Correlation Of Post-Operative Radiographic Outcome And Patient Reported Outcome Measures (Prom) In Primary Total Hip Replacement.

Dr. Hiranya Kumar S[1], Dr .Nishanth Reddy J[2], Dr.Ajith Thomas Abraham[3]*, Dr.Karthik Mn[4], Dr.Vamshikrishna Chand Nimmagadda[5],Dr Mahadev Hn[6] Dr.Prajwal V[7] Dr Akshay R[8]

Abstract

Primary Total hip Arthroplasty and found no significant difference in pain or satisfaction between patients with loose and stable components. In this context, the present study objective is to analyse the radiographic variables following Total Hip Replacement and its correlation functionally with PROMs in hip pathology and also we know the version values using radiographs and its correlation functionally and clinically in patients undergoing THR.A Retrospective Study was adopted for the current study. The data registry of all patients who underwent THR in the last four years at our institute (2018–2021) was carefully scrutinised, and patients who fulfilled the following inclusion and exclusion criteria.Inclusion Criteria; age groups range from 18 to 80 years. All primary and secondary arthritis patients with HIP who underwent THR, All Neck and femur fractures who underwent THR and Cases that underwent bilateral THR. Exclusion criteria; complex Primary THR (using Cage/ or dual mobility cups), Revision THR and Primary THR done in less than 12 months. Postoperative radiographic features were relatively correlated with various parameters and the predisposing factor of gender. The results show that the mean inclination in males was 46.89 with SD 9.52 (P > 0.05); Females were 46.44 with SD 6.00; anteversion was (14.48) in males and females (18.59); and edited anteversion was (19.54) in males and females were (23.59). All three parameters were found to be statistically insignificant (p > 0.05), and the hypothesis was tested by the Mann-Whitney U test. The correlation was done on the post-op radiographic parameters based on the laterality using the Mann Whitney Test, the inclination of the R/L mean was 47.35/45.91; the anteversion R/L was 17.22/12.23) and the edited anteversion R/L mean was found to be (22.24/17.35). All parameters were found to be statistically insignificant with respect to laterality (p>0.05).A similar statistical method was used to test the hypothesis on the correlation between HHS and EQVAS. Patients can be them within one month of THA, PROMs improve most proportionally, although function exceeds preoperative baselines after three months, and gait quality may not improve until one year. By doing so, it will be easier to set reasonable expectations and focus therapies on patients who deviate from the norm.

Key words: PROMs, Total Hip Replacement, HIP, Womac Pain scale, pain score

DOI Number: 10.48047/NQ.2023.21.4.NQ23028 **NeuroQuantology2022; 20(5):297-305**

INTRODUCTION

Total hip arthroplasty (THA), or surgical replacement of the hip joint with an artificial prosthesis, is a reconstructive procedure that has improved the management of those diseases of the hip joint that have responded poorly to conventional medical therapy. However, the above study, which utilised patient-reported outcome measures, has shown some individuals have subpar results from Total Hip Replacement in relation to functional outcome measures ([4,5]. The frequency after 'THR' of significant, ongoing pain and handicap was discovered to be 6–13%. The association between post-operative radiographic parameters and patient-reported outcomes following THR is poorly understood, even though post-operative radiographic characteristics are known to influence survivability (e.g., varus stems fail quicker). The assessment of the acetabular version using an anterior-posterior radiograph in the present era of CT scans can be a challenging issue. In this study, we attempt to analyse the

postoperative radiographic variables and their correlation with patient-reported outcome measures for cases undergoing primary 'THR' for hip pathologies. In the Journal of Bone Joint Surgery British 2002, White TO et al. (n = 200) assessed leg length six months post-operatively, either with radiological lengthening of 35mm or shortening of 21 mm, and found that there was no association between leg length ratio and the Harris Hip Score, SF-36, or patient satisfaction. In a prospective study published in 2018, Min BW et al. found that there is no difference in the Harris Hip Score or the incidence of thigh pain between patients with neutral, valgus, or varus alignment of the femoral stem. For all hips, radiographs showed stable osseous fixation of the stem and the cup. In Acta Scand 2019, Iwase et al. analysed the radiographic and clinical outcome of the Scan Hip total hip arthroplasty in 72 patients after 10 years of primary Total hip Arthroplasty and found no significant difference in pain or satisfaction between patients with loose and stable components. In this context, the present study objective is to analyse the radiographic variables following Total Hip Replacement and its correlation functionally with PROMs in hip pathology and also we know the version values using radiographs and its correlation functionally and clinically in patients undergoing THR.

MATERIAL AND METHODS

Sample size

The Sample size was determined by taking 10% as the marginal error and 99% as the confidence interval based on the patient's input into the sample size calculation. The needed to conduct the present study (the sample size was calculated based on the confidence level of 95% that the real value is within +/- 5% of the measured or surveyed value).

Study design

A Retrospective Study was adopted for the current study. The data registry of all patients who underwent THR in the last four years at our institute (2018–2021) was carefully scrutinised, and patients who fulfilled the following inclusion and exclusion criteria.

Inclusion Criteria

Age groups range from 18 to 80 years.
All primary and secondary arthritis patients with HIP who underwent THR
All Neck and femur fractures who underwent THR
Cases that underwent bilateral THR

Exclusion criteria

Complex Primary THR (using Cage/ or dual mobility cups)
Revision THR
Primary THR done in less than 12 months
After scrutiny, a total of 36 cases were selected. Radiographs of the hip and pelvis are taken prior to admission and routinely after 24 hours post-surgery. The radiographs were evaluated for (i) inclination of the acetabular cup and (ii) version of the acetabular cup. They were calculated using the method described by Liaw et al. (1978). *i.e.,* Version = sin-1* tan β, where 'β' angle is the angle between the long axis of the component and the line connecting the end of 'AB' with the endpoint of the ellipse; (iii) Inclination is the angle between the face of the cup and the transverse axis (Lewinnek et al., 1978). (iv)These variables were determined using digital software and with the assistance angles were recorded, subjects were contacted from the orthopaedic department using a telephonic questionnaire in multiple languages

***Corresponding author:** Dr. Ajith Thomas Abraham
[1]Prof and HOD, Department of orthopaedics, Vydehi institute of Medical Sciences and Research Centre
[2]Asst. Professor, Department of orthopaedics, Vydehi institute of Medical Sciences and Research Centre
[3]Asst. Professor, Department of orthopaedics, Vydehi institute of Medical Sciences and Research Centre,
Email- thomasabrahams02@gmail.com
[4]Jr Resident, Department of orthopaedics, Vydehi institute of Medical Sciences and Research Centre
[5]Professor, Department of orthopaedics, Vydehi institute of Medical Sciences and Research Centre
[6]Jr Resident, Department of orthopaedics, Vydehi institute of Medical Sciences and Research Centre
[7]Asst. Professor, Department of orthopaedics, Vydehi institute of Medical Sciences and Research Centre
[8]Asst. Professor, Department of orthopaedics, Vydehi institute of Medical Sciences and Research Centre
Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

(local and English) for a better assessment of their outcomes. The clinical outcomes were evaluated by the Oxford hip score, the EQ-5D-5L score, and the EQVAS score

Grading of the score

The Oxford Hip Score was employed for the assessment of cases on a scale of 0–48, interpreted as 0–19 severe pain and disability post-surgery, 20–39 moderate pain and disability, and 40–48 pain-free and able to carry out self-activities. An EQ-5D-5L is a Health-Related Quality of Life (HR-QoL) assessment that includes five parameters: mobility, self-care, usual activities, pain, and anxiety. EQ VAS score from (0–100), we determined the present health status of a subject. These scores were used to correlate with the radiological parameters, *i.e.,* acetabular cup inclination and version, which in turn signifies a stable prosthesis.

Statistical analysis

We find out the significant mean differences between two groups by an independent sample 't' test. Significance of restoration of cup offset and leg length with Harris Hip Score. By using ANOVA to find the mean differences between more than two groups, one-way ANOVA (F-ratio) was used to test the hypothesis. If the calculated value is greater than the table value, the null hypothesis is rejected. If the calculated value is less than the table value, the null hypothesis is accepted. In our study, ANOVA was used when more than two quantitative variables were analysed with Harris Hip Score. Karl Pearson's correlation coefficient was used. In our study, this has been used to study the association between X-ray anteversion and CT anteversion. Further, the values of mean, SD, and percentages were also determined. Experimental data were analysed using SPSS v.14 statistical version.

RESULTS

Table 1: Descriptive statistics of gender

Variable	Category	n	%
Gender	Females	20	64.5%
	Males	11	35.5%
Laterality	Right	23	74.2%
	Left	08	25.8%

A total of 31 cases were considered for the study, the males comprises 11 (35.50%) and females were 20(64.50%) with sex ration 1.:3 .Females are more predominate than females .Laterality was correlated right was seen in 23(74.20%) and right was observed in 08 cases (25.80%). Both right and left was significant associated p<0.01, chi-square 3.55

Table 2: Descriptive for the Post-op Radiographic Parameters among the study patients

Parameters(n=31)	Mean±SD	IQR	Median	CI -95%	P-Value
Inclination	46.79±8.33	28.10-68.0	47.26	30.42-63.05	0.0879
Anteversion	15.93±2.56	4.80-39.60	14.28	10.91-20.94	0.0031
Edited Anteversion	20.98±1.89	9.80-44.60	19.35	17.27-24.68	0.000

The descriptive statistics on the inclination, anterversion and edited anterversion was simulated by simple linear regression and ROC analysis. The mean inclination was 46.79±8.33 ; (IQR-28.10-68.0), median 47.20 ; CI95 30.42-63.05 P=0.0857. Similarly mean descriptive on anterversion was 15.93±2.56 (IQR-4.80-39.60), median 14.28 ; CI95% 10.91- 20.94 P=0.0031 and Edited Anteversion average was 20.98±1.89 ; 56 (IQR-9.80-44.60), median 19.35 ; CI95% 17.27- 24.68 P=0.000. The specificity and accuracy of Post-op Radiographic Parameters was tested by ROC (Specificity 0.84, sensitivity -0.74, PPV =0.70, NPV =0.69,AUC =0.89)

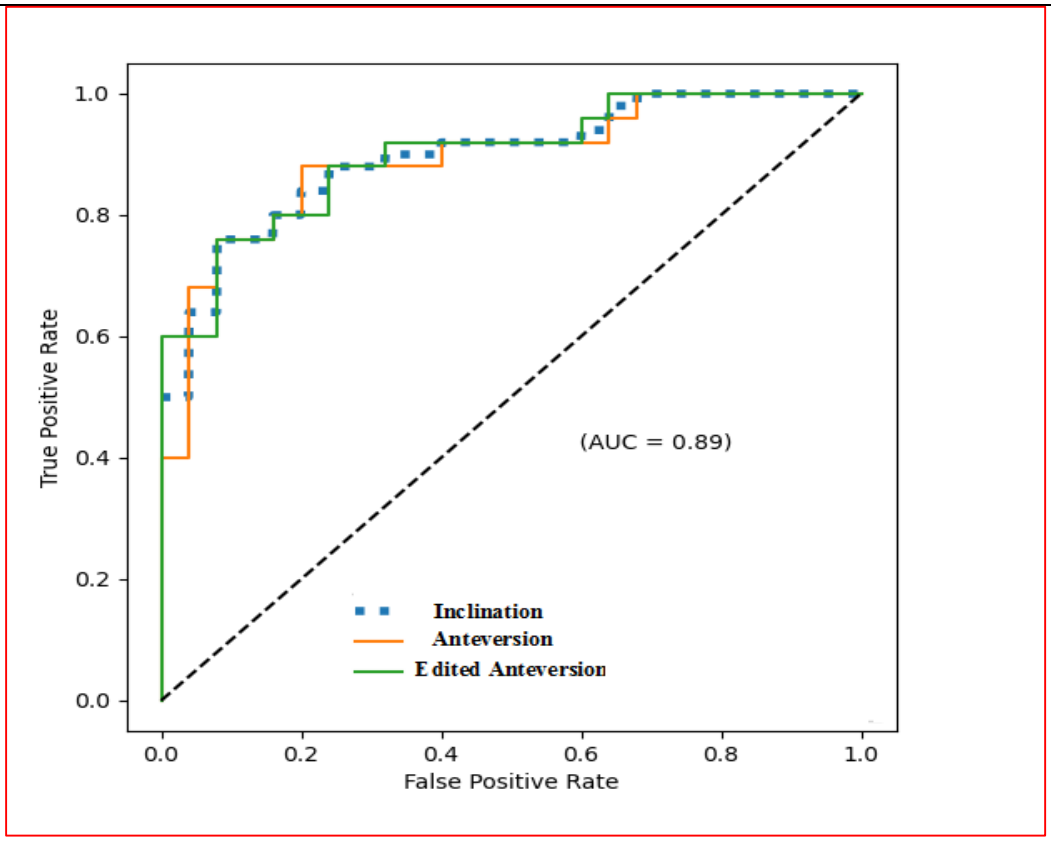

Figure 1: Correlation between the three parameters (Specificity 0.84, sensitivity -0.74, PPV =0.70, NPV =0.69,AUC =0.89)

Table 3: Descriptive for different Items of Harris Hip Scores scale among study patients

Parameters	Score 1 (n=23)		Score 2 (n=63)		Score 3 (n=88)		Score 4 (n=198)	
	n	%	n	%	n	%	n	%
Pain in hip	1	3.2%	9	29.0%	10	32.3%	11	35.5%
Pain at night	0	0.0%	7	22.6%	6	19.4%	18	58.1%
Sudden severe pain	0	0.0%	5	16.1%	7	22.6%	19	61.3%
limping	3	9.7%	1	3.2%	15	48.4%	12	38.7%
Distance walked before severe pain	2	6.5%	1	3.2%	11	35.5%	17	54.8%
Climb stairs	6	19.4%	9	29.0%	6	19.4%	10	32.3%
Put socks self	4	12.9%	5	16.1%	7	22.6%	15	48.4%
Standing from sitting	0	0.0%	6	19.4%	6	19.4%	19	61.3%
Getting in/ of a car	0	0.0%	6	19.4%	6	19.4%	19	61.3%
Taking bath	0	0.0%	4	12.9%	5	16.1%	22	71.0%
Shopping	4	12.9%	5	16.1%	3	9.7%	19	61.3%
Usual work & shopping	3	9.7%	5	16.1%	6	19.4%	17	54.8%
Chi-square				10.96,p<0.05				

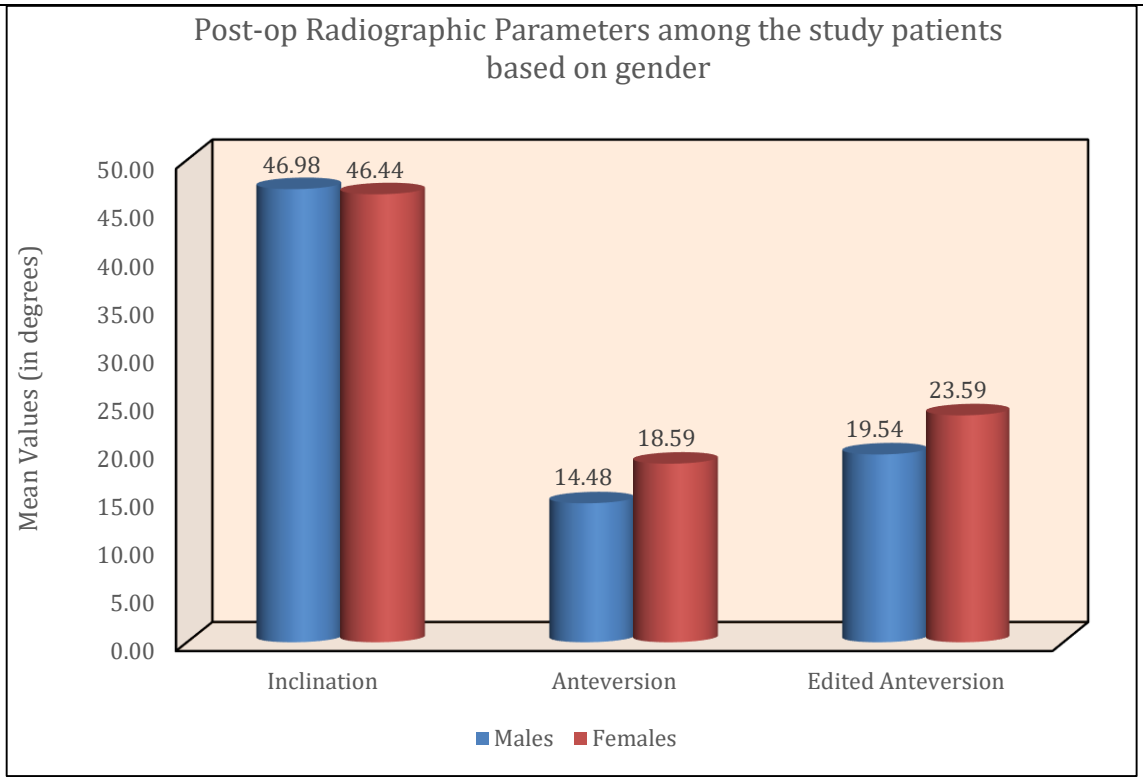

Figure 2: Post operative radiographic features among the subjects

The harris hip score was correlated by using the chi-square test, and the result found that the majority of the cases were shown to be climbing stairs (19.40%), putting stock in oneself (12.90%), and shopping (12.90%). In HHS score 1, similarly highest was seen in pain hip and climbing stairs in score 3, followed by limping (48.40%), Distance walked before severe pain (35.50%), score 4, taking a bath (71.10%), sudden severe pain (61.30%), and distance walked before severe pain (38.70%). Hypothesis was significantly correlated in scores 2 to 4, respectively, chi-square 10.96, p< 0.01. The HHS mean was 38.87+/-7.89 (median 41, IQR 20–48) and the mean of the EQ VAS was 83.10+/-7.83 (median 80, IQR 60–90), both of which were found to be statistically significant (P <0.01). Postoperative radiographic features were relatively correlated with various parameters and the predisposing factor of gender. The results show that the mean inclination in males was 46.89 with SD 9.52 (P > 0.05); Females were 46.44 with SD 6.00; anteversion was (14.48) in males and females (18.59); and edited anteversion was (19.54) in males and females were (23.59). All three parameters were found to be statistically insignificant (p > 0.05), and the hypothesis was tested by the Mann-Whitney U test. The correlation was done on the post-op radiographic parameters based on the laterality using the Mann Whitney Test, the inclination of the R/L mean was 47.35/45.91; the anteversion R/L was 17.22/12.23) and the edited anteversion R/L mean was found to be (22.24/17.35). All parameters were found to be statistically insignificant with respect to laterality (p>0.05).A similar statistical method was used to test the hypothesis on the correlation between HHS and EQVAS.

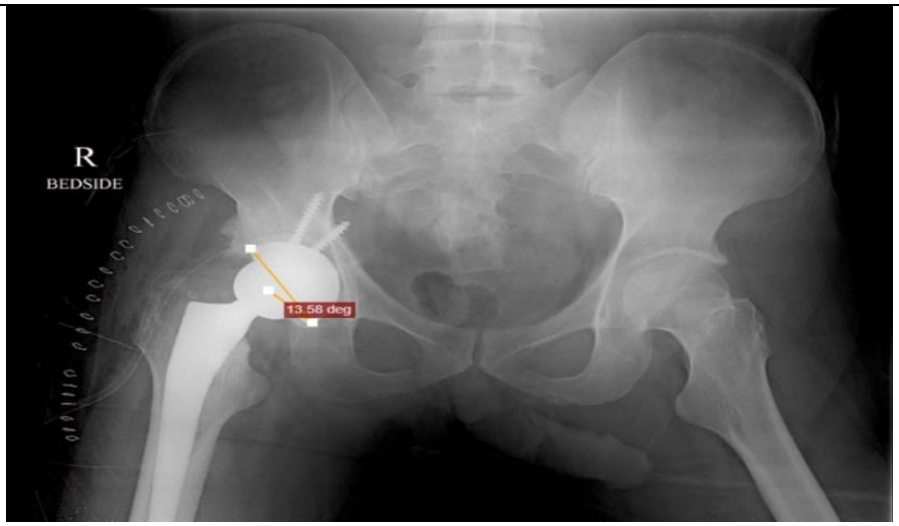

Fig 3: anterior posterior view of pelvis with both hips status post THR of right hip showing the angle of version(liaw's method, beta angle) in subject A

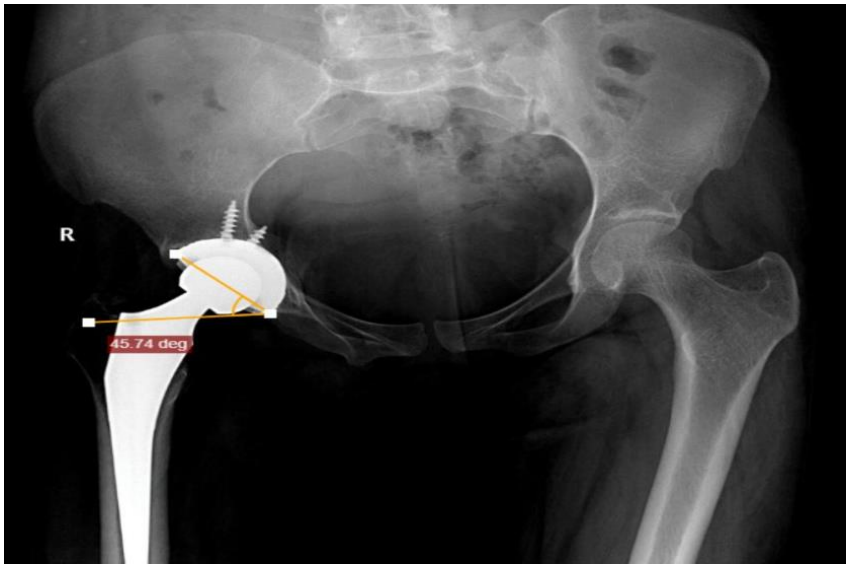

Fig 4: Anterior posterior view of pelvis with both hips status post THR of right hip showing the angle of inclination in subject B

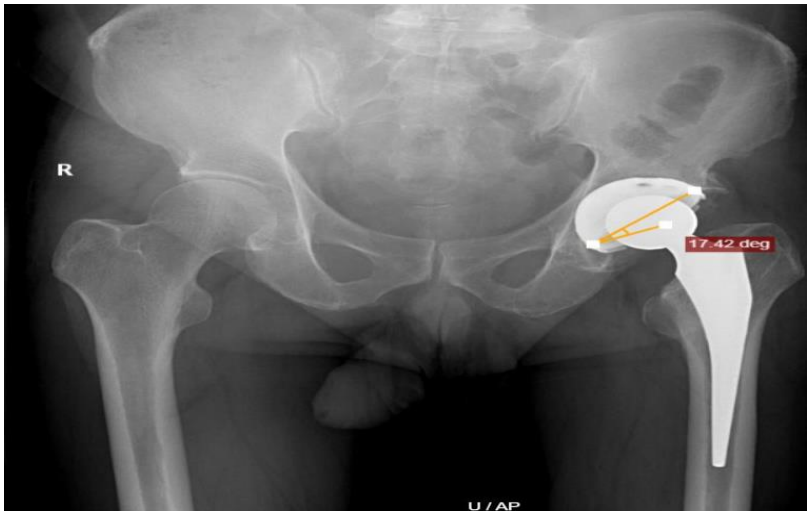

Fig 5: anterior posterior view of pelvis with both hips status post THR of left hip showing the angle of version(liaw's method, beta angle) in subject C

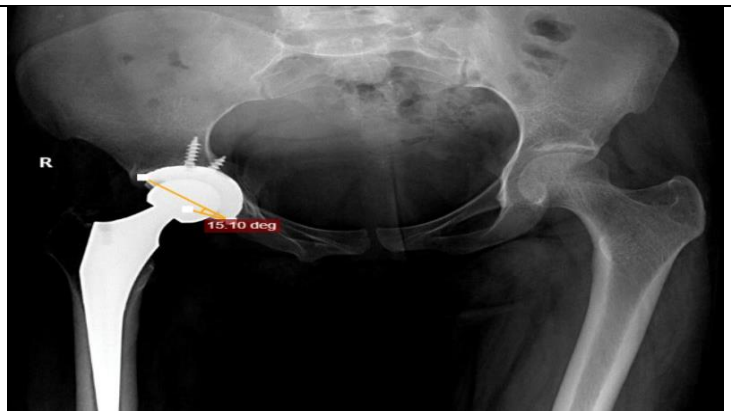

Fig 6: Anterior posterior view of pelvis with both hips status post THR of right hip showing the angle of version (Liaw's method, beta angle) in subject D

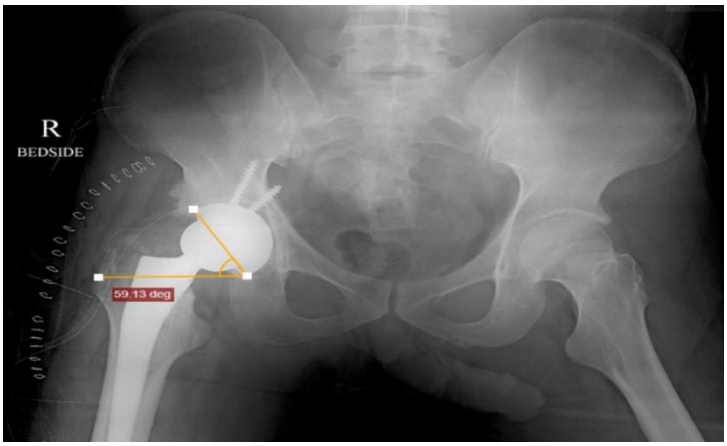

Fig 7: Anterior posterior view of pelvis with both hips status post THR of right hip showing the angle of inclination in subject E

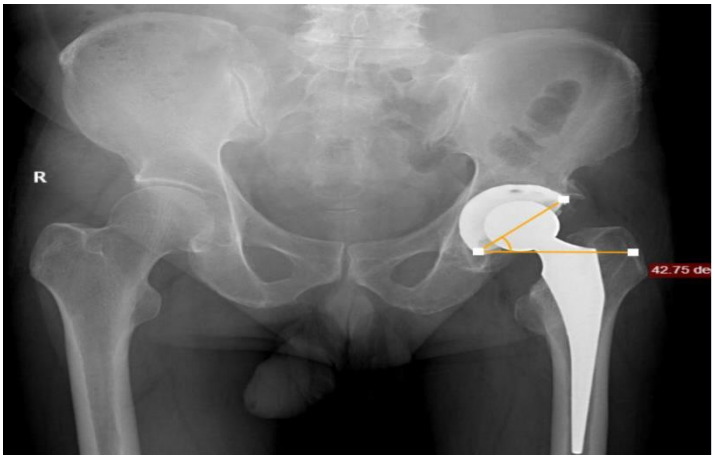

Fig 8: anterior posterior view of pelvis with both hips status post THR of right hip showing the angle of inclination in subject F

An overall mean of HHS was (39.17/38.00) and EQVAS R/L was (83.04/83.25), both of which were found to be statistically insignificant (P > 0.05). The data sets of Post-op Radiographic parameters and Functional Parameters based on gender were superimposed to know the collinearity effect between the three parameters (inclination, anteversion, and edited anteversion). The results found that females were strongly correlated (Rho =0.69) in HHS. The HHS found an insignificant correlation between EQVAS and inclination. A similar method was used to explore the correlation between laterality with HHS and EQVAS. The findings show that anteversion was a strongly correlative factor as compared to other factors (Rho = 0.93).

DISCUSSION

Large improvements in pain, function, and overall health were evident following primary hip and knee arthroplasty. Notably, there was close alignment between preoperative patient expectations for pain, mobility, and health outcomes, and those same outcomes reported at six months following arthroplasty. This positive finding may indicate that, for many patients, realistic expectations are being set by their treatment surgeon and facilitated through effective preoperative education. Patient-perceived improvement and satisfaction data further highlight the successful surgical outcomes for most patients. There were approximately 10% of patients dissatisfied with their procedure and future analyses will focus on factors contributing to optimal functional and quality of life outcomes after hip and knee arthroplasty.Although total hip replacement (THR) is regarded as a fairly successful surgical procedure, some patients report ongoing discomfort or incapacity as well as dissatisfaction with the procedure's results. Our goal was to find out whether patient-reported pain, function, and satisfaction following primary THR could be predicted by post-operative radiography characteristics. Patients completed the WOMAC Pain scale, WOMAC Function scale, and a validated measure of satisfaction with the results of surgery at 1-3 years following surgery. Prior to discharge, post-operative radiographs were rated for offset restoration, leg length restoration, femoral stem anteroposterior (AP) alignment, and AP acetabular inclination. To determine if radiographic factors were significant predictors of patient-reported outcome scores, binary logistic regression was performed. There were data on radiographic and patient-reported outcomes.At 1-3 years following THR, no radiological indicators were discovered to be significant predictors of patient-reported pain, function, or satisfaction. This demonstrates how patients who experience persistent issues even after THR may benefit from a complete multidisciplinary evaluation to identify the underlying cause of the issues. The effectiveness of total hip arthroplasty (THA) and patient satisfaction are frequently assessed using patient-reported outcome measures (PROMs). Prior to surgery, functional measurements and chronologic modelling may be used to assist define expectations. Determining the course of recovery and function in the first year post THA was our aim. Although total hip replacement (THR) is regarded as a fairly successful surgical procedure, some patients report ongoing discomfort or incapacity as well as dissatisfaction with the procedure's to ascertain whether patient-reported pain, function, and satisfaction following primary THR were predicted by post-operative radiological characteristics. Patients completed the WOMAC Pain scale, WOMAC Function scale, and a validated measure of satisfaction with the results of surgery at 1-3 years following surgery. Anteroposterior (AP) alignment of the femoral stem, AP acetabular inclination, restoration of offset, and restoration of leg length were all rated on post-operative radiographs before discharge. To determine if radiographic factors were significant predict-tors of patient-reported outcome scores, binary logistic regression was performed. Data on 452THR patients' radiographic and patient-reported outcomes were available. At 1-3 years following THR, no radiological indicators were discovered to be significant predictors of patient-reported pain, function, or satisfaction. This demonstrates that people who experience persistent issues after THAR. The effectiveness of total hip arthroplasty (THA) and patient satisfaction are routinely assessed using patient-reported outcomes measures (PROMs). Expectations may be set postoperatively with the use of functional assessments and chronologic modelling. Our aim was to outline the progression of healing and functioning within the first year after THA.

CONCLUSION

Patients can be them within one month of THA, PROMs improve most proportionally, although function exceeds preoperative baselines after three months, and gait quality may not improve until one year. By doing so, it will be easier to set reasonable expectations and focus therapies on patients who deviate from the norm.

REFERENCE

Nomura,M Naito,Y Nakamura,T Ida,D Kuroda,T Kobayashi,T Sakamota, H Seo.An analysis of the best method for evaluating anteversion of the acetabular

component after total hip replacement on plain radiographs. *Bone Joint J* 2014; 96 (3):-49-51

Widmer KH.A simplified method to determine acetabular cup anteversion from plain radiographs.*J Arthroplasty* 2004; 19: 387-390

White TO, Dougall. Arthroplasty of the hip.Leg length is not important. *J Bone Joint Surg*. 2002; 84: 335-8

Byung-Woo Min, MDKwang-Soon Song, MD,Ki-Cheol Bae et al. The Effect of Stem Alignment on Results of Total Hip Arthroplasty with a Cementless Tapered-Wedge Femoral Component. *J Arthroplasty*. 2008; 23(3):418-23

Toshiki Iwase, Inga Wingstrand, Björn M Persson, Uldis Kesteris, Yukiharu Hasegawa, and Hans Wingstrand. The Scan hip total hip arthroplasty. Radiographic assessment of 72 hips after 10 years. *Acta Orthop Scand* 2002; 73 (1): 54–59.

Wylde V, Maclean A, Blom AW. Post-operative radiographic factors and patient-reported outcome after total hip replacement. *Hip Int.* 2012 Mar 22(2):153-9.

Eleanor H. Sato, Kimberly L. Stevenson, Brenna E. Blackburn, Christopher L. Anderson. Recovery Curves for Patient Reported Outcomes and Physical Function After Total Hip Arthroplasty, *The Journal of Arthroplasty* 2023; 38(7):65-71