

ORIGINAL RESEARCH

A study to assess the effect of acetabular reaming on the centre of rotation and its functional outcome in unilateral primary total hip

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ABSTRACT

Background: Total hip arthroplasty is one of the most commonly done reconstructive procedures in orthopaedics providing pain relief and improved function to patients with end-stage degenerative joint disease. This study aims to find the effect of acetabular reaming on the medialisation and appropriate reconstruction of the hip centre of rotation and compare it with the functional outcome in 40 cases studied prospectively.

Materials & Methods: A prospective study was done on 40 patients admitted under Orthopaedics for THR. Functional outcome of the patients was assessed using HHS preoperatively and at follow up visits during 6, 12, 18, 24 weeks.

Results: Among 31 (77.5%) participants who were found to have a medial centre of rotation, 4 (12.9%) participants had good functional outcome at 24 weeks and 27 (87.1%) participants had excellent functional outcome. Only 9 (22.5%) participants had a lateral position of the centre of rotation and all of them were found to have excellent functional outcome. Results of Chi square test showed that there was no statistically significant association between COR and functional outcome. ($\chi^2=1.290$, p value=0.256).

Conclusion: Medial COR was found in 77.5% of patients and lateral in 22.5%. Excellent functional outcome was found in 87.1% patients with medial COR. There is not enough evidence to suggest an association between COR and functional outcome at 24 weeks from the present study.

Keywords: Total hip arthroplasty, Harris Hip Score, WOMAC

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Introduction

Total hip arthroplasty is one of the most commonly done reconstructive procedures in orthopaedics providing pain relief and improved function to patients with end-stage degenerative joint disease.¹ The origin of hip replacements dates back to late 19th century. Early attempts at hip replacement were done with materials like ivory, glass and later on, stainless steel. By late 1970s, polyethylene bearings came into usage, followed by ceramic-on-ceramic bearings. Maximization of the prosthesis life is the most significant issue for orthopaedic surgeons.

The success of a total hip arthroplasty depends on appropriate restoration of the hip biomechanics as close as possible to the native hip joint.¹ One of the most important steps in achieving this is to transfer the hip joint centre of rotation in to the true

acetabulum. The native acetabulum is subhemispherical in most cases, but the acetabular components used for THA are hemispherical, which inadvertently leads to displacement of centre of rotation when the acetabular component is fully implanted.² Hence, it is very vital for hip replacement to reconstruct COR of femoral head prosthesis in the anatomical position of the acetabulum side.³

The COR of hip is pivotal for recovery of muscle function⁴, joint stability, and hip prostheses longevity. In appropriate reconstruction of the centre of rotation of femoral head prosthesis, placed at a non-anatomical position, may also lead to patients with unequal limb length, unequal femoral eccentricity, etc. Over time it will cause the muscles to lose their original function, the joints are unstable, and eventually the loosening of the prosthesis.^{5,6} This study aims to find the effect o

face tabular reaming on the medialisation and appropriate reconstruction of the hip centre of rotation and compare it with the functional outcome in 40 cases studied prospectively.

Materials & Methods

The study was carried out on 40 patients selected for total hip arthroplasty of both genders. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. Radiological measurements was done on Synapse. Functional assessment was recorded using Harris Hip Score, Oxford Hip Score, WOMAC Score. Results thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

Results

Table: I Distribution of patients

Age(years)	Number(%)
<20	1 (2.5)
21-30	3(7.5)
31-40	3 (7.5)
41-50	8(20)
51-60	16 (40)
>60	9(22.5)

Table I shows that out of maximum patients 16 (40) was seen in age group 51-60 years of age.

Table: II Harris Hip Score (Hhs) Of Study Participants In Followup Visits

TIME OF VISIT	Mean HHS
Pre-operative	36.38 ± 16.24
6weeks	72.20 ± 6.55
12weeks	84.62 ± 4.08
18weeks	88.05 ± 3.47
24weeks	91.30 ± 2.71

Table II shows that the mean HHS at the initial time of presentation, before the surgery was 36.65±16.49. Mean HHS at follow up visits during 6 weeks, 12 weeks, 18 weeks and 24 weeks was calculated to be 72.20±6.55, 85.53±5.04, 89.40±4.37 and 93.65±3.97.

Table: III WOMAC Score Of Study Participants At Follow Upvisits

TIME OF VISIT	Mean WOMAC
Pre-operative	81.98 ± 6.17
6weeks	35.9 ± 3.6
12weeks	26.35 ± 3.01
18weeks	19.55 ± 3.18
24weeks	16.05 ± 3.35

The mean WOMAC Score at the initial time of presentation, before the surgery was 81.98±6.17. Mean WOMAC Score at follow up visits during 6 weeks, 12 weeks, 18 weeks and 24 weeks was calculated to be 35.9±3.6, 26.35±3.01, 19.55±3.18 and 16.05±3.35.

Table: IV ASSOCIATION BETWEEN RELATIVE POSITION OF COR AND FUNCTIONAL OUTCOME AT 24 WEEKS

RELATIVE POSITION OF COR	FUNCTIONAL OUTCOME AT 24 WEEKS (N)		
	Good	Excellent	Total
Medial	4	27	31
Lateral	0	9	9
Total	4	36	40

Among 31 (77.5%) participants who were found to have a medial centre of rotation, 4 (12.9%) participants had good functional outcome at 24 weeks and 27 (87.1%) participants had excellent functional outcome. Only 9 (22.5%) participants had a lateral position of the centre of rotation and all of them were found to have excellent functional outcome.

Discussion

Total hip arthroplasty (THA) is well established as one of the most common orthopaedic treatments and aims to reduce pain and restore the natural function of the hip joint. Especially for young and active patients, cementless implantation of hip implants has become a favoured method for many surgeons with regard to bone stock preservation and survival time.⁷The aim of this study was to find the association between the

relative position of the centre of rotation and the functional outcome using HHS.

We found that out of maximum patients 16 (40) was seen in age group 51-60 years of age. We observed that the mean HHS at the initial time of presentation, before the surgery was 36.65 ± 16.49 . Mean HHS at follow up visits during 6 weeks, 12 weeks, 18 weeks and 24 weeks was calculated to be 72.20 ± 6.55 , 85.53 ± 5.04 , 89.40 ± 4.37 and 93.65 ± 3.97 . A study done by Merle C et al⁸ on a consecutive series of corresponding 131 CT scans and radiographs of patients with primary hip OA which was evaluated using validated software for three-dimensional acetabular and femoral measurements simulating the implantation of a hemispherical press-fit cup comparing anatomic and conventional reaming techniques came to a conclusion that acetabular offset can be accurately and reliably determined on conventional radiographs and appears to be independent of femoral shape and geometry. Depending on the preferred reaming technique a substantial number of patients appear at risk for excessive cup medialization.

The mean WOMAC Score at the initial time of presentation, before the surgery was 81.98 ± 6.17 . Mean WOMAC Score at follow up visits during 6 weeks, 12 weeks, 18 weeks and 24 weeks was calculated to be 35.9 ± 3.6 , 26.35 ± 3.01 , 19.55 ± 3.18 and 16.05 ± 3.35 . A study done by Kim SC et al⁹ on 145 patients who underwent unilateral primary total hip arthroplasty, who had no distorted acetabulum on the affected hip and a normal contralateral hip came to a conclusion that centre of rotation was significantly displaced in the superior and medial directions postoperatively. Significant differences were identified in the vertical centre of rotation change, initial cup position, limb length discrepancy, cup inclination, and cups within safe zones, but not in the horizontal COR change, offset parameters, cup anteversion, or Harris Hip Score. There were no radiographic evidence of component loosening in both groups.

Among 31 (77.5%) participants who were found to have a medial centre of rotation, 4 (12.9%) participants had good functional outcome at 24 weeks and 27 (87.1%) participants had excellent functional outcome. Only 9 (22.5%) participants had a lateral position of the centre of rotation and all of them were found to have excellent functional outcome. Asayama et al¹⁰ evaluated 60 limbs in 30 patients with unilateral primary total hip arthroplasty and non-diseased contralateral hip concluded that slight increase of FO ratio along with restoration of normal hip joint center erring on the side of slight inferomedial cup positioning appeared to optimize hip abductor function.

Conclusion

Authors found that acetabular reaming in Total Hip Arthroplasty displaces the centre of rotation of the

prosthetic femoral head medially. The relative position of the centre of rotation does not have any significance on the overall functional outcome of the Total Hip Arthroplasty. But this deserves further large-scale, multi-centric, studies in a larger number of patients with a longer follow up to clearly validate the functional outcome.

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