

EFFECT OF SUBSIDENCE ON FUNCTIONAL OUTCOME OF UNILATERAL UNCEMENTED TOTAL HIP REPLACEMENT

Mohit Mahoviya., Pradeep Choudhari., Divyanshu Patel and Arpit Choyal

Department of Orthopaedics, Sri Aurobindo Medical College & PG Institute-Indore (M.P.)

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ABSTRACT

Purpose This study was designed to evaluate the effect of distal stem migration of a cementless femoral component on the functional outcome of patient over the period of 1 year after unilateral total hip replacement

Methods In this retrospective cohort study, migration patterns for 50 implants and functional outcome of patients were analysed. In all cases collarless uncemented stems were used.

Results The mean follow-up was 12 months. Xray evaluations revealed a mean subsidence of 0.36 mm after one year. Postoperatively the total Harris hip mean score was 90.83.

Conclusion functional outcome improves after total hip replacement whereas no significant change in functional outcome was seen in patients with subsidence < 2 mm when compared with patients without subsidence. Further studies are needed to confirm our findings.

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INTRODUCTION

Subsidence is a known reason for early failure of total hip arthroplasty (THA) [1, 2]. In particular, cementless THA might be vulnerable to migration [1]. Subsidence is defined as a femoral stem distalization in reference to the greater trochanter. The maximum of stem subsidence is observed within the first 1 to 6 months post surgery [3-5]. Still, there is a lack of knowledge regarding reasons for subsidence [1, 4, 7]. Cementless fixation relies on biological fixation by bone growth into the prosthesis to secure the implant. This can be achieved either by bone ingrowth (porous coating) or bone ongrowth (grit coating). This biological integration between the stem surface and endosteal bone aims to decrease the incidence of aseptic loosening [8,9]. It is ideally reserved for young active male patients requiring a total hip replacement. The disadvantages of cementless THA include thigh pain and proximal bone resorption in association with certain implants (10,11). These are considerations in the elderly, because the poor bone stock is unable to support the implant leading to poor initial fixation and loosening. Radiologically, a cementless femoral component is thought to be stable if there are no reactive lines around the implant, there are "spot welds", or periprosthetic diaphyseal endosteal bone formation is seen in at least 3 zones (12). Subsidence signifies movement and progressive subsidence is believed to represent loosening (13,14)

*Corresponding author: Mohit Mahoviya

Department of Orthopaedics, Sri Aurobindo Medical College & PG Institute-Indore (M.P.)

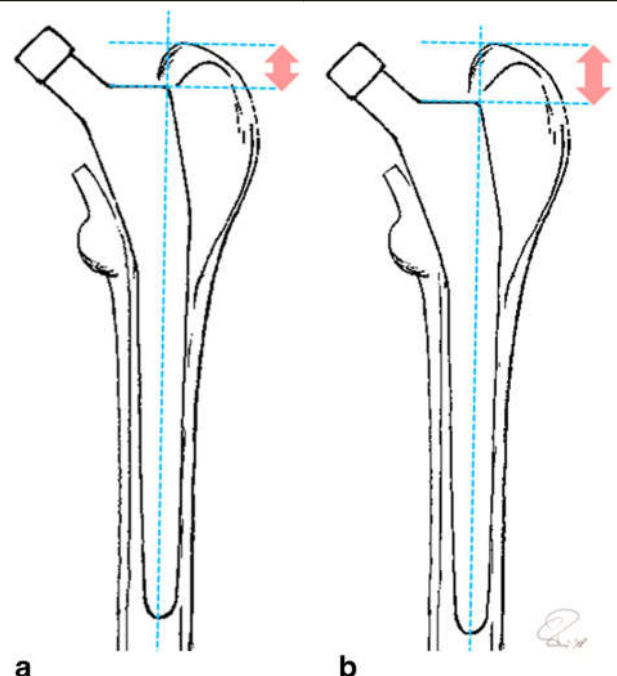


Fig. 1 a, b Sketch of femoral stem subsidence measurement.

Measurement of distance between the apex of major trochanter and the femoral stem shoulder perpendicular to the femoral stem axis a) postoperative and b) at follow-up. Subsidence is termed as a femoral stem distalization in reference to the major trochanter

MATERIAL METHOD

The study was done in SAMC and PGI, Indore which included 50 cases.

We performed a retrospective review of the records and radiographs of patients who met the inclusion criteria between 2019 and 2020.

AGE (Mean)	36 YEARS	Percentage
MALE	36	72%
FEMALE	14	28%
SIDE	Right – 29 (58%)	Left - 21(42%)

Criteria for inclusion were

1. unilateral uncemented THR
2. a minimum of 1 year follow up, available radiographs from 1 day post-operatively and 1 year post-operatively and available clinical records.

The operative indications for total hip arthroplasty were chronic severe pain and functional limitation (accounting for a Total Harris Hip Score(HHS) score under 50) because of a chronic hip disease

The exclusion criteria

1. Acute trauma
2. Infection
3. Neoplasia
4. any associated pathology in the body influencing gait or physical activity

Operative Technique

Uncemented total hip arthroplasty was performed by southernmoore approach in all the patients using indian implants. Templating of the femur was done preoperatively to determine the cup size, the femoral size and the neck geometry. The acetabulum was sequentially reamed until fresh pin point bone bleed is observed. The proximal femur was rasped serially in increments of 1mm until a press-fit was achieved. The rasp was introduced to the proximal femur in the same degree of version as the neck. A trial was done with the trial stem and appropriate trial head until a stable construct was achieved.

Postoperative Protocol: The hip is positioned in approximately 15 degrees of abduction while the patient is recovering from the anaesthetic using a triangular pillow to maintain abduction and prevent extremes of flexion. The patient is taught static quadriceps exercises, knee and ankle mobilization exercised and made to sit. Second post operative day dressing is changed and smaller dressing is applied. Gait training was also started using a walker with weight bearing as per tolerance. Drains were removed 48 hours after surgery. IV antibiotics were given for 5 days later switched over to oral antibiotics for further 7 days more. 13th Post op day sutures are removed and discharged from the hospital to be reviewed after one month. They were advised not to sit cross legged, not to use Indian toilets or squat and not to cross the lower limb across the midline. The patients were followed up at 1 month, 3 month, 6 month and 12 month intervals.

Clinical Assessment: During each visit the deformity and ROM were measured with goniometer. All clinical and functional outcomes were evaluated by Modified Harris Hip Score which is based on a total of 100 points possible and each question is awarded a certain number of points. Questions are

further grouped into categories. 44 points were given for no pain in the hip, slight pain 40 points, down to 0 points for disabling pain. If there is no limp, dont use any walking aid, and if one can walk more than six blocks, 33 points were awarded less if the patient was to use a cane, or walk only two blocks, etc. Functional activities, consists of questions about how the patient climb stairs, put on shoes, length of time you can sit in a chair, and if the patient can use public transportation. Finally, a table based on physical exam results was made, and on the basis of absence of deformity and range of motion; up to 9 points were. The score of 90-100 is considered as excellent results, 80-90 being good, 70-79 fair, 60-69 poor, and below 60 a failed result. Based on this reasoning a point scale with a maximum of 100 points is used with the maximum possible scores: Pain is awarded 44 while Function 47, Range of Motion 5 and Absence of deformity 4, with Total of 100.

Radiological Assessment

Subsidence was measured at 1 month, 6 months and 1-year post-op compared to initial post-operative radiographs. Measurement was taken from the highest point of the greater trochanter to the highest lateral aspect of the femoral stem. All our radiographs were digital images. Measurements were computer assisted from our PACS system – (Picture Archiving and Communication System).

RESULTS

All immediately post op patients were allowed full weight bearing as tolerated. All patients had an immediate standard post op AP pelvic radiograph prior to discharge. They were followed up at 1 month, 6 months and 12 months post total hip replacement with an AP radiograph.

Age distribution: This study was conducted on patients with age ranging from 30 to 60 years with a mean age of 36 years.

Gender Distribution: In this study, 36 were males and 14 were females.

Side Affected: Total hip replacement was done 21 on the left side and 29 on the right side.

For total score and all the parameters, higher score implies lesser disability. The mean total preoperative score was 34.61. The maximum score being 74 and while 17 being minimum. Postoperatively the total mean score was 90.83, with the minimum score bring 72 and 97 being the maximum. with respect to the various parameters In the scoring system ie, pain, gait, functional activity and ROM, there was a statistically significant improvement ('p' value of <0.001) in the postoperative score when compared to preoperative score.

All patients were allowed to fully weight bearing as tolerated immediately post op. All patients had an immediate standard post op AP pelvic radiograph prior to discharge. They were followed up at 1 month, 6 months and 12 months post total hip replacement with an AP radiograph. At 1 month x-ray 36 patients did not have any subsidence, 10 patients had 1 millimeter (mm) subsidence, 4 patients had 2mms subsidence. (Table 1).

When compared with 6 months x-rays only 2 patients had a further subsidence of 1 mm. No further subsidence occurred at 1 year follow up x-rays. All total hip replacements were performed by the consultant in charge.

One patient had an intra-operative calcar fracture that was dealt with cabelling of the femur. This patient had only 1 mm subsidence at 6 weeks follow up. One patient had posterior dislocation of hip which was reduced manually.

Subsidence in Millimeters (1 year)	Patients (Percentage)
0	36 (72%)
1	8 (16%)
2	6 (12%)

DISCUSSION

Our observational study is conducted in SAMC and PGI where 50 unilateral cementless total hip replacement were done in the period from 2018 to 2020. After 1 year follow up subsidence of 6(12%) patients was 2mm and subsidence of 8 (16%) patients was 1 mm. Harris hip score was not affected by subsidence rate.

Veenesh Selvaratnam *et al* in 2015 states that subsidence does occur in the first 6 weeks in collarless Corail hip replacement, of up to 13mms were asymptomatic.(15)

Campbell *et al.* 2011 [01] reported a mean (range -0.233.71) subsidence of 0.58 mm at two years for the collarless Corail stem. The report by these authors also affirms subsidence to be confined to the first six months following implantation, and the finding is similar to our study. We measured subsidence only up to 1 year of follow up. Campbell *et al.* [02] did not obtain 6 weeks radiographs. Mostly the subsidence in our study occurred in the radiographs of 6 weeks. Our study demonstrates femoral stem subsidence confinement mainly in the first 6 postoperative weeks. Subsidence generally stabilized after this period. Only 2 patients in our study had subsequent subsidence at 6 months as compared to the 6 weeks radiograph.

Strom *et al.* 2007 [04] showed that the majority of subsidence in a cementless stem occurred within the first two postoperative months. Within the first week of implantation in their study there was no significant stem subsidence.

From our study we can conclude that subsidence does occur in the first 1 month.

Hence we recommend:

1. The patient be informed about subsidence when consent is taken
2. 1 month check radiographs must be considered
3. Further prospective study with larger numbers and better measurement technique is needed.

Subsidence is frequently reported in cementless stems [1-5]. The factors related include male patients [16], osteoporotic bone [17] and Dorr type C proximal femur [18]. Furlong Active stems (JRI), in 2006, presented some differences with the “classical” one: absence of collar, longer and thicker metaphyseal segment, shorter diaphyseal stem, and a more “tapered” design. A recent paper has communicated a subsidence up to three times higher than that of the “classical” stem when analyzed by RSA [19,20]. It has been our purpose to analyze short-term radiological subsidence in cementless total hip replacement as well as its effect on the functional outcome.

CONCLUSION

Functional outcome improves after total hip replacement whereas no significant change in functional outcome was seen in patients with subsidence <2 mm when compared with patients without subsidence. Further studies are needed to confirm our findings.

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