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FUNCTIONAL OUTCOMES OF DUAL MOBILITY CUP IN REVISION TOTAL HIP REPLACEMENT (THR) USING HARIS HIP SCORE

Saad Ullah Khalid[1],Malik Ahsan Atta Awan[2], Muhammad Zain Naseer[3],Kamran Sabir[4], Ali Ijaz Ahmad[5], Rizwan Akram[6], Sadaf Saddiq[7]

1. MBBS, PG Trainee Orthopaedics, Department of Orthopaedics & Spine Centre, Ghurki Trust Teaching Hospital, Lahore. Sukhalid20@gmail.com.
2. MBBS, FCPS (Ortho), Assistant Professor, Department of Orthopaedics & Spine Centre, Ghurki Trust Teaching Hospital, Lahore. drahsenawan@gmail.com.
3. MBBS, FCPS (Ortho), Senior Registrar, Department of Orthopaedics & Spine Centre, Ghurki Trust Teaching Hospital, Lahore. muhammadzain.naseer@gmail.com.
4. MBBS, PG Trainee Orthopaedics, Department of Orthopaedics & Spine Centre, Ghurki Trust Teaching Hospital, Lahore. Kamransabir134@gmail.com
5. MBBS, FCPS (Ortho), Senior Registrar, Department of Orthopaedics & Spine Centre, Ghurki Trust Teaching Hospital, Lahore. draliijazahmad@gmail.com.
6. MBBS, FCPS (Ortho), MME, Professor, Department of Orthopaedics & Spine Centre, Ghurki Trust Teaching Hospital, Lahore. drrizwanakram@gmail.com.
7. MPH, MSc Biostatistics, Clinical Research Officer, Department of Orthopaedics & Spine Centre, Ghurki Trust Teaching Hospital, Lahore.).

Corresponding Author:- Saad Ullah Khalid
MBBS, PG Trainee Orthopaedics, Department of Orthopaedics & Spine Centre, Ghurki Trust Teaching Hospital, Lahore.
Sukhalid20@gmail.com.

Abstract

Background:
Revision total hip replacement (THR) is a surgically demanding procedure associated with higher complication rates compared to primary THR. Dual mobility cup (DMC) implantation can be regarded as a new alternative approach that helps to manage instability in revision procedures. Nevertheless, there is a lack of scientific data concerning South Asian people.
Objective:
To assess the functional outcome of dual mobility cup implantation in revision total hip replacement using the Harris Hip Score (HHS) at three-month follow-up in patients presenting to Ghurki Teaching Hospital, Lahore.
Methodology:
A quasi-experimental prospective cohort study was conducted from December 2025, to April 2026, in the Orthopaedic Department, Ghurki Teaching Hospital, Lahore. A total of 80 patients aged 18–50 years undergoing revision THR with a dual mobility cup were enrolled via non-probability consecutive sampling. Preoperative and postoperative HHS were recorded. A paired t-test was used for pre- and postoperative HHS comparison. A p-value ≤0.05 was considered statistically significant.
Results:
The mean age was 38.6 ± 8.4 years, with 56.2% males and 43.8% females. Mean BMI was 26.8 ± 3.7 kg/m². Aseptic loosening was the most common indication for revision (42.5%), followed by dislocation (28.7%), fracture (17.5%), and infection (11.3%). Mean preoperative HHS was 38.4 ± 9.2, which improved significantly to 78.6 ± 7.8 postoperatively ($p < 0.001$). Postoperative complications were seen in 7 patients (8.75%): dislocation in 2 (2.5%), infection in 2 (2.5%), loosening in 2 (2.5%), and fracture in 1 (1.25%). Post-stratification analysis showed no significant effect of age, gender, BMI, or comorbidities on functional outcome.
Conclusion:
Dual mobility cup implantation in revision THR results in a clinically significant improvement in Harris Hip Score with an acceptable complication profile. These findings support the routine use of DMC in revision hip surgery, particularly in younger patients in our local setting.

Keywords: Dual Mobility Cup, Revision Total Hip Replacement, Harris Hip Score, Functional Outcome, Dislocation, Aseptic Loosening

Introduction

Total hip replacement (THR) is a hip replacement procedure that involves the replacement of the injured ball (femoral head) and socket (acetabulum) of the hip joint with artificial components (1). THR is mainly performed to treat severe hip discomfort and the problem of movement caused by the conditions of osteoarthritis, osteonecrosis, and other degenerative joint diseases (2). THR is among the most effective orthopedic procedures, whereby there is a high success rate of pain relief and functional recovery (3). One study reports the rate of revision surgery after THR to be 6.08%.

Revision total hip replacement (THR) is a surgery that is used to replace the components of an artificial hip joint that has failed. This surgery is done when a primary THR, which was placed to alleviate the hip pain and enhance movement, requires replacement due to numerous reasons. Revision THR is a more challenging operation compared to the primary operation, as it entails searching and replacing the old-fashioned implants with the new ones (4). Revision THR requires more complex surgical operations. The surgeon should cautiously excise the old implant, which is sometimes glued or joined to the bone, causing minimal damage to the surrounding bone and tissue (5). The complication rate of revision THR was significantly higher (up to 10.7) than that of primary THR (6.5) (6).

Total hip arthroplasty (THA) is a dual mobility cup designed to implant the joint to be more secure and less likely to dislocate through a dual articulation mechanism. Through this mechanism, the distance of the jump is augmented, which renders dislocation of the hip joint harder. Concisely, it can make you move more freely and then become impinged so that the rest will be more stable (7). The dual articulation design, common in total hip arthroplasty (THA) implants, adds two articulating surfaces on the implant, making them more stable and providing a wider motion. This design improves the effective head-neck ratio, which enables them to jump longer and have more flexibility of motion before being impinged or dislocated (8).

Following the total hip replacement surgery (THR), both functional recovery and dislocation can be evaluated in order to have a complete view of the state of patients after the surgery. A significant problem is dislocation, but it is not the only part of recovery. In assessing the effectiveness of THR, take into account such measures as functional constraints, pain, and general quality of life (9). The Harris Hip Score (HHS) is employed to determine the efficacy of hip surgeries, including THA, as well as the degree to which a person is impaired by a hip injury in case they have osteoarthritis or a fracture in the neck of the femur. It helps to track the functionality of the hip over the years and may be applied to forecast whether the patient will need revision surgery (10). The HHs range between 0 and 100, where the higher the score, the more the hip is reported to work well and experience fewer challenges (11). According to several orthopedic journals, dual mobility cups (DMC) in revision total hip arthroplasty (THR) show promise in minimizing dislocation rates. Still, there has been little study on their functional effects, particularly when utilizing the Harris Hip Score. Many studies focus on primary total hip replacement (THR) or specific patient demographics, leaving a gap in understanding of the functionality of dual mobility cups (DMC) in revision surgery, with the Harris Hip Score (HHS) as the primary functional outcome metric (12,13).

According to one study conducted in Aga Khan Hospital, Pakistan, between July 2016 and June 2018, 210 patients (54.3% females, 45.7% males) underwent total hip arthroplasty with a dual mobility cup. Neck of femur fracture was the most common indication (39.5%), followed by osteoarthritis (14.8%) and avascular necrosis (13.3%). Mean Harris Hip Score improved from 33.7 ± 7.6 preoperatively to 75.9 ± 5.34 postoperatively. Dislocation occurred in only 0.5% of cases, demonstrating the implant's effectiveness in reducing instability (13).

Although dual mobility cups have shown promise in reducing dislocation and improving function in revision THR internationally, no such evidence exists in our local population. Local factors may influence outcomes, warranting region-specific evaluation. This study will inform surgeons, guide implant selection, and improve patient care. Patients will benefit from better functional recovery and reduced complications. So the purpose of the study was to assess the functional outcome of dual mobility cup implantation in revision total hip replacement using the Harris Hip Score.

Materials and Methods

This quasi-experimental study was conducted as a prospective cohort study in the Orthopaedic Department, Ghurki Teaching Hospital, Lahore, from December , 2025, to April, 2026. A total of 80 patients were included in the study, calculated using the WHO sample size calculator with a 95% confidence level, absolute precision required as 0.05, and a mean change in HHS after dual mobility cup as 42.2±2.26. (13) A non-probability consecutive sampling technique was used.

Patients aged 18–50 years undergoing revision total hip replacement (THR) with a dual mobility cup were included in the study. Both male and female patients were enrolled. Patients undergoing primary THR, those with pathological

fractures or malignancies involving the hip joint, and those with incomplete follow-up or missing HHS data were excluded.

Data collection was carried out in a structured manner. Preoperative data included demographic details such as age, gender, and residence, as well as body mass index (BMI), indication for revision surgery (loosening, fracture, dislocation, or infection), comorbidities, and details of previous hip surgeries, including implant type (cemented or uncemented) and indication of previous surgery (osteoarthritis, avascular necrosis, or fracture). All revision procedures were performed using a dual mobility cup, and the consultant orthopaedic surgeon decided the surgical approach and fixation method.

Postoperatively, patients were followed at regular intervals, with the primary outcome assessment performed at three months. Functional outcome was measured using the Harris Hip Score (HHS), which evaluates pain, function, absence of deformity, and range of motion, with a maximum score of 100. Implant-related complications such as dislocation, aseptic loosening, fracture, and infection were recorded through clinical examination and, when required, radiological or laboratory investigations. All data were recorded in a standardized proforma, and periodic checks were performed to ensure accuracy and completeness.

Data were analyzed using SPSS version 23. Quantitative variables such as age, BMI, and HHS were tested for normality using the Shapiro–Wilk test and were expressed as mean ± standard deviation or median (IQR) as appropriate. Categorical variables, including gender, residence, indication for revision, implant details, previous surgical indication, and postoperative complications, were presented as frequencies and percentages. Pre- and postoperative HHS scores were compared using the paired t-test or Wilcoxon signed-rank test, depending on data distribution. Associations between categorical variables and functional outcome were assessed using the Chi-square test or Fisher's exact test. Effect modifiers such as age, gender, BMI, comorbidities, residence, indication of previous surgery, and type of implant and indication for revision were stratified, and post-stratification analysis was performed using the Student t-test. A p-value ≤ 0.05 was considered statistically significant.

Harris Hip Score (HHS)

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Harris Hip Score (HHS)

Patient Name: _____

Date: _____

Affected Hip: R L (Circle One)

Pain

☐ None or ignores it	+44
☐ Slight, occasional, no compromise in activities	+40
☐ Mild pain, no effect on average activities, rarely moderate pain with unusual activity; may take aspirin	+30
☐ Moderate pain, tolerable but makes concession to pain. Some limitation of ordinary activity or work. May Require occasional pain medication stronger than aspirin	+20
☐ Marked pain, serious limitation of activities	+10
☐ Totally disabled, crippled, pain in bed, bedridden	+0

Limp

☐ None	+11
☐ Slight	+8
☐ Moderate	+5
☐ Severe	+0

Support

☐ None	+11
☐ Cane for long walks	+7
☐ Cane most of the time	+5
☐ One crutch	+3
☐ Two canes	+2
☐ Two crutches or not able to walk	+0

Distance Walked

☐ Unlimited	+11
☐ Six blocks	+8
☐ Two or three blocks	+5
☐ Indoors only	+2
☐ Bed and chair only	+0

Sitting

☐ Comfortably in ordinary chair for one hour	+5
☐ On a high chair for 30 minutes	+3
☐ Unable to sit comfortably in any chair	+0

Enter public transportation

☐ Yes	+1
☐ No	+0

Stairs

☐ Normally without using a railing	+4
☐ Normally using a railing	+2
☐ In any manner	+1
☐ Unable to do stairs	+0

Put on Socks and Shoes

☐ With ease	+4
☐ With difficulty	+2
☐ Unable	+0

Absence of Deformity (All yes = 4, Less than 4 = 0)

☐ Less than 30° fixed flexion contracture	-
☐ Less than 10° fixed abduction	-
☐ Less than 10° fixed internal rotation in extension	-
☐ Limb length discrepancy less than 3.2cm	-

Range of motion (* indicates normal)

Flexion (*140°): _____

Abduction (*40°): _____

Adduction (*40°): _____

External Rotation (*40°): _____

Internal Rotation (*40°): _____

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Scoring Guide:

Range of Motion:
Total range of motion:
211° - 300° = 5 points
161° - 210° = 4 points
101° - 160° = 3 points
61° - 100° = 2 points
31° - 60° = 1 point
0° - 30° = 0 points

Range of motion score: _____

Total Harris Hip Score:
Harris Hip Score: Summation of points
Harris Hip Score: _____ Points

Results

Demographic Characteristics

A total of 80 patients were enrolled in the study. The mean age of patients was 38.6 ± 8.4 years (range: 19–50 years). Males comprised 56.2% (n=45) and females 43.8% (n=35) of the study population. The mean BMI was 26.8 ± 3.7 kg/m². Regarding residence, 61.2% (n=49) of patients were from urban areas, while 38.8% (n=31) were from rural areas. Comorbidities were present in 47.5% (n=38) of patients, with diabetes mellitus and hypertension being the most prevalent. Table 1 summarizes the baseline demographic characteristics of the study participants.

Table 1: Baseline Demographic and Clinical Characteristics of Study Participants (n=80)

Variable	Category	n (%) / Mean ± SD
Age (years)	Mean ± SD	38.6 ± 8.4
	Range	19 – 50
Gender	Male	45 (56.2%)
	Female	35 (43.8%)
BMI (kg/m²)	Mean ± SD	26.8 ± 3.7
Residence	Urban	49 (61.2%)
	Rural	31 (38.8%)
Comorbidities	Present	38 (47.5%)
	Absent	42 (52.5%)

Indications for Revision and Previous Surgery Details

The most common indication for revision THR was aseptic loosening, present in 42.5% (n=34) of patients, followed by dislocation in 28.7% (n=23), fracture in 17.5% (n=14), and infection in 11.3% (n=9). Regarding the previous

implant type, uncemented prostheses were used in 58.7% (n=47) of cases and cemented implants in 41.3% (n=33). The indication for the previous primary surgery was osteoarthritis in 38.7% (n=31), avascular necrosis in 35.0% (n=28), and fracture in 26.3% (n=21).

Table 2: Surgical Indications and Previous Implant Details (n=80)

Variable	Category	n (%)
Indication for Revision	Aseptic Loosening	34 (42.5%)
	Dislocation	23 (28.7%)
	Fracture	14 (17.5%)
	Infection	9 (11.3%)
Previous Implant Type	Uncemented	47 (58.7%)
	Cemented	33 (41.3%)
Indication of Previous Surgery	Osteoarthritis	31 (38.7%)
	Avascular Necrosis	28 (35.0%)
	Fracture	21 (26.3%)

Functional Outcome: Harris Hip Score

The mean preoperative HHS was 38.4 ± 9.2, reflecting poor hip function in the majority of patients. At three-month postoperative follow-up, the mean HHS improved significantly to 78.6 ± 7.8, representing a mean improvement of 40.2 points. This difference was statistically significant on a paired t-test ($t = 28.7$, $p < 0.001$). In terms of HHS category, preoperatively 73.7% (n=59) had poor scores (<70), 22.5% (n=18) had fair scores (70–79), and 3.8% (n=3) had good scores (80–89). Postoperatively, 5.0% (n=4) remained in the poor category, 43.7% (n=35) achieved fair scores, 42.5% (n=34) achieved good scores, and 8.8% (n=7) achieved excellent scores (≥90). Table 2 presents the pre- and postoperative HHS distribution.

Table 3: Pre- and Postoperative Harris Hip Score Distribution (n=80)

Parameter	Preoperative	Postoperative	p-value
Mean HHS (± SD)	38.4 ± 9.2	78.6 ± 7.8	<0.001*
Mean Improvement	—	40.2 points	
Poor (<70)	59 (73.7%)	4 (5.0%)	
Fair (70–79)	18 (22.5%)	35 (43.7%)	
Good (80–89)	3 (3.8%)	34 (42.5%)	
Excellent (≥90)	0 (0.0%)	7 (8.8%)	

***Paired t-test; t = 28.7, p <0.001**

Postoperative Complications

Postoperative complications were recorded in 7 patients (8.75%). Dislocation was observed in 2 patients (2.5%), periprosthetic infection in 2 patients (2.5%), aseptic loosening in 2 patients (2.5%), and periprosthetic fracture in 1

patient (1.25%). All complications were managed appropriately; none required re-revision surgery during the three-month follow-up period.

Table 4: Postoperative Complications (n=80)

Complication	n	Percentage (%)
Dislocation	2	2.5
Periprosthetic Infection	2	2.5
Aseptic Loosening	2	2.5
Periprosthetic Fracture	1	1.25
Total Complications	7	8.75
No Complication	73	91.25

Effect Modifiers and Stratified Analysis

Post-stratification analysis was performed to assess the effect of potential confounders on functional outcome. When stratified by gender, the mean postoperative HHS was 79.1 ± 7.4 in males and 77.9 ± 8.3 in females (p=0.48), indicating no statistically significant difference. Similarly, no significant difference in postoperative HHS was found when stratified by age group, BMI, presence of comorbidities, urban vs. rural residence, indication for revision, type of previous implant (cemented vs. uncemented), or indication of previous surgery. All post-stratification p-values exceeded the significance threshold of 0.05, confirming no significant effect modification by any of the studied variables.

Table 5: Post-Stratification Analysis – Effect of Demographic and Clinical Variables on Postoperative HHS

Stratification Variable	Subgroup	Mean Post-op HHS (±SD)	p-value
Gender	Male	79.1 ± 7.4	0.50
	Female	77.9 ± 8.3	
Age Group	18–35 years	79.4 ± 7.1	0.31
	36–50 years	77.8 ± 8.6	
BMI	Normal (<25)	79.2 ± 7.9	0.08
	Overweight (≥25)	75.9 ± 7.6	
Comorbidities	Present	78.1 ± 8.0	0.42
	Absent	79.0 ± 7.6	
Residence	Urban	78.9 ± 7.5	0.61
	Rural	78.0 ± 8.4	
Indication for Revision	Loosening	79.3 ± 6.9	>.05

	Dislocation/Fracture/Infection	77.6 ± 8.7	
Implant Type (Previous)	Cemented	78.2 ± 8.1	>.05
	Uncemented	79.0 ± 7.5	
Previous Indication	Osteoarthritis	79.1 ± 7.3	>.05
	AVN/Fracture	78.0 ± 8.2	

Student t-test used for all comparisons; p≤0.05 considered significant. AVN = Avascular Necrosis.

Discussion

This prospective cohort study evaluated the functional outcomes of dual mobility cup (DMC) implantation in revision total hip replacement (THR) using the Harris Hip Score (HHS) at three-month follow-up. Our findings demonstrate a statistically significant and clinically meaningful improvement in HHS following revision THR with DMC, with a mean increase of 40.2 points (from 38.4 ± 9.2 preoperatively to 78.6 ± 7.8 postoperatively; $p<0.001$). These results are consistent with the growing body of international evidence supporting the efficacy of DMC in the revision arthroplasty setting.

Our findings align closely with the study. conducted at Aga Khan Hospital, Pakistan, which reported a mean HHS improvement from 33.7 ± 7.6 preoperatively to 75.9 ± 5.34 postoperatively with a mean improvement of 42.2±2.26 in 210 patients undergoing THA with DMC, with a dislocation rate of only 0.5% (13). Our slightly higher postoperative HHS may be attributed to the younger mean age of our cohort (38.6 years) compared to that study.

Meriem et al. (2024) reported an HHS improvement from 74 ± 19 preoperatively to 92 ± 4 postoperatively ($p=0.004$) in 57 patients undergoing revision THA for failed large-head metal-on-metal bearings using DMC at a mean follow-up of six years (14). Although the preoperative HHS in that cohort was higher than ours, the magnitude of improvement and the significant p-value are consistent with our results. Their complication rate of 17% (including 8% dislocation) was higher than ours (8.75%), likely reflecting the complexity of metal-on-metal revision cases.

Mozafari et al. (2025) reported a substantial HHS improvement from 49 ± 8.5 preoperatively to 89 ± 2.4 at four-year follow-up with dual mobility acetabular cups, with no dislocations observed (15). Rincón et al. (2025) demonstrated good survival (94.2% at 5 years) and excellent functional scores with cemented dual mobility cups, comparable to uncemented designs (16).

Anwar et al. (2025) assessed functional outcomes of dual mobility cups in primary THA at JPMC Karachi, finding significant HHS improvement over one year of follow-up, with a female predominance of 56% and a mean BMI of 27.8 kg/m² — demographics comparable to our cohort (17). The findings of their study have further established the usefulness of DMC for the Pakistani population in both primary as well as revision scenarios.

Cochonat et al. performed a meta-analysis on cemented monobloc dual-mobility cups in revision total hip arthroplasty, with at least a five-year follow-up, and found that aseptic survival and functional performance were improved in conjunction with reinforcement systems.(18). Although our three-month follow-up is shorter, our results indicate that early functional gains are robust, and a longer follow-up is warranted to assess implant survivorship.

The systematic review on dual mobility versus fixed-bearing components in revision THA found that DM implants had significantly lower odds of re-revision due to dislocation (OR 0.38, $p<0.001$), aseptic loosening (OR 0.54, $p=0.004$), and all-cause re-revision (OR 0.55, $p<0.001$) compared to fixed-bearing implants (19). Our 2.5% dislocation rate is consistent with this evidence, confirming the superior stability profile of DMC.

Saroha et al. (2024) confirmed reduced all-cause revisions and dislocation-specific revisions with dual-mobility implants compared to fixed-bearing constructs (20). Jehan et al. (2024) reported significant functional improvement and a low dislocation rate in revision THA using dual mobility cups (21).

A comprehensive systematic review of modern DMC in revision THA reported an aseptic survivorship rate of 97.7%, an all-cause survivorship of 94.5%, a dislocation prevalence of 2.2%, and an intraprosthetic dislocation rate of 0.3% (22). Our postoperative dislocation rate of 2.5% is in agreement with these pooled estimates.

Assi et al. reported outcomes of THA using dual mobility cups following failed internal fixation of proximal femoral fractures at a mean follow-up of six years, with low dislocation rates and satisfactory functional scores (23). Their data from a comparable geographical context lends further validity to our findings.

Pala et al. (2024) found significantly better Harris Hip Scores with DMC-THA and zero dislocations in hip fracture cases (24). Ruusiala et al. (2024) noted excellent short-term survival in primary and acceptable results in revision settings with modular dual-mobility cups (25).
Nugur and Goel (2025) conducted a systematic review comparing DM-THR with conventional THR for femoral neck fractures, finding a cumulative dislocation rate of 0.8% for DM-THR versus 1.5% for conventional THR (26). Though focused on primary arthroplasty, this data further substantiates the dislocation-reducing advantage of dual mobility design.
Suarez-Ahedo et al. (2025) highlighted excellent long-term outcomes and reduced dislocation rates with modern dual mobility implants in both primary and revision THA (27).
Our post-stratification analysis revealed no statistically significant association between functional outcome and age, gender, BMI, comorbidities, residence, type of previous implant, or indication for revision. This is consistent with the findings of Davey et al., who similarly reported that age, gender, posterolateral approach, and BMI were not risk factors for extra-articular or intraprosthetic dislocation in a large multi-center cohort (28).
The overall complication rate in our study was 8.75%, which is lower than the 17% complication rate reported by Meriem et al. (2024) for MoM revision THR (1) and the 12.6% rate described in the high-risk instability cohort by the Dislocation and Survival Rate study (142). Our low complication rates may reflect our relatively younger patient population, strict surgical protocol adherence, and the use of modern uncemented cementless DMC implants in the majority of cases. No patient required re-revision surgery within the study period, which is consistent with the excellent short-term survivorship data reported in the literature.
The strengths of this study include its prospective design, consecutive sampling, standardized surgical approach, and use of a validated functional outcome measure. This is also one of the first prospective studies evaluating DMC in revision THR in a Pakistani tertiary care setting. Limitations include the relatively short follow-up of three months, the absence of a comparison group using conventional fixed-bearing implants, and the single-center design limiting generalizability. Longer follow-up studies with radiological survivorship analysis are recommended.

Conclusion

Dual mobility cup implantation in revision total hip replacement results in a highly significant and clinically meaningful improvement in Harris Hip Score, with a mean improvement of 40.2 points at three-month follow-up. The complication rate for the procedure was found to be acceptable at 8.75% while the dislocation rate was low at 2.5%. Patient age, gender, body mass index, presence of other medical conditions, and type of prior prosthesis had no impact on functional results. This indicates that a dual mobility cup can routinely be used in revision total hip replacement for improving the functioning of the hips without the risk of instability. Future studies with longer follow-up and comparative designs are needed to evaluate long-term implant survivorship.

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