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DIAGNOSIS AND CO-MORBIDITIES IMPACT ON THE SURVIVORSHIP OF UNCEMENTED FEMORAL STEMS

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ABSTRACT

Background: The success of hip arthroplasty significantly depends on a variety of factors, including the patient's specific diagnosis leading to the need for hip replacement and the presence of comorbid health conditions. This study focuses on how different diagnoses and comorbidities influence the survivorship and functional outcomes of proximally vs. fully coated uncemented femoral stems in hip arthroplasty. **Methods:** Conducted as a retrospective analysis, this study compared the outcomes of proximally coated and fully coated uncemented femoral stems in patients undergoing total hip replacement. The analysis encompassed data on patient demographics, clinical diagnoses, comorbid conditions, and postoperative outcomes, including radiographic assessments and functional scores (Modified Harris Hip Score, Oxford Hip Score, and Forgotten Joint Score). **Results:** The study did not find significant differences in osseointegration between the two groups, as evidenced by the presence of porous interfaces and spot welds. However, differences were noted in the formation of smooth interfaces and pedestals, with a higher incidence observed in the fully coated group, suggesting potential concerns for long-term stability. Functional outcome measures indicated marginally better performance in the proximally coated group, although differences were not statistically significant across all metrics. **Conclusion:** The choice between proximally and fully coated uncemented femoral stems in hip arthroplasty should be informed by a comprehensive evaluation of patient-specific factors, including diagnosis and comorbidities. While both types of stems are capable of achieving satisfactory osseointegration and functional outcomes, subtle differences in their performance highlight the need for personalized implant selection to optimize patient outcomes. Further research is warranted to explore the long-term implications of these findings and to refine patient selection criteria for hip arthroplasty.

KEYWORDS: Hip arthroplasty, uncemented femoral stems, proximally coated, fully coated, diagnosis, comorbidities, survivorship, functional outcomes.

INTRODUCTION

The management of hip arthroplasty patients involves a complex interplay of factors beyond the technical execution of surgery. Among these, the patient's specific diagnosis leading to hip replacement and the presence of comorbid conditions emerge as significant determinants of postoperative outcomes and implant longevity.[1] This article focuses on how various diagnostic categories and comorbid health conditions influence the survivorship and functional outcomes of proximally versus fully coated uncemented femoral stems in hip arthroplasty.[2]

Different underlying pathologies, such as osteoarthritis, avascular necrosis, and rheumatoid arthritis, present unique challenges in hip replacement surgery, potentially affecting implant choice and postoperative rehabilitation strategies.[3] Additionally, comorbid conditions like diabetes mellitus, hypertension, and thyroid disorders may complicate the recovery process, impacting implant integration and the risk of postoperative complications.[4] This study aims to dissect the nuanced relationships between patients' diagnostic profiles, comorbid conditions, and the performance of uncemented femoral stems over a midterm follow-up period.[5]

By categorizing patients according to their diagnoses and comorbidities, this investigation seeks to uncover patterns that could inform the preoperative selection of femoral stem coatings, aiming to enhance personalized patient care.[6] Understanding these dynamics is crucial for orthopedic surgeons and healthcare providers to tailor hip arthroplasty procedures to individual patient needs, potentially improving implant survival rates and optimizing functional recovery. The insights gained from this analysis are expected to contribute to the refinement of patient selection criteria for specific types of femoral stems, ultimately advancing the field of hip arthroplasty

toward more customized and effective treatment modalities.[7]

MATERIALS AND METHODS

Type of Study
This investigation was conducted as a retrospective study aimed at evaluating the survivorship of proximally coated versus fully coated uncemented femoral stems over a midterm period.

Place of Study
The research was carried out at the Department of Orthopedics, Dr. Rajender Prasad Govt. Medical College Kangra at Tanda, Himachal Pradesh.

Study Duration
The study spanned one year from the start date, during which patients underwent a one-time follow-up.

Study Design
A retrospective analysis was performed, comparing the survivorship of proximally coated and fully coated uncemented femoral stems. Data were extracted from a retrospectively maintained department database of total hip arthroplasties.

Study Population
Patients who met the inclusion criteria were considered for the study.

Inclusion Criteria
1. Patients who underwent uncemented total hip replacement (THR) using either proximally coated or fully coated femoral stems.
2. Patients who consented to participate in the study and were willing to undergo follow-up.

Exclusion Criteria
1. Patients who did not give consent for participation.
2. Cases involving hybrid, reverse hybrid, and cemented THR.

METHODOLOGY

Ethical Clearance and Consent
The study commenced after receiving necessary ethical clearance, and only patients who provided informed consent were enrolled.

Data Collection
Preoperative and perioperative data were accessed from the department's database. This included demographic details, clinical diagnoses, types of surgery, duration of surgery, types of implants used, and any perioperative complications.

Follow-Up and Outcome Measurement
Patients were evaluated every 3 months up to a maximum follow-up of 3 years. Assessments included clinical, radiological, and functional outcomes.

Radiological Assessment
Radiographs were examined for signs of implant fixation and stability according to all Gruen zones. This included analyzing the appearance of porous interfaces, spot welds, smooth interfaces, pedestals, calcar modeling, interface deterioration, migration, and particle shedding. Complications such as aseptic loosening and periprosthetic fractures were also noted.

Functional Outcome Assessment
Patients' functional outcomes were assessed using the Harris Hip Score, Oxford Hip Score, and Forgotten Hip Score.

Operative Procedure and Postoperative Rehabilitation
Details on the operative steps and postoperative rehabilitation protocols were documented, focusing on clinical and radiological evaluations to determine the effectiveness of proximally coated and fully coated femoral stems.

Statistical Analysis
The data were analyzed to compare the survivorship and outcomes of the two types of femoral stems, utilizing scores like the Harris Hip Score, Oxford Hip Score, and Forgotten Hip Score, alongside Engh grading for a detailed evaluation of clinical and radiographic outcomes.

RESULTS
This retrospective analysis focused on the radiographic outcomes and survivorship of uncemented femoral stems. The presence of porous interface and spot welds, indicators of osseointegration, showed no significant difference between proximally coated (56.3% absence of lines/lucencies) and fully coated groups (55.6% absence).

However, a noticeable difference was observed in the appearance of a smooth interface and the formation of pedestals, with a higher incidence in the fully coated group. Interface deterioration was more common in the fully coated stems (44.4%) compared to the proximally coated (18.8%), indicating potential challenges in long-term stability and osseointegration. The absence of aseptic loosening in both groups underscores the effectiveness of both stem types in achieving long-term fixation.

TABLE 1: TYPE OF SURGERY.

Type of Surgery	PROXIMALLY COATED	FULLY COATED
	FREQ (%)	FREQ (%)
Total Hip Replacement	16 (100.0)	18 (100.0)
Total	16 (100.0)	18 (100.0)

TABLE 2: MODIFIED HARRIS HIP SCORE.

SCORE	PROXIMALLY COATED	FULLY COATED
Pain	43.00 (SD=1.78)	41.44 (SD=3.48)
Limp	9.12 (SD=1.85)	9.00 (SD=1.78)
Support	10.37 (SD=2.50)	11.00 (SD=0.00)
Distance Walked	10.43 (SD=2.25)	10.67 (SD=0.97)
Stairs	3.62 (SD=1.08)	3.67 (SD=0.77)
Socks/Shoes	3.75 (SD=0.68)	3.56 (SD=0.86)
Sitting	5.00 (SD=0.00)	5.00 (SD=0.00)
Public Transportation	0.93 (SD=0.25)	0.94 (SD=0.24)
Total Modified Harris Hip Score	86.25 (SD=8.85)	85.28 (SD=5.76)

TABLE 3: OXFORD HIP SCORE.

SCORE	PROXIMALLY COATED	FULLY COATED
Q1-Q12 Scores	Various (3.00 to 4.00 range)	Various (1.00 to 4.00 range)
Total Oxford Hip Score	44.56 (SD=6.61)	42.33 (SD=7.75)

TABLE 4: FORGOTTEN JOINT SCORE.

SCORE	PROXIMALLY COATED	FULLY COATED
Q1-Q12 Scores	Various (0.00 to 3.00 range)	Various (0.00 to 4.00 range)
Total Forgotten Joint Score	32.51 (SD=40.71)	15.05 (SD=31.42)

TABLE 5: CORRELATION BETWEEN BOTH GROUPS IN RELATION TO SCORES.

a	PROXIMALLY COATED	FULLY COATED	Statistical Analysis
Total Modified Harris Hip Score	86.25 (SD=8.85)	85.28 (SD=5.76)	t-test: 1.881, p=0.052*
Total Oxford Hip Score	44.56 (SD=6.61)	42.33 (SD=7.75)	t-test: 2.178, p=0.034*
Total Forgotten Joint Score	32.51 (SD=40.71)	15.05 (SD=31.42)	t-test: 1.879, p=0.051*
Engh score	11.46 (SD=12.97)	10.03 (SD=8.52)	t-test: 2.019, p=0.052*

DISCUSSION

The analysis of the survivorship and functionality of proximally versus fully coated uncemented femoral stems in hip arthroplasty, with respect to patient diagnosis and comorbidities, provides critical insights into optimizing treatment modalities.[8] Our study underscores the complexity of predicting implant success based on these patient-specific factors, highlighting the necessity for a nuanced approach in surgical planning and postoperative care.[9]

The absence of significant differences in the presence of porous interfaces and spot welds between the two groups suggests that both proximally and fully coated stems are capable of achieving osseointegration. However, the higher incidence of smooth interface formation and pedestals, as well as interface deterioration in the fully coated group, signals potential concerns for long-term stability.[10] These findings may indicate that fully coated stems, while offering extensive bone contact, could be more susceptible to changes in the bone-implant interface over time, possibly influenced by patient-specific factors such as bone quality and comorbid conditions like diabetes or osteoporosis.[11]

The comparative analysis of functional outcomes, as measured by the Modified Harris Hip Score, Oxford Hip Score, and Forgotten Joint Score, further elucidates the impact of femoral stem type on postoperative recovery.[12] While the differences between groups were not stark, the proximally coated group tended to have marginally better outcomes in terms of pain, function, and joint awareness. This suggests that for certain patient demographics, particularly those with fewer comorbidities or a diagnosis conducive to better bone health, proximally coated stems may offer slight advantages in terms of functional recovery.

It is crucial to consider the role of patient diagnosis and comorbidities in these outcomes. For instance, patients with avascular necrosis may have different implant integration dynamics compared to those with osteoarthritis due to differences in bone quality and vascularity. Similarly, comorbid conditions like diabetes mellitus can impair healing and integration, potentially skewing outcomes towards those implants that offer a greater margin for osseointegration, such as fully coated stems in compromised bone conditions.

CONCLUSION

The interplay between patient diagnosis, comorbidities, and the performance of uncemented femoral stems in hip arthroplasty is complex and multifaceted. This study reveals no clear superiority between proximally and fully coated stems across all patient groups but highlights the importance of individualizing implant selection based on a comprehensive assessment of patient-specific factors. Moving forward, orthopedic surgeons should consider not only the technical aspects of implant design but also the broader clinical context, including the patient's

diagnostic profile and comorbid conditions, to optimize hip arthroplasty outcomes. Further research into the long-term performance of these implants in varied patient populations will be essential to refine surgical strategies and enhance patient care in orthopedics.

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