6 m knee score	90.47	13.74		
KSS 12 m knee score	98.73	2.63		
KSS 1 m function score	44.67	14.94	57.38	<.001 HS
KSS 6 m function score	73.00	22.42		
KSS 12 m function score	96.33	8.76		

ANOVA, analysis of variance; HS, highly significant.
[a] Repeated-measure ANOVA test.

Table 4
Change in KSS in Arthroplasty group.

KSS in DFR group	Mean	SD	F[a]	*P* value
KSS 1 m knee score	88.33	5.37	1.80	.18 NS
KSS 6 m knee score	90.40	10.11		
KSS 12 m knee score	91.73	10.59		
KSS 1 m function score	45.00	14.27	41.18	<.001 HS
KSS 6 m function score	75.00	24.64		
KSS 12 m function score	83.00	24.63		

ANOVA, analysis of variance; HS, highly significant.
[a] Repeated-measure ANOVA test.

In the current study, 3 patients (20%) in the DFR group had a periprosthetic fracture, among whom 2 had periprosthetic femoral fractures in the second year after surgery and were managed using exchange of femoral components with a longer distal femoral part and longer stems. The third patient had a patellar fracture 4 weeks following surgery after a twisting knee injury, which was managed through fixation using wires and transosseous sutures, and this did not affect the final outcome as the patient reached 100° flexion and is ambulatory with 1 crutch. Appleton et al. reported 4 fractures (7.4%) occurring at the tip of the femoral component, all of which healed properly [14]. Bettin et al. reported 1 patient (5.5%) who had a periprosthetic fracture that required revision with total femoral replacement, [5,14] whereas Hull et al. reported 1 patient (9%) who had a stress fracture between DFR and total hip arthroplasty that was managed through plate fixation [8]. However, no periprosthetic fractures were reported in the study by Hart et al. [12] or that by Rosen and Strauss [13].

In the current study, deep venous thrombosis occurred in only 1 patient (6.7%) in the fixation group. Although this occurred once in the study of Hart et al., it did so in the DFR group and not in the fixation group [12]. Moreover, it occurred once in the DFR group in the study by Hull et al. and caused a nonfatal pulmonary embolism [8].

Lastly, a patient in our DFR cohort had a fixed flexion deformity of 40° after their surgery. Despite being able to fully extend the knee immediately after surgery, the patient developed the deformity gradually over the next 12 weeks; however, the patient was ambulatory with a walking aid indoors and outdoors (to help the patient in ambulation, in part because the patient has contralateral knee osteoarthritis with a fixed flexion deformity around 40°).

The current study showed that the rate of reoperation was 20% (3 patients) in the fixation group and 26.66% (4 patients) in the replacement group, with no significant difference between the groups. Meanwhile, Hart et al. found that the secondary operation rate was 11% and 10% in the fixation and replacement groups, respectively, [12]. The rate of reoperation in replacement patients was comparable to that in the study by Appleton et al. (13.6%) and Bettin et al. (11%) [5,14]. However, Rosen and Strauss showed a rate of only 4% [13]. Recently, in July 2022, Aebischer et al. published a retrospective registry review that was performed using data from the Australian Orthopaedic Association regarding the DFR usage in periprosthetic femur fractures after total knee replacement [20]. The study showed the survivorship of the DFR was 97% and 83% at 5 and 10 years, respectively. Infection and loosening were the most common reasons for a second revision after DFR [20].

In our study, 100% of the fixation group were ambulatory at the end of follow -up, whereas 1 patient in the replacement group (6.7%) was nonambulatory due to stiffness after infection and debridement. In the study by Hart et al., all patients in the DFR group were ambulatory, but 25% of those in the fixation group were wheelchair-bound [12]. All patients in the study by Rosen and Strauss were ambulatory at the end of their follow-up period [13].

In the study by Hart et al., all patients in the DFR group were ambulatory, but 25% of those in the fixation group were wheelchair-bound [12]. All patients in the study by Rosen and Strauss were ambulatory at the end of their follow-up period [13]. The current study measured functional outcome using the KSS, which has 2 components: knee and function. The mean KSS for the knee component was 85 and 88 for the fixation and replacement groups, respectively, at 1 month, 90 for both groups at 6 months, and 99 and 92 for the fixation and arthroplasty groups at 12 months, respectively, with the difference at 12 months being statistically significant. No significant difference was observed in the mean KSS for the function component across the entire follow-up period. Accordingly, function component scores were 45 for both groups at 1 month, 73 and 75 for the fixation and arthroplasty groups at 6 months, respectively, and 96 and 83 for the fixation and replacement groups at 12 months, respectively. Hull et al., who

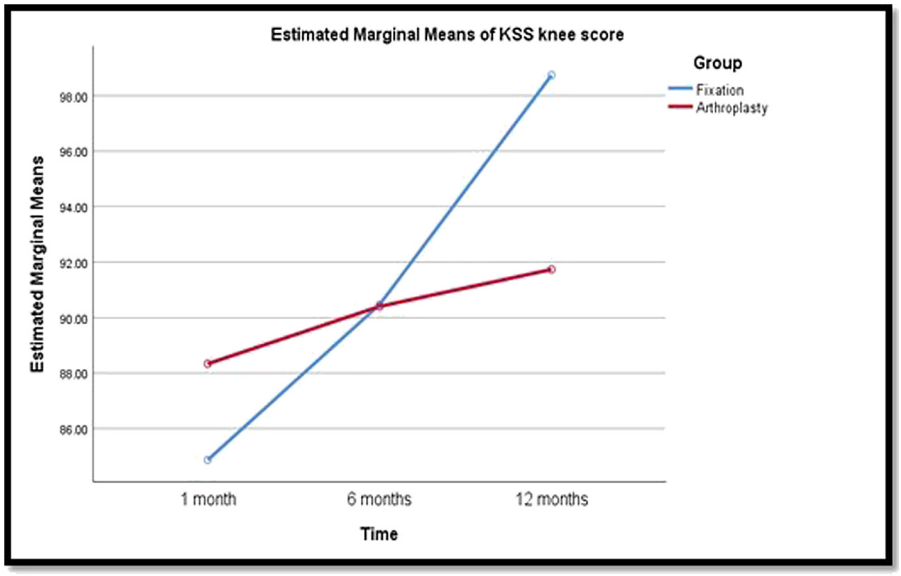

Figure 7. Relation between the progress of KSS knee part between the 2 groups.

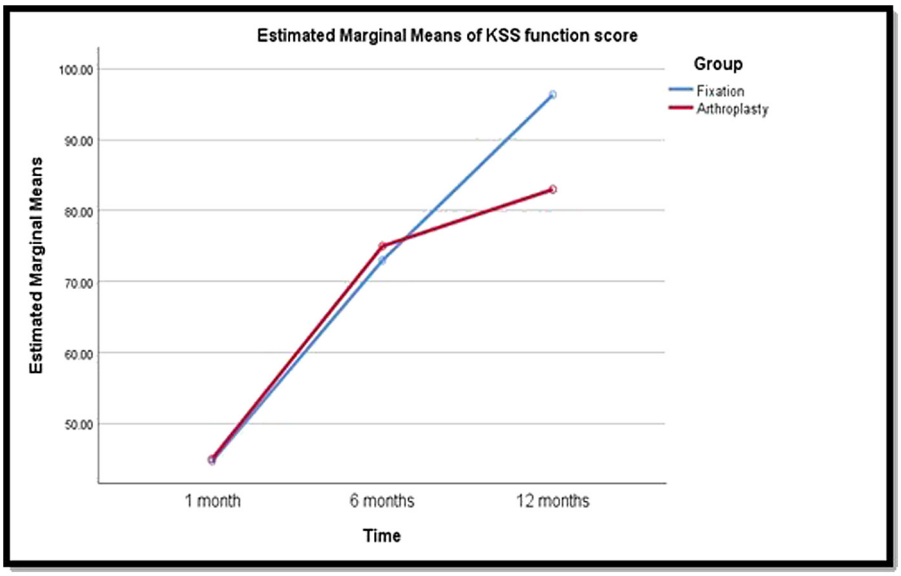

Figure 8. Relation between the progress of KSS function part between the 2 groups.

utilized the Oxford Knee Score, [8,21] showed results of 26, 31, and 31 in the replacement group at 6 weeks, 6 months, and 9 months, respectively, compared to those presented here, with their fixation group having lower scores of 24, 28, and 27 at the same intervals, respectively, [8]. Meanwhile, Hart et al. had not carried out an assessment using a scoring system; however, they did show that all patients in the replacement group were ambulatory, whereas 1 in 4 patients in the fixation cohort were wheelchair-bound [12]. In the study by Bettin et al., the mean KSS was 86 after a mean follow-up period of 2.5 years, which was comparable to our results [5].

Knee ROM was assessed individually, in the current study, with our results showing that the DRF group had a greater ROM at 1 month than the fixation group (102° vs 87°, respectively). After 12 months, however, the fixation group had better ROM than the DRF group (116° vs 108°, respectively), with the latter being comparable to that in the study by Rosen and Strauss (102°) [13].

The strength of the current study is that it is the first prospective randomized controlled trial (RCT), to the best of our knowledge, to compare fixation with DP and DFR in a sample of 30 patients considering that similar studies and case series published previously had smaller sample sizes and were retrospective in nature. Moreover, our study population was homogenous, all the fractures included were native, periprosthetic fractures were excluded, and all the fractures included were randomly allocated (in both groups, the fractures of type A3 and C 1, 2, 3 in AO/OTA classification were included). In addition, we compared a single method of fixation to a single type of replacement to rule out any heterogenicity of the results and outcomes attributed to different types of fixations such as plating or retrograde nailing, which may affect the surgical outcome, rehabilitation, and even union.

One limitation of our study was our short-term follow-up. In our opinion, a longer follow-up period of 5 or 10 years may yield much more accurate data regarding complication and reoperation rates in the replacement group. Moreover, despite including a large sample relative to past RCTs, it remains insufficient for obtaining the desired results. The lower incidence of distal femur fractures (in comparison to proximal ones), especially after exclusion of patients younger than 60 years, periprosthetic fractures, and fractures without metaphyseal comminution and/or articular extension, poses a challenge in securing a larger sample size. Hull et al. stated that to achieve a sufficiently powered RCT, up to 1400 patients would be required from more than 230 centers internationally [8]. Finally, another limitation was that we could not account for the actual total cost of each treatment method; hence, the actual total cost was difficult to assess. Of course, the initial cost of the implant was higher for the replacement group, but we believe that if we estimated the total cost for hospital admission, reoperation surgeries, walking aids, and medications, the total cost may be different, especially in low-income countries. Our study suggested that DFR can be a valid option for the treatment of distal femoral fractures in geriatric populations, especially in the presence of comminution and low bone quality. The benefits of DP in the management of these fractures outweighed the disadvantages of the stiff construct of the dual plating, which allows for earlier weight-bearing and faster rehabilitation.

We recommend larger studies with longer follow-up periods given the several aspects in decision-making that still require further clarification, such as whether the size of the distal segment of the fractures would be enough to hold fixation, the degree of osteoporosis that would necessitate replacement and would contraindicate fixation, the association between these fractures and knee osteoarthritis, and its effect on rehabilitation and union rates after fixation.

Conclusions

DFR and DP had comparable functional (KSS) and radiological outcomes in the management of distal femoral fractures among geriatric patients. No significant difference in postoperative complications, reoperation rates, or operative time had been observed between both groups, except for knee ROM at 1 year, which was significantly greater in the DP group.

Conflicts of interest

The authors declare there are no conflicts of interest.

For full disclosure statements refer to https://doi.org/10.1016/j.artd.2023.101113.

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