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Constrained captive acetabular cup for recurrent dislocation of hemiarthroplasty in elderly: A case series

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ABSTRACT

INTRODUCTION: Hemiarthroplasty of the hip is one of the commonest procedures done for intracapsular fractures of the neck of femur in elderly. Dislocation of the hemiarthroplasty is a recognised and significant complication. This is associated with considerable morbidity and mortality. The treatment options include closed manipulation, skin and skeletal traction, conversion to total hip replacement, exploration and open reduction and leaving it out of the acetabulum.
PRESENTATION OF CASE: A retrospective review of ten patients with recurrent and failed closed manipulative reduction of hemiarthroplasty who underwent revision using a cemented captive acetabular cup and cement to cement revision of femoral component with Exeter CDH stem was carried out. The follow up period was two years and the functional outcomes were assessed using Harris hip scores.
DISCUSSION: The management of recurrent dislocations of hemiarthroplasty in elderly patient are very challenging. Even though various treatment options are described most of them are associated with increased morbidity and mortality and prevent these patients from early mobilisation. The use of captive acetabular avoid repeated dislocations, prolonged bed rest, wearing of a brace and all the complications associated with sustained immobilization. The drawbacks of using constrained cups are hip pain, limited hip movements and loosening.
CONCLUSION: We describe a new method of treatment of this difficult condition with a cemented constrained acetabular captive cup and cement to cement revision using a CDH femoral stem. This method prevents further dislocations and will give good functional outcomes thus reducing the high morbidity and mortality.

1. Introduction

Fracture neck of femur in elderly is one of the commonest admissions to the orthopaedic units. The gold standard for the treatment of intracapsular fracture neck of femur in elderly is to perform a hemiarthroplasty [1]. The advantages of hemiarthroplasty outweighs the risks and complications of internal fixation in displaced intracapsular fractures of the neck of femur in elderly [2,3]. The dislocation in a hemiarthroplasty is a serious complication, about 1–7% of cases [4] which is associated with serious morbidity and morality [5]. The factors that predispose to the dislocation of a hemiarthroplasty are defective surgical techniques which include hip exposures, neck resection and femoral neck offset measurement. Sometimes dislocation is common in shorter patients and in dysplastic aceabulum [6]. The medical comorbidities such as dementia, Parkinsons disease and cerebrovascular accidents can also contribute to the cause of dislocation in hemiarthroplasty [7].

The management for dislocation of hemiarthroplasty can be broadly divided into conservative and surgical. The conservative measures include closed reduction with screening in theatre for stability followed by bed rest either with an abduction wedge or skin/skeletal traction and then mobilization usually after 2–4 weeks. There are concerns with closed reduction and bed rest as most elderly patients may not tolerate it and prolonged bed rest predispose to complications such as DVT, PE, pressure sores, chest infection, urinary tract infections, joint contractures and muscle wasting.

The surgical options could include soft tissue release in the case of severe hip contractures, revision to a bipolar prosthesis and Girdlestone excision arthroplasty. The functional results of Girdlestone hemiarthroplasty in the elderly in this situation are generally very poor. The patient does not tend to walk again and there are difficulties with rehabilitation due to leg length discrepancies [8,9].

The aim for our study is to assess the functional outcomes of recurrent dislocation of hemiarthroplasty in elderly patients treated with a constrained captive acetabular cup and cement to cement revision of using Exeter femoral stem.

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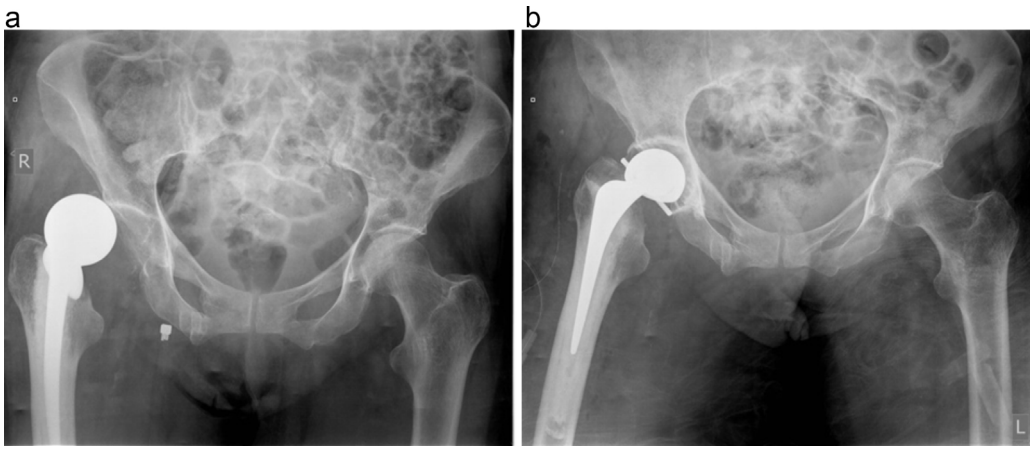

Fig. 1. (a) 76 year old female with dislocated Thompsons hemiarthropalsty (b) revsion to captive cup and Exeter CDH stem.

2. Materials and methods

All patients with a dislocated hip hemiarthroplasty over a 6-year period from 2008 to 2013 in our hospital were identified from theatre records and our coding department. A retrospective case note and radiological review of all the cases who had sustained dislocation of hemiarthroplasty were carried out. From these patients all those who underwent constrained acetabular component revision for dislocated hemiarthroplasty were documented and analyzed.

The inclusion criteria for revision to captive acetabular cups are patients with recurrent dislocation after repeated closed manipulative reduction. The exclusion criteria were patients with cognitive impairment and ASA grades 4. During revision procedure the old incision was used. Flexible osteotomes and OSCAR (Orthosonics System for Cemented Arthroplasty Revision) are used to disturb the cement mantle and the implant is then extracted. Once the implant is removed OSCAR is used further to clear a channel in the femur to accept the Exeter CDH stem. The acetabulum is reamed to accept the largest captive cup possible. In six cases a Stryker (Omnifit) and four cases Zimmer (Longevity) captive cups were used. A cement in cement revision is then performed using the 44 offset CDH Exeter stem (Figs. 1 and 2a & b). The patients were followed up at one and two years after revision surgery. A functional assessment at two years was done using Harris Hip Score outcome measures.

3. Results

There was a total of 732 patients had hemiarthroplasty during this period. Twenty nine (3.96%) patients had dislocation of hemiarthropalsty. Nineteen patients had Thompsons and ten patients had ETS hemiarthroplasty.

The various surgical procedures carried out in these twenty nine patients were resection arthroplasty (Girdlestone procedure) 3(10%), Closed manipulative reduction under anaesthesia 13(45%), revision to another hemiarthroplasty 4(14%), prosthesis was left dislocated in 4(14%) due to high risk for anaesthesia and exploration of the prosthesis and open reduction was carried out in 5(17%) cases (Table 1).

Ten patients who had closed manipulative reduction went on to have recurrent dislocation. Majority of these patients had atleast three attempted closed manipulative reduction. All the patients had a good postoperative recovery. They were mobilised and discharged early. There were no complications including infections, deep vein thrombosis, pulmonary embolism or further dislocation at one and two year follow-up. The average Harris Hip Score was 78 at two years after the revision with no mortality (Table 2).

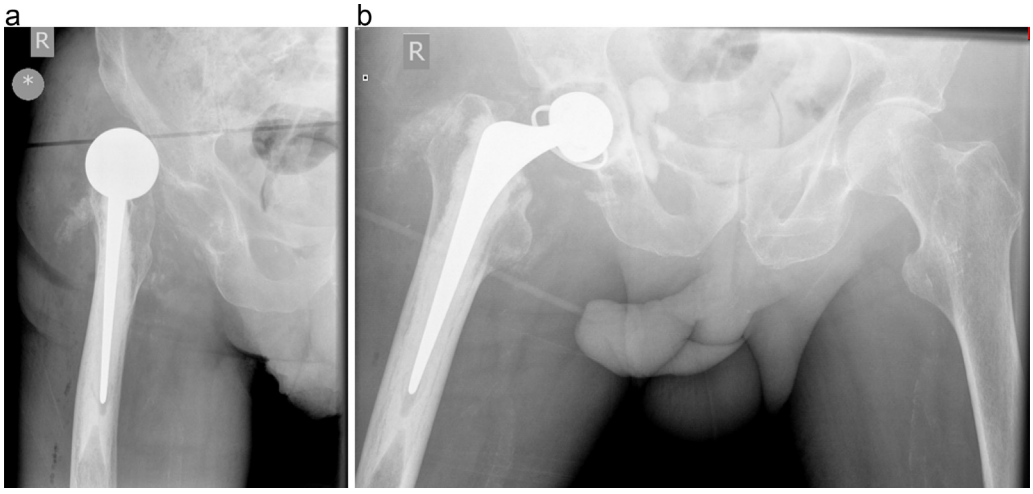

Fig. 2. (a) 91 year old male with dilocated ETS hemiarthroplasty (b) revision to captive cup and Exeter CDH stem.

Table 1
Definitive treatment for the dislocated group.

Management	N = 29
Girdlestone procedure	3(10%)
Closed manipulative reduction	13(45%)
Revision to another hemiarthroplasty	4(14%)
Open reduction	5(17%)
No intervention	4(14%)

4. Discussion

The constrained acetabular liner has used successfully in revision hip arthroplasty with a very good success rate [10]. The concept of using the constrained acetabular cups in recurrent dislocation of hemiarthroplasty in our study was encouraged by the success of use of these liners in revision total hip replacement [11]. The various options of treatment for recurrent dislocation of hemiarthroplasty are closed manipulative reduction and bracing, Girdlestone procedures, revision to another hemiarthroplasty of total hip replacement, exploration of the prosthesis with debridement of acetabulum and open reduction and also leaving it out of the acetabulm [12]. The effectiveness and success of these procedures are unpredictable [13].

There are different types of constrained acetabular liners, bipolar (single articulation), tripolar (double articulation), cemented and uncemented. The mechanism by which the captive cups function are by capturing the femoral head within the acetabular component by means of a locking mechanism. There are different designs which accept different head sizes of varying diameter and have differing amounts of rim elevation and offset. In a non-constrained cup once the limit to movement has been reached, impingement occurs, further excursion of the head results in dislocation. A constrained cup is different as it is designed to hold the head captive within the acetabular liner by means of a locking mechanism. Forces that would otherwise cause dislocation when impingement occurs are transferred to this locking mechanism and then onwards liner-shell and shell-bone interfaces [14,15].

The most important problem with recurrent dislocation especially in elderly patients is inadequate soft tissues with abductor insufficiency and also the failure to form a capsule around the hip joint which will keep the prosthesis in the joint [16]. Most of these patients have cognitive impairment which will prevent them from following the rehabilitation protocol and dislocation precautions [17]. In these situations constrained acetabular cups gives inherent stability to the hip joint which will help in early mobilisation and prevents prolonged bed rest.

Salem et al. in their study of the outcomes following closed manipulative reduction twenty six cases dislocation of hemiarthroplasty noted that although the procedure was successful in 65% of cases only in 6% of cases this was a definitive treatment. The rest 70% of cases needed further surgery to treat the dislocation [12].

Noon et al. reported that in twenty three patients with recurrent dislocation treated with skin and skeletal traction 75% of the patients re-dislocated. They also stated that 60% of the patients who were fitted with abduction braces sustained further dislocation of the hip [18].

Girdlestone operation is one of the salvage procedures for recurrent dislocation of the hip. In cases of sepsis this procedure is effective to control infection and achieve wound healing [19]. It has also got a role in patients with dementia as there is a high rate of recurrent dislocation after a closed manipulation [20]. The procedure gives good pain relief in 35–100% of patients [9,19,21]. One of the major draw backs of the Girdlestone procedure is significant limb length discrepancy in the nature of shortening of the affected leg. This varies from 3.2 cm to 4.5 cm [8,9].

Conversion of hemiarthroplasty into a total hip replacement is also an option for recurrent dislocation. But the long term studies and follow up showed failure of the femoral stem with radiological loosening and stem failure [22,23].

The constraint cups are not devoid of complications. In addition to the general complications such as superficial and deep infections, deep vein thrombosis, pulmonary embolism and the risks of anaesthesia, the complication which can happen as a result of the constraining mechanism are dislocation, head dissociation from the stem, liner dissociation from the acetabular device, and impingement with or without locking ring breakage. The problems due to inherent constraint are aseptic component loosening and osteolysis, and periprosthetic fracture [24].

The main advantage of using a cemented captive cup in managing a dislocating hip hemiarthroplasty is that it is an effective medium term solution for a serious complication that carries a high morbidity and mortality [16]. Its use should be considered a bail out option to avoid repeated dislocations, bed rest; wearing of a brace and ultimately failure of prolonged non-operative management. The surgical technique for cup insertion is relatively straightforward. This is in contrast to an uncemented constrained cup that can

Table 2
Description of the ten cases of recurrent dislocation of hemiarthroplasty who had captive cup.

Case No.	Age	M/F	Peri-operative data of patients	Implants used in revision	Harris Hip Score at two years
1.	76	F	Dislocated Thompsons hemiarthroplasty three days post op. Had two failed MUA. Revision surgery on 21st Post op day	Omnifit cup and Exeter 44 offset CDH stem	80
2.	84	F	Dislocated Thompsons hemiarthroplasty three days post op. Had three failed MUA. Revision surgery on 7th Post op day	Longevity cup and Exeter 44 offset CDH stem	76
3.	79	F	Dislocated Thompsons hemiarthroplasty five days post op. Had three failed MUA. Revision surgery on 17th Post op day	Omnifit cup and Exeter 44 offset CDH stem	82
4.	91	M	Dislocated ETS hemiarthroplasty 22 days post op. Had three failed MUA. Revision surgery on 29th Post op day	Omnifit cup and Exeter 44 offset CDH stem	80
5.	88	M	Dislocated ETS hemiarthroplasty 10 days post op. Had two failed MUA. Revision surgery on 24th Post op day	Longevity cup and Exeter 44 offset CDH stem	74
6.	93	F	Dislocated Thompsons hemiarthroplasty seven days post op. Had three failed MUA. Revision surgery on 15th Post op day	Omnifit cup and Exeter 44 offset CDH stem	76
7.	86	F	Dislocated Thompsons hemiarthroplasty six days post op. Had two failed MUA. Revision surgery on 12th Post op day	Longevity cup and Exeter 44 offset CDH stem	80
8.	83	M	Dislocated Thompsons hemiarthroplasty eight days post op. Had three failed MUA. Revision surgery on 16th Post op day	Omnifit cup and Exeter 44 offset CDH stem	76
9.	90	M	Dislocated Thompsons hemiarthroplasty eleven days post op. Had two failed MUA. Revision surgery on 18th Post op day	Longevity cup and Exeter 44 offset CDH stem	84
10.	84	F	Dislocated Thompsons hemiarthroplasty seven days post op. Had three failed MUA. Revision surgery on 15th Post op day	Omnifit cup and Exeter 44 offset CDH stem	72

Table 3
Summary of the review of literature on various implant designs for constrained acetabular cups.

Authors	Year	No. of patients	Mean age	Implant design (used)	Indication for revision	Mean follow up(years)	Dislocation rate (%)	Re-Operation rate (%)	Revision for loosening (%)	Mean Harris score at follow up
Anderson et al. [26]	1994	21	66	S-ROM	Recurrent dislocation Unstable revision	2.6	28.6	–	0	69
Sharader et al. [27]	2003	111	66	Howmedica	Recurrent dislocation Unstable revision	3.2	0	8.2	1.8	76
Smith et al. [28]	2004	38	–	DePuy	Recurrent dislocation	7.3	0	3	–	–
Bremmer et al. [29]	2006	101	71	Omnifit	Recurrent dislocation Unstable revision Neurological abnormality	10.3	5.9	24.8	4	–
Khan et al. [16]	2006	34	73	Trident	Recurrent dislocation	3	3	17.6	8.8	69
Munro et al. [30]	2013	81	68	Longevity	Recurrent dislocation Unstable revision Neurological abnormality	2	3.6	16	0	–
Pace et al. [31]	2013	137	64	Novel	Primary total hip arthroplasty	6	1.9	2.6	0	98.9
Rajeev and Banaszkiewicz (Current Study)	2012	10	85.4	Omnifit(6) and Longevity(4)	Recurrent dislocation for hemiarthroplasty	2	0	0	0	78

be difficult to insert especially with the more complicated designs available that increase range of motion.

The disadvantage of a cemented captive cup is not a good choice for a young patient as there is a high failure rate after 5 years owing to significant shear forces transmitted to the cement/bone and cement/prosthesis interfaces leading to accelerated wear and loosening. There is a restricted range of motion and residual hip pain which can be very problematic. Other complications include a liner displacing from the acetabular cup or an acetabular cup dislodging from the acetabulum. When dislocations occur with a constrained device they are very difficult to manage [25]. A summary of review of literature on different implant designs of captive cup and its results are given in Table 3.

5. Conclusion

In recurrent dislocation of hemiarthroplasty in elderly, a total hip replacement using a cemented constrained acetabular cup combined with a cement to cement CDH femoral stem is a treatment option which will give good predictable results. This will allow early mobilisation and prevent the morbidity and mortality associated with prolonged bed rest.

Competing interest

There is no competing interest in relation to this article. No financial or funding has been received from anybody or organisation.

Funding

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Ethical approval

Ethical approval has been got from the hospital trust.

Consent

Informed consent has been obtained.

Author contribution

Aysha Rajeev - has contributed to study concept, design data collection, data analysis and writing of the paper.

Paul Banaszkiewicz - contributed towards the management and follow up of the patient.

Guarantor

The author takes full responsibility for the work.

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