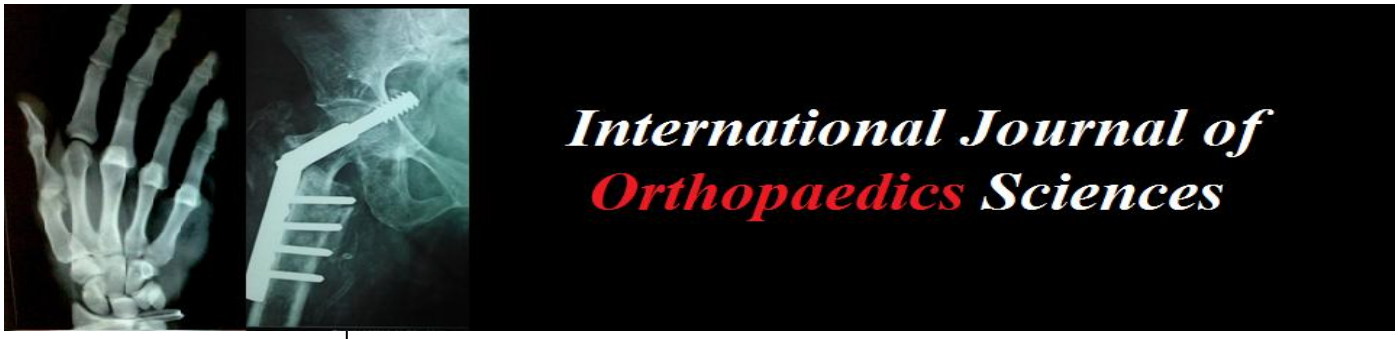


ISSN: 2395-1958
IJOS 2018; 4(4): 155-160

www.orthopaper.com
Received: 15-08-2018
Accepted: 20-09-2018

Dr. Srinivasan N
Assistant Professor, Department of Orthopedics, Sree Balaji Medical College and Hospital, BIHER, Chennai, Tamil Nadu, India

Dr. Pugazhendhi G
Associate Professor, Department of Orthopedics, Sree Balaji Medical College and Hospital, BIHER, Chennai, Tamil Nadu, India

Dr. Venkatachalam K
Professor, Department of Orthopedics, Sree Balaji Medical College and Hospital, BIHER, Chennai, Tamil Nadu, India

Correspondence
Dr. G Pugazhendhi
Associate Professor
Department of orthopaedics
Sree balaji medical college and hospital, BIHER, Chennai
Tamil Nadu, India

A short term prospective study of the functional outcome of uncemented bipolar hemiarthroplasty in displaced fracture neck of femur in elderly

Dr. Srinivasan N, Dr. Pugazhendhi G and Dr. Venkatachalam K

DOI: https://doi.org/10.22271/ortho.2018.v4.i4c.27

Abstract
Fractures of the hip is emerging as a commonly encountered fracture in the older individuals. Among the proximal femur fracture, neck of femur constitutes around 50%. Treatment goals for fracture neck of femur are aimed at early return to a satisfactory functional status to pre-injury ambulatory status. Bipolar hemiarthroplasty has emerged as good surgical option for pre-morbid active elderly patients. We are presenting a prospective study of the functional outcomes of uncemented bipolar hemiarthroplasty in displaced fracture neck of femur in the elderly. This study was conducted at Sree Balaji Medical College and Hospital, Chromepet Chennai from June 2015 to May 2018. A total of 25 patients were recruited for this study aged between 61 to 75 years. Based on Singh's index and Dorr's Classification of femoral canal ratio, idealy suited patients were selected for uncemented bipolar hemiarthroplasty. Functional outcomes of the patients were evaluated using the Harris Hip Score. All the cases were followed up for a minimum of 12 months and we had 88% of excellent to good results in our study and there were no poor outcomes. Uncemented bipolar hemiarthroplasty avoids the complications of cementing in the elderly, and preserves the bone for a later THR if needed. Also they reduce the risk of acetabular erosion and protrusion. We conclude that bipolar uncemented hemiarthroplasty produce good functional outcome with minimum complications for carefully selected displaced intra-capsular femoral neck fractures in the elderly.

Keywords: uncemented bipolar prosthesis, hemiarthroplasty, fracture neck of femur, southern moore approach

1. Introduction
With the increasing life expectancy, the percentage of the ageing population has seen an exponential growth. Associated with this phenomenon, are an increase in the types of fractures sustained in these age groups. Among all fractures, fractures of the hip are emerging as being more commonly encountered. It is been roughly estimated that the incidence of hip fracture which was 1.66 million in 1990 will rise to about 6.26 million by the year 2050 [1]. Intra-capsular fractures of the femoral neck constitutes about 53% of these hip fractures. Among these around 33% are un displaced and the remaining 67% are displaced [2].Femoral neck fractures and per-trochanteric fractures are of approximately equal incidence [3, 4] and together make-up for over 90% of the proximal femur fractures and the remaining 5 to 10% are of the sub-trochanteric type. Further, half of the proximal femur fractures are of the intra-capsular variant [5].

Surgical treatment of fracture neck of femur has always remained dabatable and treatment modalities adapted for the young and old, have divergent methodologies and protocols. Treatment methods have got significantly refined over the last 2 decades [6]. The main reasons for the surgical failures of internal fixation are avascular necrosis and non-union. Failure of such internal fixations leads to a high incidence of re-interventional surgery [2]. Osteoporosis plays a major role among the many risk factors which cause fracture of the bone in this age group [7]. The treatment goals for femoral neck fractures; are an early return to a satisfactory functional status along with a pre-morbid ambulatory status [3]. Prosthetic replacement of the femoral head with Austin Moore or Thompson prosthesis has undoubtedly played an important role, over the last three decades but lately are becoming obsolete.

To overcome these problems, bipolar hemiarthroplasty has emerged as a good surgical option for active elderly patients who need a stable fixation with joint stability [6]. Disabling thigh and hip pain and acetabular erosions are frequent complications, after the use of hemi replacement unipolar prosthesis [9]. So in an attempt to retard the acetabular wear and also delay the need for revision surgery, the bipolar prosthesis was developed by James E. Bateman in Toronto in 1947 [10]. Here the erosion and protrusion of acetabulum are less because the motion is present between metal head and polythene socket (the inner bearing). There is a second layer of motion between metallic cup and acetabulum (The outer bearing. This minimizes the acetabular articular wear significantly. However this movement is appreciated only during the ambulatory weight bearing phase.

In these elderly patients (Above 55 years), some have a relatively good bone quality (conforming to grade 3 to 6 on the Singh's index and Dorr classification Type A and B). It is in these patients that the uncemented bipolar hemiarthroplasty has a significant utility. The present prospective short term study is to evaluate the functional and outcome of this surgical procedure done in a group of carefully selected cases of elderly fracture neck of femur with reasonably fair bone quality and femoral canal Dorr's ratio of less than 0.75.

2. Materials and Methods

This prospective study was conducted at the Department of Orthopaedics, Sree Balaji Medical college and Hospital, Chromepet Chennai between June 2015 and May 2018.The recruitment was for a period of 24 months, (i.e till May 2017) and the study concluded in May 2018, so that there was a minimum follow up period of 12 months (Range 12 to 35 months).

2.1 Inclusion criteria

- Displaced fracture neck of femur conforming to Garden Type 3 and 4 alone were included.
- Both male and female in the age group of 61 to 75 years alone were included.
- Only patients with X- rays of the hip conforming to Singh's index range of 3 to 6, were included.
- Only cases whose proximal femoral X-rays conforming to Dorr classification Type A and B were included.

2.2 Exclusion criteria

- Displaced fracture neck of femur.
- Extra-capsular neck of femur fracture.
- Age not conforming to the above range were excluded.
- Poly-trauma, pathological fractures and medically unfit cases were excluded.

Twenty-five patients were enrolled in this study, which conformed to our inclusion criteria. All the patients were evaluated for comorbid conditions like diabetes mellitus, systemic hypertension heart disease etc and anesthetic fitness obtained.

All cases were done under regional anesthesia that included spinal or epidural anaesthesia and were taken up for surgery within 3days of admission. Using the Southern Moore's approach, uncommented bipolar hemiarthroplasty was done. The average duration of surgery was 50 minutes with average blood loss of 300 ml, mean duration of hospital stay was 14 days (range 12 to 21days). Post-operatively broad spectrum antibiotics was given for 48 hours and thrombo-prophylaxis was given for 5 days. Partial weight bearing was started with walker support an POD 3 and weight bearing increased as tolerated by the patient. Full weight bearing was allowed only after 6 weeks.

Regular follow-up of all cases was done at 6 weeks, 3 months, 6 months and at one year. At each follow-up, patients were evaluated clinically using Harris Hip Score and roentgenographically. Harris Hip Score was used to evaluate the functional outcome in the present study at the end of 12 months of follow-up.

Table 1: Harris hip score

HH. Score	Interpretation
90 to 100	Excellent
80 to 89	Good
70 to 79	Fair
< 70	Poor

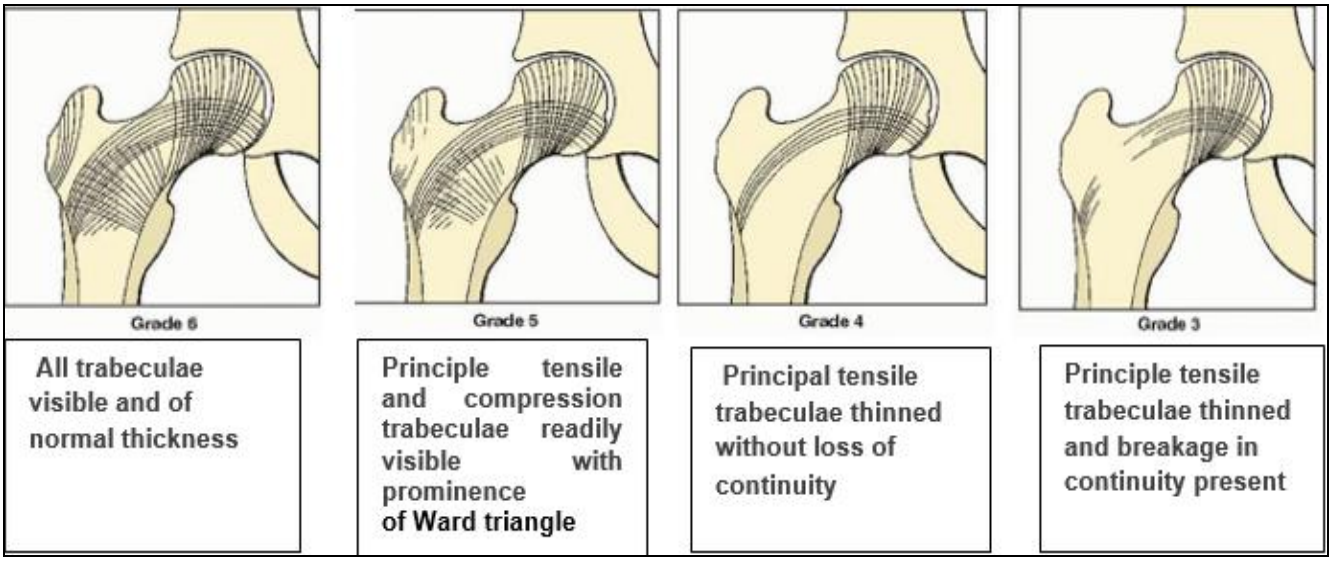


Fig 1: Singh's index

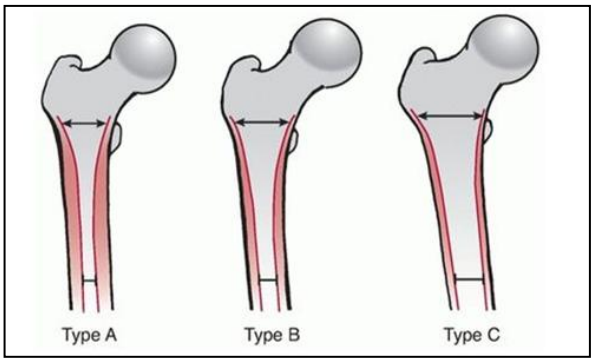


Fig 2: Dorr's Classification

Table 2: Dorr's Ratio Classification

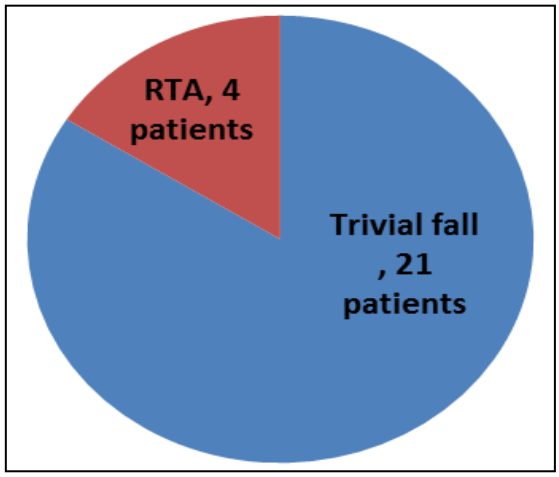
Dorr classification	Canal to calcar diameter ratio	Suggested femoral component fixation
Type A	< 0.5	Uncemented
Type B	0.5 to 0.75	Uncemented
Type C	> 0.75	Cemented

3. Results

Conforming to our inclusion criteria, 25 patients got recruited for uncemented bipolar hemoarthroplasty for displaced fracture of neck of femur, in the 24 months recruitment period. Of these 36% (n=9) were males and 64% (n=16) were females (M: Fratio 1:1.78). The patients distribution was almost similar in all age distribution groups. The mean age was 67.52 years with a range from 61 to 75 years. The mode for this group was 71 years, with a median of 68 years. With regard to the mechanism of injury; trivial fall from standing height constituted 84% (n=21) patient and in the remaining 16% (n=4) RTA was the cause. In 60% (n=15) the injury was on the right hip and left hip constituted 40% (n=10). In 72% (n=18) the fracture pattern conformed to Type 4 Garden and Type 3 Garden consisted of 28% (n=7). In all there were 16% (n=4) with complications, with 12% (n=3) complications having an impact on the final outcome. The Harris Hip Score evaluated at the end of 12 months of follow-up was excellent in 48% (n=12), good in 40% (n=10) and fair in 12% (n=3) cases. All cases were followed up for a minimum period of 12 months (mean 16.8 months; range 12 to 35 months).

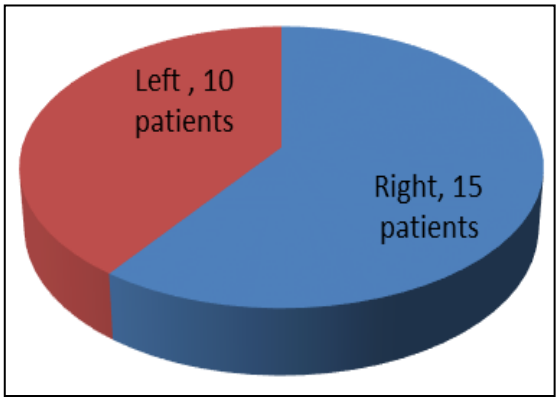
Table 3: Age and Sex distribution

Age(in years)	Male 'n'	Female 'n'	'n'	% age
61-65	2	7	9	36
66-70	4	4	8	32
71-75	3	5	8	32
Total	9	16	25	100



Pie chart depicting mode of Injury

Fig 3: Mechanism of injury



Pie chart depicting side of hip injury

Fig 4: Hip injury sidedness

Table 4: Garden typing of injury

Fracture Pattern	Male		Female		Total	
Parameter	'n'	% age	'n'	% age	'n'	% age
Type 3 Garden	4	16	3	12	7	28
Type 4 Garden	5	20	13	52	18	72
Total	9	36	16	64	25	100

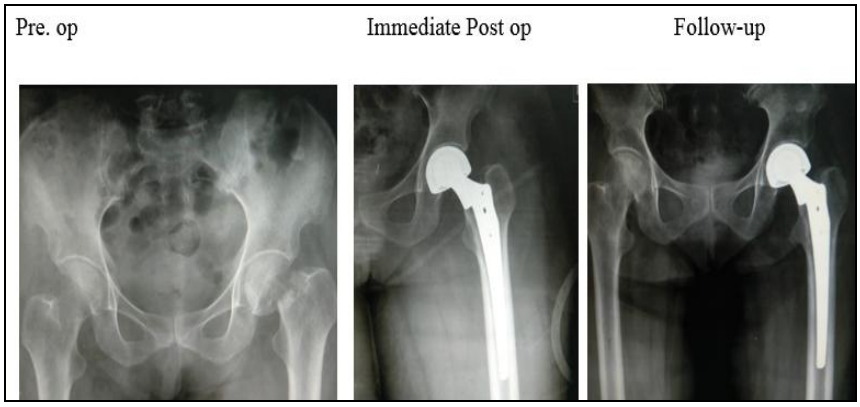
Table 5: Complications encountered

Complications	'n'	% age
Superfical infection	1	4
Painful hip	1	4
Limb Lengthening	2	8
Total	4	16

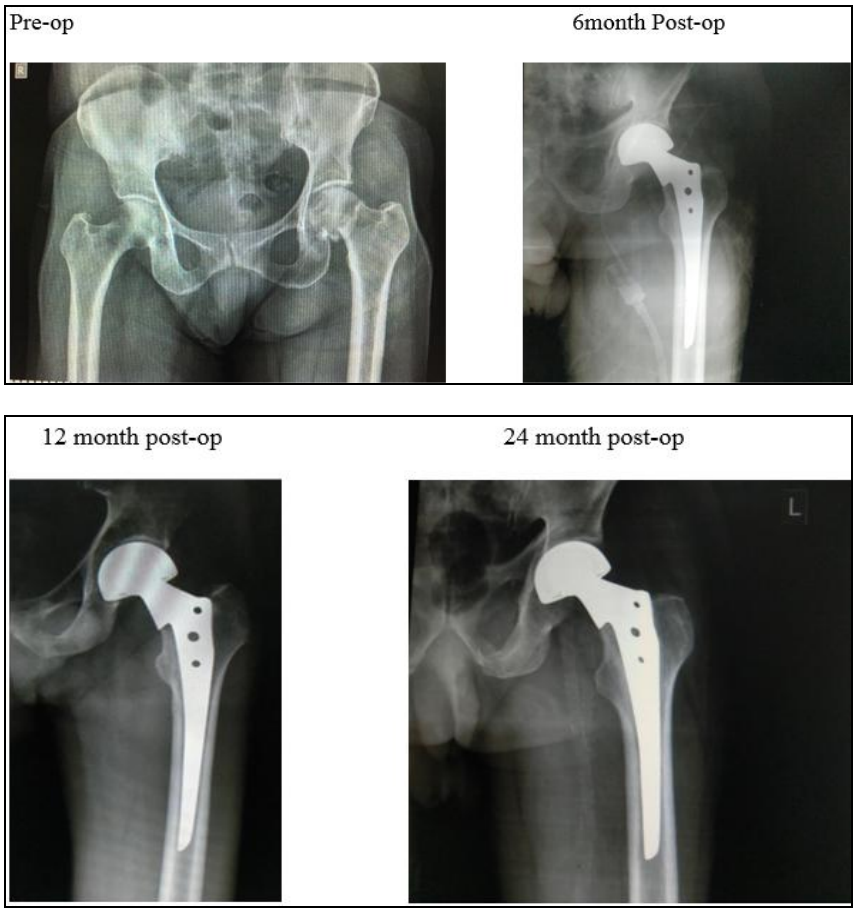
Table 6

Harris Hip Score- Grading	No. of Patients	
Parameter	'n'	%
Excellent (90-100)	12	48
Good (80-89)	10	40
Fair (70-79)	3	12
Poor (60-69)	0	0

Case illustration



Case 1



Case 2

4. Discussion

Replacement surgery done for fracture neck of femur has a primary aim of being able to make the patient ambulatory as early as possible, so that morbidity and mortality associated with prolonged recumbency and hospitalization are avoided. Internal fixation by DHS or Cancellous screw fixation in these group of older people are associated with an unacceptably high rate of failure like AVN and non-union ther by entailing a repeat surgical intervention [10].

Fracture neck of femur is more common in the elderly and more so in the females. The solution to this problem was ventured to 5 decades back. In 1932 Hey Grooves replaced femoral head with ivory. In 1938 Smith Peterson used Vitallium mould. In 1944 Judet Brother introduced acrylic femoral head. In 1948 Mc Bride introduced the threaded stem. Moore in 1950 introduced self-locking cobalt chrome alloy prosthesis. In 1952 Thompson worked on a prosthesis. In 1947 Bipolar prosthesis was first introduced by James E. Bateman and Gilbert. In 1983 Charnley-Hastings used bipolar prosthesis. The bipolar prosthesis gained popularity as there would be less of erosion and protrusion of acetabulam since there is movements both in the inner and outer bearing.

Because of this compound bearing surface bipolar designs provide greater overall range of motion than unipolar design. With the recent modification of the axis of metallic and polyethylene cups, that have been made eccentric, so that with hip loading the metallic cup shall rotate laterally rather than medially thereby avoiding fixation in varus and avoiding impingement of head on the edge of the cup. The design is such that when the joint tends to dislocate, it is prevented so by the movement of the outer bearing in the opposite direction [12]. It has a considerably longer life span when compared to

other universal endo-prosthesis. When an uncemented prosthesis is used it is essential to achieve a firm fit within the femoral canal and good seating of the neck of the prosthesis on the calcar valgus rather than varus position should be borne in mind.

Yamagata *et al.* [1] in their classical study, reviewed 1001 cases of hip hemiarthroplasty. There were 682 unipolar and 319 bipolar cases. Patients undergoing bipolar arthroplasty exhibited higher hip scores and lower acetabular erosion rates compared to the unipolar replacement.

Lestrange [14] reviewed 496 patients with bipolar replacement for displaced femoral neck fractures and compared them with patients having fixed-head prosthesis. He found that the bipolar prosthesis offered advantages over one-piece designs in terms of stability, decreased acetabular erosion and improved function.

Bochner *et al.* [15] observed that dislocation occurs less frequently with bipolar prostheses. The theoretical advantage of the bipolar prosthesis is that the combined arc of motion of the dual joint should reduce the incidence of dislocation, because most of the motion during activities of daily living should take place at the inner articulation.

Table 7: Comparison of patient demographics with outcome HHS score and follow-up period

S. No	Study By	'n'	Mean age (yrs.)	Age Range (yrs.)	M:F	HHS				Mean HSS	Range HSS	Follow up Period (months)
						E % age	G % age	F % age	P % age			
1	R.K. Ponraj *et al*. [8]	30	64	52-87	1:1.7	23.3	56.7	13.3	6.7	84.2	64-97	6
2	Ankush Mohabey *et al*. [16]	40	70.03	50-90	1:1.2	20	70	10	0	85	69-89	12
3	Wender Figved *et al*. [17]	108	69.5	56-89	1:2.8	16	57	19	8	79.8	66-82	72
4	Naiya Samares *et al*. [18]	20	72.2	66-85	1:3.2	14	71	10	5	90	75-95	24
5	H.Krishnan *et al*. [19]	21	76.7	60-87	1:2.4	12	68	18	2	84.2	59-100	30.5
6	Our stydy	25	67.52	61-75	1:1.8	48	40	12	0	83.6	66-97	16.8

Key: HHS: Harris Hip Score, E-Excellent, G-Good, F-Fair, P-Poor.

Table 8: Intra-operative and Perioperative Parameters

S. No	Study	Approach	Average duration of surgery (mins)	Averge blood loss (ml)	Average blood transfusion (units)	Average Hospital Stay (days)
1	R.K. Ponraj *et al*. [8]	Sounthern Moore's	45	260	1.4	11.9
2	Ankush Mohabey *et al*. [16]	Sounthern Moore's	78.25	176	2	16.5
3	Wender Figved *et al*. [17]	Sounthern Moore's	70.2	300	2.3	8.4
4	Naiya Samares *et al*. [18]	Sounthern Moore's	150	420	3	22.43
5	Our study	Sounthern Moore's	66	217	2	16.67

The present study comprised of 25 patients. Our patient demographics and HSS score compared closest to the study by Wender Figved *et al.* [17] and R.K. Ponraj *et al.* [8] Our complications matched the study by R.K. Ponraj *et al.* [8] Our sidedness and mode of injury was comparable to the study by Ankush V. Mahabey *et al.* [16] Our intraoperative and perioperative parameters were on par with the study of Ankush V. Mahabey [16] and Wender Figved *et al.* [17] Many of a studies have not been able to establish the superiority of cemented over the uncemented version of bipolar hemiarthroplasty. Yet there is a component of anterior thigh pain, more often in the uncemented version and incidence of peri-prostetic fracture has been reported. BCIS- the bone cement implantation syndrome, which at times can be fatal, is avoidable by using uncemented variant.

5. Conclusion

From our relatively short term prospective study, we conclude that bipolar uncemented hemiarthroplasty produces good functional outcome with minimal complications for displaced intra-capsular femoral neck fractures and has several advantages. The operative time is less and blood loss minimized. It is however imperative to note that the Singh's index and Dorr ratio consideration are to be strictly adhered to in the selection of patients for uncemented bipolar hemiarthroplasty.

6. References

1. Kannus P, Parkkari J, Sievänen H, Heinonen A, Vuori I, Järvinen M. Epidemiology of hip fractures. Bone. 1996; 18(1):57S-63S
2. Somashekar MS, Sathya Vamsi Krishna, Sridhara MS, Murthy JNM. Treatment of Femoral Neck Fractures: Unipolar Versus Bipolar Hemiarthroplasty; Malaysian Orthopaedic Journal. 2013; 7(3).
3. Allfram PA. An epidemiological study of cervical and trochanteric fractures of the femur in an urban population. Analysis of 1,664 cases with special reference to etiologic factors. Acta Orthop Scand Suppl. 1964; 65-65:1-109.
4. Gallagher JC, Melton LJ, Riggs BL, Bergstrath E. Epidemiology of the fractures of the proximal femur in Rochester, Minnesota. Clin Orthop Relat Res. 1980; 150:163-71.
5. Orlin Filipov. Epidemiology and Social burden of the femoral neck fractures; J of IMAB. 2014; 20(4).
6. Raghvendra TS, Jayakrishna Reddy† BS, Jithuram Jayaram. Management of Fracture Neck of Femur with Cemented Bipolar Prosthesis; Indian Journal of Clinical Practice. 2014; 24(9):64-76.
7. Shivanand Mayi C, Sachin Shah, Sadashiv Jidgekar R, Arunkumar Kulkarni. Evaluation of functional outcome of cemented bipolar hemiarthroplasty for treatment of osteoporotic proximal femoral fractures in elderly people; IJOS. 2016; 2(3):180-183.
8. Ram Kumar Ponraj, Senthilnathan Arumugam, Prabhakar Ramabadran. Functional Outcome of Bipolar Hemiarthroplasty in Fracture Neck of Femur; Sch. J App. Med. Sci. 2014; 2(5D):1785-1790.
9. Sharma V, Awasthi B, Kumar K, Kohli N, Katoch P. Outcome analysis of hemiarthroplasty vs. Total hip replacement in displaced femoral neck fractures in the elderly. J Clin Diagn Res. 2016; 10(5):11-3.
10. Dr. Arvind Kumar SM, Dr. Venkatesh Kumar N, Dr. Udayamoorthy S, Dr. Kailash. Radiological assessment of inter-prosthetic jointmovement in bipolar hip hemiarthroplasty for fractureneck of femur; ISSN: 2395-1958IJOS. 2017; 3(2):583-589.

11. Marya SKS, Thukral R, Hasan R, Tripathi M. Cementless bipolar hemiarthroplasty in femoral neck fractures in elderly; Indian Journal of Orthopaedics. 2011; 45(3):48-55.
12. Anil Rai K, Rakesh Agarwal, Saurabh Singh, Ratnav Ratan. The BHU bicentric bipolar prosthesis in fracture neck femur in active elderly. Journal of Trauma Management & Outcomes. 2008, 2-7.
13. Yamagata M, Chao EY, Ilstrup DM, Melton III LJ, Coventry MB, Stauffer RN. Fixed head and bipolar head endoprosthesis-a retrospective clinical and roentgenographic study. J Arthroplasty. 1987; 2:327-41.
14. Lestrange NR. Bipolar arthroplasty for 496 hip fractures. Clin Orthop Relat Res. 1990; 251:7-19.
15. Bochner RM, Pellicci PM, Lyden JP. Bipolar hemiarthroplasty for fracture of the femoral neck. Clinical review with special emphasis on prosthetic motion. J Bone Joint Surgery Am. 1988; 70:1001-10.
16. Ankush Mohabey V, Prajakta Warjukar R, Ravikumar M. Functional outcome of cemented versus uncemented modular bipolar hemiarthroplasty in proximal femoral neck fractures JOS. 2017; 3(4):609-611.
17. Wender Figved, Vidar Opland, Frede Frihagen, Tore Jervidalo, Jan Erik Madsen, Lars Nordsletten. Cemented versus Uncemented Hemiarthroplasty for Displaced Femoral Neck Fractures; Clin Orthop Relat Res. 2009; 467:2426-2435.
18. Samares Naiya, Pradip Kumar Ghosh, Arunima Chaudhuri, Sudipta Dasgupta, Abhijit Ghosh, Anindita De. Comparative analysis of functional outcomes of different modalities of hemiarthroplasty in the treatment of fracture neck of femur in an elderly population of rural Bengal; Saudi Journal of Sports Medicine. 2015; 15(3).
19. Krishnan H, Ortho MS, Yoon TR, Park KS, Bipolar MD. Hemiarthroplasty in Elderly Patients Presenting With Displaced Intracapsular Femoral Neck Fractures - A Comparison of Cemented and Uncemented Prosthesis Placement; Malaysian Orthopaedic Journal. 2010; 4(1):124-130.