Periprosthetic Femur fractures in Octogenarians: Are plating systems the Answer?

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Abstract

23 consecutive periprosthetic femur fractures in 22 Octogenarian patients were treated surgically. 15 case were operated using Mennen plating system or Dall Miles cable plates. Rest were treated with long stem Cannulock or conventional femoral stem revision surgery. 2 out of 8 B1 fractures, 1 out of 5 B2 fractures and 2 C-type fractures treated with plating system resulted in to failure of fixation and non-union requiring further surgery. There were no cases of implant breakage. All cases with intra medullary long stem fixation resulted in to union.
Plating systems used in isolation appears to be associated with high failure rate in this age group of patients with poor physical abilities, associated co-morbidities and poor bone quality.

AIM

To identify outcome using extra medullary plating systems without any other supplementary fixations in periprosthetic femur fractures in octogenarian group of patients.

INTRODUCTION

Hip Arthroplasty surgeries are rapidly becoming a routine Orthopaedic surgery in many countries world wide. There is also increasing demand for it with rise in the aging population.

Arthroplasty surgeries in elderly patients bring with it a potential risk of periprosthetic fractures in presence of already osteoporotic bone. Fractures following a Total Hip Replacement pose a great challenge for the surgeon treating these injuries and also for the patient as they occur more often in the elderly population who tend to have a number of co morbid factors. With increasing number of total hip replacement and hemiarthroplasties being performed, the number of periprosthetic femoral fractures will also rise.

This is a prospective study of 23 periprosthetic femur fractures in 22 Octogenarian patients, looking at outcome of fracture management using both Mennen Plating system and Dall – Miles cable plating system. We were unable to find a study which had looked at both the commonly used plating systems at the same time, particularly focusing in Octogenarian patients.

Aim of the study was to look at outcome of management of Vancouver type B and C Peri prosthetic femur fractures [5] in Octogenarian patients using either of the plating systems, up to the end point which was defined as either a successful union of the fracture or failure of fixation or failure of union. We have also made an attempt to identify the reasons for the failures to help us in better management of these complicated fractures in otherwise physically and mentally fragile age group.

MATERIALS AND METHODS

This is a prospective study of management of outcome of periprosthetic femur fractures in Octogenarian patients using Mennen Plating system and Dall Miles cable plating system, two of the commonest extra medullary implants used along with use of Cannulock hip revision surgery system and use of traditional long stem femoral stem fixation. No other additional surgical procedures like onlay cortical grafting or dual plating etc. were used when plating systems were used in our series.

There were total 23 periprosthetic femur fractures in 22 patients treated between the years 1996 and 2005. One patient sustained bilateral femur fractures in two separate incidents. Average age of patients was 84 years. There were 6 male and 17 female patients.

In all these cases, the mechanism of injury was a trivial fall, hence a low energy trauma. In all these cases, there was no

radiological evidence of other bone pathologies responsible for the fracture apart from Ostepaenia.

We used the Vancouver classification [5] as it has been demonstrated to be both reliable and valid. All "type A" fractures were excluded from the study as most often them being stable injuries; outcome is not influenced significantly by method of treatment used.

According to the Vancouver classification there were 10 type B1 Fractures, 9 type B2 fractures and 4 type C fractures.

Of B1 fractures, 4 patients had a Mennen plate fixation, the other 4 had a Dall-Mile's cable plate system used and further 2 had revision to Cannulock -long stem cemented prosthesis.

Of the B2 fractures 3 had Mennen plate fixation 2 had Dall-Miles cable-plate system, 3 had Cannulock revision prosthesis and 1 patient had a revision to a long stem prosthesis cemented & augmented with cable system.

Of the 4 C type fractures 2 had Dall-Miles cable plate system used, 1 had Cannulock prosthesis and 1 had a periarticular plate fixation (Zimmer).

Figure 1

Table 1: Vancouver Classification

TYPE	LOCATION	SUBTYPE
A	Trochanteric Region	A-G : Greater Trochanter
		A-L : Lesser Trochanter
B	Around or just distal to the stem	B1 : Prosthesis Stable
		B2 : Prosthesis Unstable
		B3 : Bone stock Inadequate
C	Well below the stem	

All the patients have undergone open reduction and internal fixation with or without revision of primary femur prosthesis as indicated. Surgeries were carried out as soon as patients were fit enough to undergo this major surgical procedure, without any undue delays.

Post operatively, patient were allowed weight bearing mobilization as pain permits with help of Zimmer frame to begin with followed by crutches. It was found to be impossible to keep this age group of patients completely immobile due to higher risk of other co morbidities associated with it OR to keep them non or partial weight bearing due to difficulty in such mobilization in otherwise poorly mobile patients.

All the cases were clinically and radiologically followed up, up to the end point which was defined as either a successful union without any further procedures OR failure of fixation / failure of union requiring further surgical interventions. Average follow up in this study is 9.2 months.

RESULTS

The average radiological time to union was approximately 20 weeks. Fixation failures were noticed in all the 3 types of periprosthetic fractures. All cases had radiological evidence of Ostepaenia. We did not confirm the evidence of osteoporosis by bone densitometry in any of these cases.

B-1 Fractures: Out of 10 cases, there were two cases of fixation failure – one each with Mennen plate and Dall-Miles cable plate system. Both underwent successful revision procedures in from of long stem cemented hip replacement with circlage wires augmentation.

B-2 Fractures: There was one failure of fixation out of three Mennen plate fixations for which the patient had a revision to a long stem hip prosthesis and use of Mennen plate with additional circlage wire to improve stability proximally The Cannulock system used for the two of the B 2 fractures had breakage of screws with autolysis around the distal aspect and sinking of the prosthesis due inadequate proximally fixation and poor distal mechanical stability between the implant and host bone. Three cases had successful Dall-Miles fixation and one had long stem cemented total hip replacement following periprosthetic fracture.

C Fractures : With the C Type fractures where cable plate systems were used in two cases, both failed and required long stem femur prosthesis with additional plating and circlage wires and bone grafting. Out of further two cases, One each case was treated with periarticular plating and Cannulock arthroplasty with success.

Out of a total of 16 cases of periprosthetic fractures treated with either type of extra medullary plating systems, 5 (31.25 %) cases resulted into failure of fixation requiring revision surgery. All 5 cases treated with Cannulock system of revision hip surgery resulted into fracture healing without any fixation failures.

2 out of 10 cases of B-1 fractures resulted in to fixation failures.

1 out of 9 cases of B-2 fractures resulted in to fixation failure.

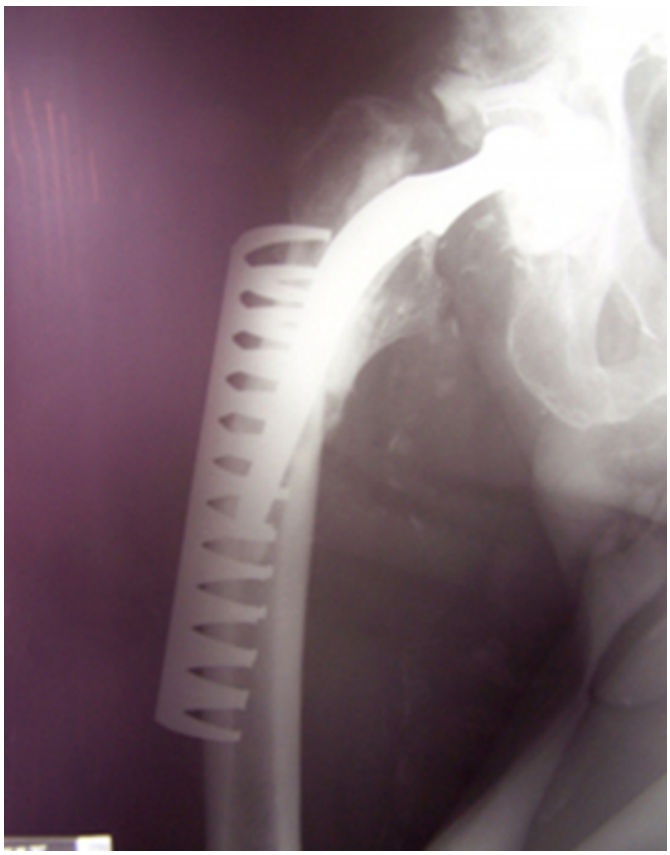
2 out of 4 cases of C-type of fractures resulted in to fixation failure.

Figure 2

Figure 1: Periprosthetic Fracture with uncemented hemiarthroplasty. Failure of fixation with Dall-Miles cable plate system.

Figure 3

Figure 2: Periprosthetic fracture with cemented femoral stem in situ.Failure of fixation with Mennen plate fixation.



DISCUSSION

The initial treatment of these fracture in the early 70s from early reports were in the form of non operative treatment with bed rest and traction until healing occurred. If traction failed then operative treatment was undertaken in the form of revision surgery. Open reduction and internal fixation will nevertheless be required for a considerable number of fractures around a well fixed implant.

From the above results it is clear that there is no single solution for these complex fractures. The outcome of periprosthetic femur fractures following plate and cable fixation in 15 cases, by Kamineni et el [8] showed 3 cases of failure requiring long stem re-revision surgery. Overall they were happy with the outcome. In a study of 16 B-1 type fractures, Agarwal et al [2] found major complications in 4 cases including non-union, deep infection and persistent pain, this concluding high co-morbidities associated with this type of injuries.

In our series, radiological fracture healing time was approximately 20 weeks which was comparable to this study where the average time to union radio graphically was 4

months implant and 20 weeks for cement less implants. [1]

In a study by Lowen Hielm and Associates [12] the estimated prevalence of post operative fractures was found to be 0.25% after 15 years. Other studies suggest a prevalence of 0.1%-2.1% [3]

In our series, with the B 2 fractures that were treated with Mennen plate fixation there was only one failure. Radcliff CN et al [14] published result of 5 cases of Mennen plate fixation in otherwise frail group of patients with successful union and improved mobility. With the B2 variety, in spite of poor fixation of the implant within the bone, we only revised 3 prosthesis. The rest of the patient in this group had lot of co morbid factors that prevented us from revising the femoral components. B2 fractures where we used Cannulock systems showed breakage of screws and autolysis at the tip of implant with associated sinking of the prosthesis. This is due to the relative poor mechanical stability of the implant achieved by screw distally and proximally poor biological fixation in otherwise osteoporotic bone with wide medullary canal.

Tadross et al [15] case series of eight patients treated with cable plate systems had four cases that were considered as failures 2 cases of non unions and 2 cases of malunion. The potential reason for these failures has been attributed to the varus position of the femoral prosthesis. Additional fixation with cortical struts may help to avoid these failures.

Chandler and associates [6] have reported good union rates in 21 of the 22 patients who had use of a metal plate on one cortex and allograft strut on the other. Haddad et al [7] also reported successful outcome in their introductory treatment method of Dall Miles plating and strut graft in 4 cases.

In another review of 12 patients with B1 fractures treated with cable plate system Learmonth ID et al [10] with a minimum follow up of two years noted good union rates in 11 of these fractures. This was similar to the results achieved by Venu et al.[17] and Yuji Uchio et al. [18]

In a review series of 16 cases, Tsiridis et al [16] found total 5 cases of failure in B1 and B3 types where femoral component did not bypass the fracture adequately.

With regard to the c type fractures, in our series,2 failed out of 4 cases and required long stem revision and additional bone graft and cable plate fixation. This result makes it very obvious that out of all the varieties, type c fractures are likely to be most unsuitable for isolated extra medullary fixation and are better treated with long stem intra-medullary fixation.

Kolstad [9]in his series of 23 fractures treated with long stem revision stems showed healing in all cases however accelerated loosening was found again in some cases. Berry DJ [4] has reported successful outcome in all 8 cases of B-3 fractures treated with fluted tapered uncemented long stem. Similarly MacDonald Et al [13] in their series of 14 cases showed no implant failure and good union in all cases treated with uncemented long stem femur stem.

All the above cases with periprosthetic fractures were result of low velocity injuries. A minor episode of trauma is sited as the most frequent cause of these fractures. It is interesting to note that Lewallen and associates [11] reported that upto 50% of their patient presented with insidious pain and fracture with no history of fall or trauma preceding the fracture.

CONCLUSION

Surgical management of Periprosthetic femur fractures has been recognised as technically demanding particularly in elderly age group patients with poor bone quality and other associated co-morbidities. There are number of specialist intra and extra medullary implants are available for their management.

Looking at the failure rate in our study using either form of plating system in treatment of periprosthetic femur fracture, in our opinion, relying on plating for the periprosthetic fractures without any other form of supplementary fixations should not be a preferred method of fixation and should be avoided in otherwise frail octogenarian group of patients. This group of patients are unable to withstand repeated surgeries and deserves the treatment method which is less likely to result into failure.

In our opinion, intra medullary fixations using either specialist implant like Cannulock system or using long stem femur prosthesis is more than likely to end in satisfactory outcome in comparison to extra medullary fixations.

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