ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Primary Cemented Hemiarthroplasty Gives Predictable Early Mobility in Inter-Trochanteric Fractures of Elderly.

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ABSTRACT

In the young adults, the inter-trochanteric fractures of femur are treated with fixations. In the elderly patients these fracture pose problems of poor fixations and also naturally cause troubles of recumbence. Cemented bipolar hemi-arthroplasty can rebuild proximal femur to give early and predictable mobility to these elderly patients. This paper aims to analyze the results of 13 cemented hemi-arthroplasties over 10 years.

Keywords: predictable, early,mobility, patient satisfaction, independent life, cemented, hemiarthroplasty, osteoporosis, poor result.

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ISSN: 0975-8585

INTRODUCTION

Inter-trochanteric fractures are common orthopaedic injuries. They occur both in young and the elderly with difference in the quantum of the force required to cause these fractures. In general inter-trochanteric fractures are managed with internal fixation devices. In the elderly when there are additional problems of osteoporosis and more comminution these devices are inclined to fail [1,2]. There is additional problem specifically relating to the sliding of the Dynamic Hip Screw and consequential uninhibited collapse at fracture site in osteoporotic bone [3-5]. When a senior citizen has an inter-trochanteric fracture, the concern and hence the intent is to quickly rehabilitate the fractured so as to render their remaining life spent with greatest independence. [6] Thus there is a challenge to any orthopaedic-surgeon. Arthroplasties are tried in the treatment of trochanteric fractures in the elderly [7-11]. Most of these studies have used hemi arthroplasty prosthesis when the primary surgery of internal fixation had failed. In a turn-around, Tronzo started to even primarily replace the femoral head for an inter-trochanteric fracture [12].

After this, the regular hemi arthroplasty prosthesis was started to be used for trochanteric fractures primarily [1,13-15]. In such situations, the patients loaded their limb earlier [15] with less pain [16] and walked earlier so had less pneumonitis and pressure sores [16]. All these even with a compromised bone stock. But with some extra blood loss in the prosthetic group [17]. However one study without proper comparison of internal fixation and hemiarthroplasties concluded that there was no difference between the prosthesis group and the internal fixation group [18]. There are also a few works from Indian centres [19-21]. This study was aimed to prospectively study the usefulness of cemented bipolar hemiarthroplasty in managing trochanteric fractures in the elderly.

Methodology

This prospective study was done between 2004 and 2012 on 13 hips in 12 cases (ten regular inter-trochanteric fractures and three reverse oblique fractures). There were ten men and two ladies (between 65 years and 94 years) in an average age of 80.33 years. Most of the injuries were on the left side. Six patients had diabetes mellitus and three had previous treatment for ischemic heart disease. All these patients were walking just before the fall. All cases had thorough cardiac, nephrology and anesthetic evaluation. There was age related risks of anesthesia in these cases. We excluded from the study, the patients with poor cardiac tolerance, elevated renal parameters and those who were not independently walking before the fall. The average time interval between the fall and the admission to our centre was one day. The mean time lag between the admission and the surgery was three days.

Operative technique

All patients were given spinal anaesthesia, were put on lateral position with the affected side the uppermost .By a lateral incision the greater trochanter was exposed with approach similar to Hardinge's approach. The dissection was kept close to the anterior aspect of the greater trochanter. A Charnley's self-retaining retractor was used to retract the soft tissue. By gradual external rotation with application of the cautery, the proximal fragment was exposed .The type of treatment from here onwards depended on the type of the proximal fragment.

Figure 1: Radiograph of an 80 year old postmenopausal lady, a diabetic and hypertensive, showing a displaced inter-trochanteric fracture on the right side.

ISSN: 0975-8585

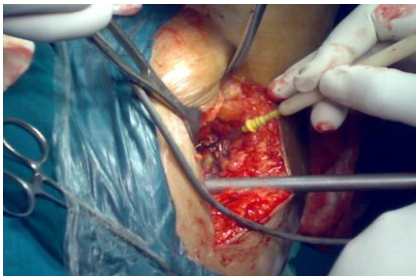

Figure 2: By the lateral approach, the hip joint capsule was exposed .The anterior part of the capsule was cut. The proximal part of the fracture was identified and a myoma screw was introduced .The soft tissue around the lower spike of the proximal fracture fragment was released.

In regular trochanteric fractures, the distal fragment with proximal shaft of femur was retracted. A myoma-screw was inserted through the fracture surface of the basi-trochanter into the neck and head. (Figure 3) Using the same myoma screw (Figure 3) as a joy-stick to manipulate the head and neck, the soft tissue around the neck was erased with diathermy and head was removed by using a Murphy's skid. The size of the head was measured. A suitable a bipolar hemi-arthroplasty prosthesis of one size smaller was selected. ® A pre-sterilised bipolar prosthesis manufactured by SSEPL® . (Sharma surgical and engineering private limited ,Vadodara, Gujarat, India) was used in all these cases . Its bipolar head has an outer shell, a liner and an inner head . Figure 4.

Figure 3:The femoral head and neck, up to fracture site was excised by passing a cork screw through the fractured end the head's diameter was measured with a gauge.

Figure 4: A bipolar prosthesis was selected one size smaller than the diameter of the head which was removed

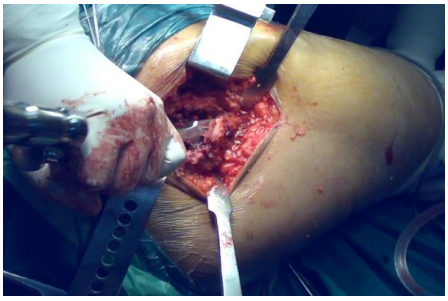

Figure 5: The femoral shaft was prepared with a broach to receive the prosthesis.

The proximal femur was reamed initially with a regular intramedullary nail reamer and later with a broach (figure 5**).**The ante version was decided by the position of the rasp perpendicular to the flexed leg of the same side. Trial seating of prosthesis was done. We did not try to provisionally fully reconstruct the proximal femoral bone by trial reduction or to pull the limb to the length of the uninvolved side as in other series. The uninjured contra lateral lower limb was actually kept flexed and secured to the operation table. The prosthesis length was assessed by the relative position of the head of the prosthesis after trial seating into the medullary canal of the femoral shaft. The fragments were allowed to fall in place and relative position of the tip of the greater trochanter and the centre of the prosthesis head was measured. The ideal length the amount of the stem of the prosthesis that should go inside the femoral shaft was measured with a scale and determined before cementing. We did not use a centralizer in any of our cases due to the cost factor. Instead bone graft pieces from the head and the nibbling of the greater trochanter was made as a small mass and inserted into the femoral canal. This process was completed by the femoral rasp. We did not use a calcar substituting prosthesis due to the cost factor.

Figure 6: Prepared bone cement being introduced into the prepared femoral canal

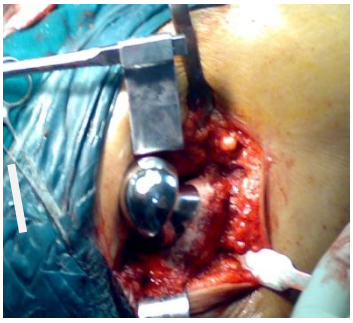

Figure 7: The selected bipolar prosthesis was passed into the proximal femur with head and neck of the prosthesis at 90 degree to the flexed ipsilateral leg (not seen here). This was because we do not have a neck to assess the ante version.

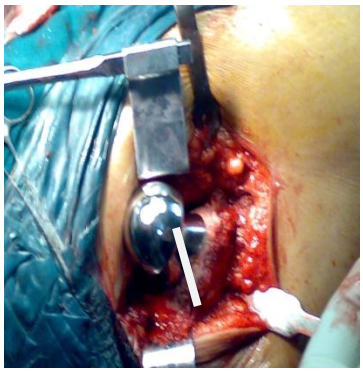

Figure 8: The height of the prosthesis was adjusted with the relative position of the centre of the head and the position of the tip of the greater trochanter. (Marked with a white line)We did not try the traction method as the patient is kept in lateral position and the lower unaffected limb was kept flexed and tied with a pillow in between.

ISSN: 0975-8585

The bone cement was pushed manually after drilling the proximal shaft of femur to let out air and excess cement. Figure6. The already selected bipolar hemi arthroplasty prosthesis was inserted up to the level determined earlier. Figure7. The level of the prosthesis was determined as seen from the white line joining the centre of the head of the prosthesis and the tip of the prosthesis (figure 8) as elaborated above. The excess cement from the free surface around the prosthesis was removed with an 11- blade on a Bard-Parker knife handle, when the cement was still semisolid. After the cement had set, the comminuted fragments of greater trochanter were allowed to fall back on to the fracture site and these were sutured with Vicryl® with each other. Reconstruction of the proximal femur and the adequacy of cement below the lower limit of the stem of the prosthesis were confirmed in the C-arm views (figures 9 and 10).

Figure 9: Image intensifier views taken after the surgery in another case.

Figure 10: The other image intensifier view in another case showing the stem of the prosthesis was well inside the medullary cavity of the femur and a mantle of cement below the stem of the prosthesis marked by the arrow.

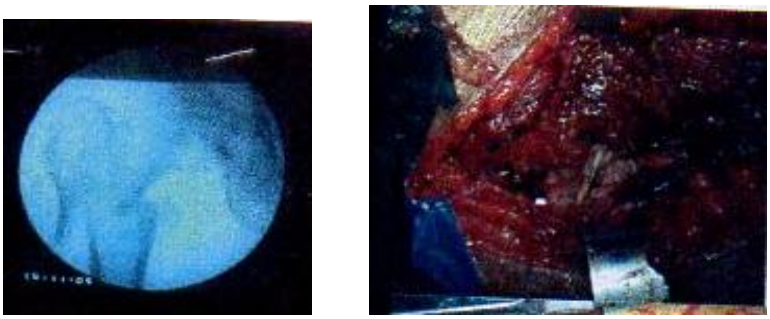

Figure 11: A case of reverse oblique fracture and its exposure

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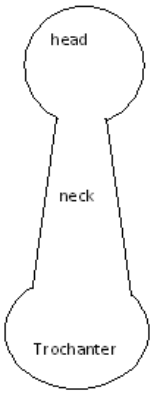


Figure 12: Planning for the neck osteotomy is the first step in reverse oblique fracture. A line diagram showing the head, neck and trochanter as seen from above is shown here.

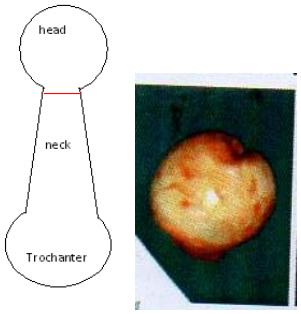


Figure 13: Saggital red line shows neck osteotomy. The sectioned and removed head is seen on the side.

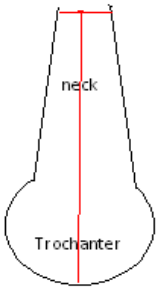


Figure 14: The second red line in coronal plane shows osteotomy of the remaining proximal fragment.

The technique of surgery was different in reverse oblique fractures as seen from figure 11, onwards. Here after exposing the trochanter as already described, the neck site osteotomy was planned with drill holes and cut. (Figure 13and 14) The head was removed with myoma screw and skid as before. In the proximal femoral part, the trochanter was split longitudinally and the anterior part was retracted. (Figure 15).

The femoral shaft was reamed and prepared as for regular trochanteric fractures. (Figure16). A cemented bipolar hemiarthroplasty was done and the excess cement removed as already described. The longitudinally split bone fragments were sutured with a thick Vicryl ® (Figures 17,18)

ISSN: 0975-8585

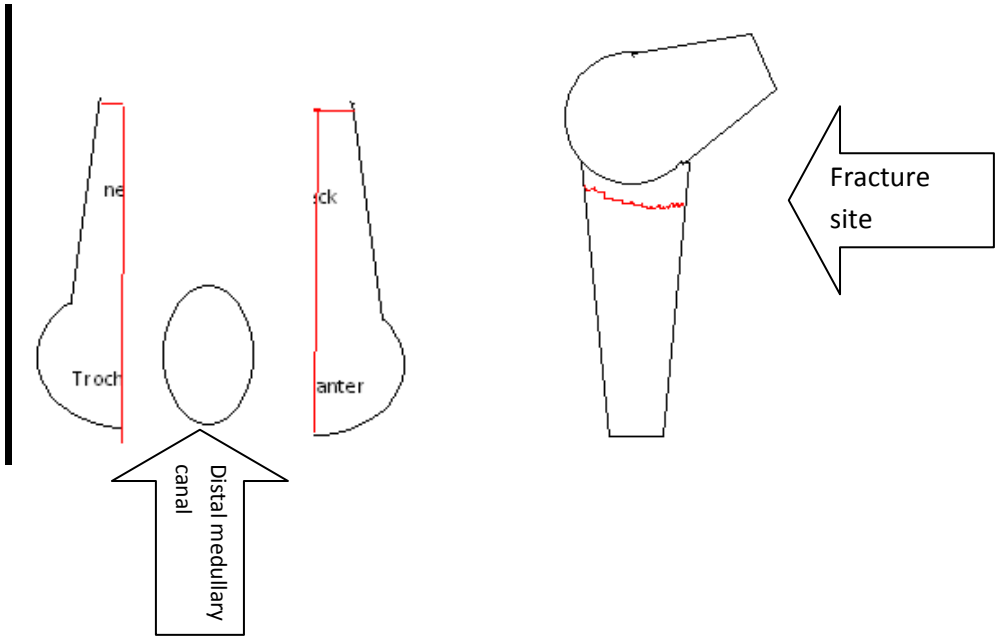
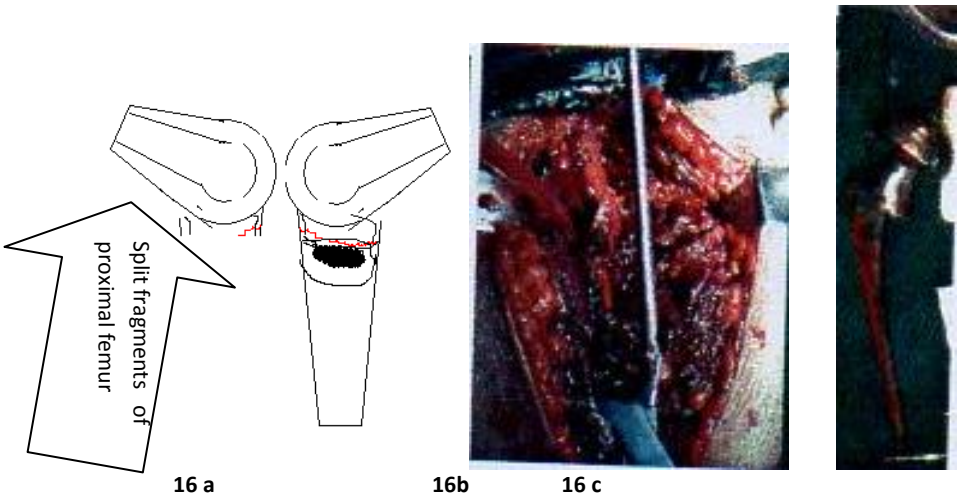


Figure 15: The proximal fragment was split coronally into two fragments, so that the central medullary canal could be reamed and then a femoral hemiarthroplasty could be cemented to the medullary canal.



16 a **16b** **16 c**

Figure 16: Proximal fragment opened coronally the distal fragment reamed with regular intramedullary nail reamer followed by the hemiarthroplasty rasp.

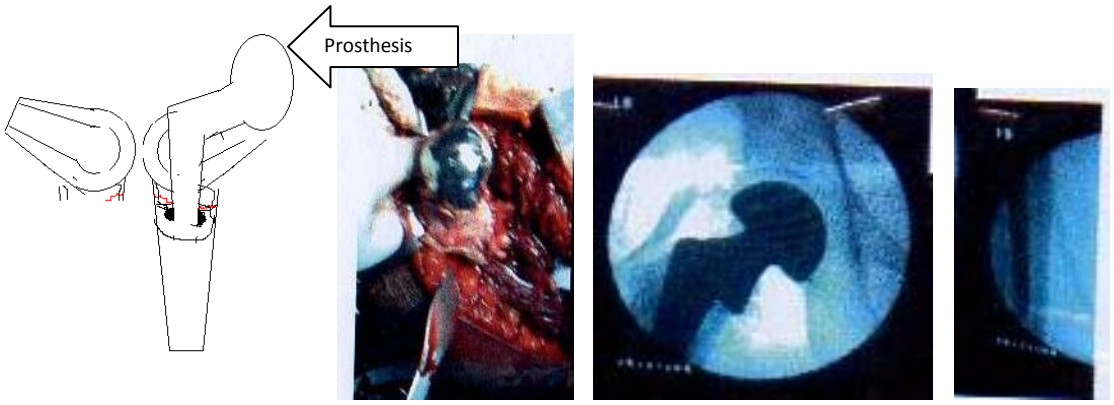


Figure 17: A line diagram showing how in reverse oblique trochanteric fractures, the bipolar hemiarthroplasty was fixed with cement. The two fragments of the proximal fragment was split by the above coronal osteotomy. The intra operative photgraphs and the C-arm views showing the fragments and the prosthesis were also shown.

ISSN: 0975-8585

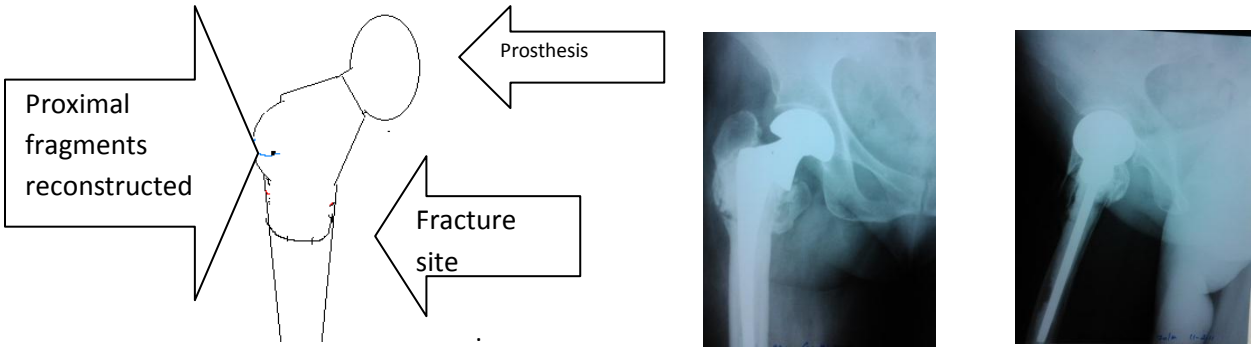


Figure 18: A line diagram showing how in reverse oblique trochanteric fractures, the bipolar hemiarthroplasty was fixed with cement and finally the two fragments of the proximal fragment (which were initially split by the coronal osteotomy) were reaffixed by suturing with Vicryl passing through them. The intra operative C-arm views showing the prosthesis in situ is also presented by the side.

Before the skin incision prophylactic antibiotics of injection Magnex® 1 gm, and injection Targocid® 400mg were administered and were continued till the patient was discharged. If the patient was a diabetic then adequate glycemic control was achieved by appropriate insulin preparation like Actrapid®. In five cases, two units of packed cells were given preoperatively. No blood was transfused in rest of our cases. The mean operation time was 65 minutes. (55 – 80 minutes). The mean intra operative blood loss was 150 ml (100-200 ml). From six hours after surgery, injection Lupinox® 40mg was given subcutaneously as thrombo-prophylaxis and continued for 15 days. All patients were made to be ambulant as early as the 1st post operative day with a knee brace and a walker with full weight bearing. The drains were removed on the 3rd post operative day and their tips were sent for culture. All the patients were discharged on the 6th day with physiotherapy advice. They were put on oral antibiotics Cefdinir® 300mg bids, subcutaneous injection of Lupinox® 40mg o.d. At home they were advised to keep the operated lower limb elevated and to mobilize the ankle and hip. The patients were reviewed on the 14 day when all the sutures were removed. From that day, all patients were prescribed a nasal calcitonin preparation 1 snuff per day till rest of their life. The average follow up was 30 months (3 to 10 years). The clinical outcome was assessed using Harris Hip Score. The details of all our cases is presented in table 1.

Table 1: The details of all cases that underwent cemented hemi-arthroplasties for trochanteric fractures.

S. no	Name	Sex	Age in years	Type of fracture	Side	Year of surgery	No of years alive	Result by Harris hip score	Alive
1	Rmy	Male	80	Regular	L	2004	6	Good	Died in 2010
2	Sbg	Female	80	Regular	R	2006	8	Good	Alive
3	Srn	Male	80	Regular	L	2008	6	Excellent	Alive
4	Sep	Male	75	Regular	L	2009	5	Good	Alive
5	Gnd	Female	80	Reverse Oblique	L	2009	5	Excellent	Alive
6	Tng	Male	80	Reverse Oblique	L	2010	4	Good	Alive
7	Ins	Male	65	Regular	L	2007	2	Good	Died in 2009
8	Adr	Male	89	Regular	L	2007	7	Excellent	Died in 2014 (same patient as 12)
9	Mha	Female	79	Regular	L	2008	6	Excellent	Alive
10	Pan	Male	80	Regular	L	2008	6	Excellent	Alive
11	Lli	Female	82	Reverse Oblique	L	2009	5	Excellent	Alive
12	Adr	Male	94	Regular	R	2011	3	Good	Died in 2014
			80.33 years				5.25 years		8alive /11patients

ISSN: 0975-8585

RESULTS

All drain-tubes sent for culture, were reported negative for any growth. Two patients developed a small bed sore before the surgery even with alpha (pneumatic) bed put the first day itself as seen in figures 18 a and b. These bedsores dried up when the patient started walking (Figure19). 100 percent of the cases walked with walker in the first post operative day with a knee brace and a walker and all were ambulant when discharged. (Figure20). The functional clinical results based on Harris hip score (HHS) are presented in table 1. A score less than 70 was regarded as a poor result , between 70 and 79 a fair result, between 80-89 was a good result and between 90-100 was an excellent result . There were good results in six hips and excellent results in seven hips. (Figure 21,22). All patients lived at least two years. At the latest follow up of ten years, three patients had died. The cause of death was myocardial infarction in two cases and unknown in one case. The first was an insurance agent, known to abuse alcohol presented 15 days after the injury that caused the fracture. He was operated and was discharged a week after. He came all alone for a change of dressings a week later. He lived two years after surgery. Only his sister who came for her consultation to our centre informed about his death. However the exact cause of his death was not known. The second patient was a rice-shop owner who had cemented bipolar arthroplasty and became independent enough to draw money from an ATM. He lived four years after the surgery, before he died of myocardial infarction. The third patient was a Sanskrit scholar had his first trochanteric fracture on the left side in September 2007 and had this procedure (serial number 8 in table 1). He was rehabilitated to independent walking. He went on to write two Sanskrit books. He again fell down in December 2011 and this time had inter-trochanteric fracture on his right hip and had the same procedure (serial number 12 in table 1) and was content. He lived three years after the second surgery in 2011 and died due to myocardial infarction in 2014. At the latest follow up all other patients were alive with independent ambulation. The final mortality rate was 25 percent. We did not have any degree of infection in any of our cases. At the latest follow up we did not have any significant thigh pain, or gross limb length discrepancy. We also did not have any hip dislocations. There was severe contusion in all the removed heads, as seen from figure 23, justifying the hemi-arthroplasty in these cases.

Figure19: Two cases who developed bed sores even on the first post injury day.

Figure 20: One of the patient who was made to walk with a walker on the first post operative day

ISSN: 0975-8585

Figure 21: Post operative appearance of the operation site – after an year (patient is lying on his side)

Figure 22: Patient able to actively abduct the left hip at one and half months(patient is lying on his side)

Figure 23: A severely contused head removed using a cork screw from a trochanteric fracture patient in this series. This was replaced. This retrospectively questions the fixation type of treatment which preserves the head (osteo-synthesis) in these cases.

DISCUSSION

Proximal femur region in the aged is osteoporotic and fractures in these region cause concern of poor fixation and hence delayed mobilization. For this many authors have used different techniques [7-11], but none have accurately compared internal fixation and hemiarthroplasties. Even a Cochrane database meta-analysis has no appropriate comparison and still reports no difference between the prosthesis and internal fixation groups in inter trochanteric fractures.

The core issue is if a given treatment method will make the patient with proximal femoral fracture ambulate earlier. This should prevent deep vein thrombosis, lung infections and urinary tract infections. The internal fixation treatment in this age and fracture area confront two problems, 1st the osteoporosis and 2nd the comminution causing instability with putting the implant in a position to slice through the soft bone causing loss of original intra-operative position and varus deformity [24-26].

Free loading of the injured limb in the post-operative period is not permitted when devices like the Dynamic hip screw are used particularly in severe osteoporotic fractures [27]. Thus there are complications of internal fixation devices usage in inter trochanteric fractures [27-30]. and Dynamic Hip Screw in particular [3-

6]. Cemented replacement for the proximal femur is a viable alternative, described as coxo -femoral bypass, as it in the immediate post operative period , stabilizes the hip leaving the operated wound as the only source of pain. This gives good co-operation of the patients to post-operative physiotherapy. The main point to discuss is whether this surgery of 'coxo femoral bypass' is justified in these fractures when fixation systems are available. These aspects are discussed in table 2 below. The fixation in the elderly fracture patient with Dynamic Hip Screw or Proximal Femoral Nail restricts mobilization in vital period of initial weeks [1, 27, 31]. The expectancy of life and Quality of life-Immediate nursing care and mobilization and the Quality of bone are the main considerations. The one advantage that is possible is that if everything goes well the internal fixation group can squat or sit cross legged after surgery.

Table 2: Comparison of internal fixation systems with primary cemented replacement

Parameters	Internal fixation.	Cemented replacement.
Time spent in bed	Six weeks of rest	Till surgery
Walking with full weight bearing	Not Possible	Possible, from the first postoperative day
Cut through of the bone by the implant	Possible	Nil
Ability to squat or sit cross legged after surgery	Possible if fracture unites	Discouraged
Chances of Deep Vein Thrombosis	More	Less

Though squatting was discouraged most of our patients in this series of hemi-arthroplasty, most of them obstinately squatted. This type of experience was not reported in other Indian series [21-23]. A case control study was difficult in these situations, given the problems of the internal fixations in these group, we feel it was unethical to even try the methods of internal fixations in inter-trochanteric fractures in these age group. With extra increase in lifespan and the mechanical problems of the prosthesis will happen. A the average Indian lifespan is 70 years at 60th year [32] every single month of real autonomous living counts.

CONCLUSION

Though the study had not direct compared internal fixation, it found that primary cemented bipolar hemi arthroplasty in the inter trochanteric fractures in the elderly gave early painless independent ambulation restoring the morale to live longer.

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