

FUNCTIONAL IMPAIRMENT IN ASEPTIC LOOSENING OF TOTAL HIP ARTHROPLASTY: THE ROLE OF DEFECT SEVERITY, OSTEOLYSIS BURDEN, AND FIXATION TYPE

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ABSTRACT

Background: Aseptic loosening remains a major indication for revision total hip arthroplasty. The relationship between functional impairment and structural disease burden is clinically relevant but not fully quantified.

Objective: To evaluate whether Harris Hip Score is associated with Paprosky defect severity, computed tomography based osteolysis volume, anatomical osteolysis distribution, and fixation type in patients revised for aseptic loosening.

Methods: Sixty patients revised for aseptic loosening were analyzed, including 30 cemented and 30 cementless implants. Harris Hip Score was evaluated in relation to Paprosky defect type, femoral, acetabular, and total osteolysis volumes, and Gruen and DeLee and Charnley zone involvement. Multivariable linear regression, interaction models, sensitivity analyses, and influence diagnostics were performed.

Results: Harris Hip Score was lower in cementless than cemented implants (35.4 ± 11.42 versus 57.95 ± 9.24 ; $p < 0.001$). Functional score declined progressively with increasing Paprosky severity. In the primary adjusted model, Paprosky score was independently associated with lower Harris Hip Score ($B = -6.18$; $p < 0.001$), while cementless fixation remained independently associated with lower score ($B = -17.01$; $p < 0.001$). The model explained 88.0% of Harris Hip Score variation. Adding osteolysis-volume variables minimally improved model performance. Sensitivity analyses confirmed the stability of the main predictors.

Conclusions: Functional impairment in aseptic loosening after total hip arthroplasty is most strongly associated with Paprosky defect severity and fixation type. Computed tomography based osteolysis volume and anatomical zone mapping provide complementary structural information for revision planning.

Keywords: aseptic loosening; total hip arthroplasty; Harris Hip Score; osteolysis; revision arthroplasty

INTRODUCTION

Aseptic loosening constitutes one of the principal long-term causes of failure following total hip arthroplasty and persists as a frequent indication for revision surgery [1-8]. Its clinical manifestation ranges from moderate discomfort

to pronounced functional impairment. Given that structural alterations do not invariably correlate with patient-reported or clinician-assessed function, functional evaluation should be interpreted

in conjunction with radiographic and computed tomography-based assessment [2-6,9,10].

Periprosthetic osteolysis and loosening represent biologically and mechanically intricate processes, encompassing inflammatory bone resorption, perturbed load transfer, implant micromotion, and progressive deterioration of implant stability [11-17]. Imaging plays a pivotal role in the detection of loosening and in delineating the extent of osseous loss [4-6,18-22]. The Paprosky classification retains considerable clinical relevance in revision planning, as it provides a concise framework for characterizing acetabular defect severity and the corresponding reconstructive complexity [23-27].

Nevertheless, the relative contributions of Paprosky defect severity, osteolytic volume, anatomical distribution, and mode of fixation to functional impairment remain incompletely elucidated. The present study examined the Harris Hip Score in relation to structural disease burden in patients undergoing revision for aseptic loosening following total hip arthroplasty. It was hypothesized that greater Paprosky severity and a more extensive osteolytic burden would be associated with lower Harris Hip Score values.

MATERIALS AND METHODS

This retrospective comparative study included 60 patients who underwent revision total hip arthroplasty for aseptic loosening. The cohort comprised 30 patients with cemented implants and 30 patients with cementless implants. In all cases, the index total hip arthroplasty had been performed using an ultra-high-molecular-weight polyethylene (UHMWPE) acetabular liner articulating with a 28 mm femoral head. All cemented implants were of a single, identical design, whereas the cementless cohort comprised two femoral stem designs that differed in their surface-coating philosophy and mode of biological fixation: one design featured a fully hydroxyapatite-coated stem relying on osseointegration along the entire stem length, while the other was a proximally porous-coated stem relying on metaphyseal ingrowth with a smooth, non-coated distal segment. Inclusion was restricted to patients whose primary total hip arthroplasty had been performed for primary or post-traumatic osteoarthritis, displaced femoral neck fracture, avascular necrosis of the

femoral head, or failed osteosynthesis of a femoral neck fracture. Patients with autoimmune disease or those receiving regular corticosteroid therapy were excluded, in order to limit potential confounding of the periprosthetic inflammatory and bone-remodelling response. Septic loosening and other non-aseptic causes of revision were also excluded on the basis of the available clinical and laboratory evaluation.

Preoperative functional status was assessed using the Harris Hip Score. Demographic variables included age, sex, and body mass index. Acetabular defect severity was classified according to the Paprosky classification. For the purposes of regression analysis, Paprosky type was treated as an ordinal score ranging from 1 to 6, corresponding to types 1, 2A, 2B, 2C, 3A, and 3B, respectively.

Osteolysis was quantified by means of computed tomography-based volumetric assessment. Femoral, acetabular, and total osteolysis volumes were recorded. The anatomical distribution of osteolytic lesions was characterised using the Gruen femoral zones and the DeLee and Charnley acetabular zones, and the number of involved zones was calculated for each patient.

Computed tomography osteolysis measurement

Preoperative computed tomography scans of the affected hip and pelvis were acquired with a slice thickness of 0.625 mm and reviewed in the axial, coronal, and sagittal planes. CT Digital Imaging and Communications in Medicine (DICOM) datasets were imported into 3D Slicer software (version 5.6.2) for image review, multiplanar reconstruction, segmentation, and volumetric calculation. Osteolysis was defined as a focal or geographic periprosthetic bone defect adjacent to the femoral or acetabular component, clearly demarcated from the surrounding cancellous bone and not attributable to normal postoperative remodelling, screw tracks, vascular channels, or imaging artefact.

Metal artefact reduction

Implant-related streak artefact was reduced using the Metal Deletion Technique (MDT), an iterative projection-based metal artefact reduction algorithm in which projection rays passing through or near metal are excluded

and iteratively replaced with forward-projected values derived from the reconstructed non-metal portions of the image, thereby attenuating artefacts arising from beam hardening, photon starvation, scatter, motion, and edge effects [28]. The MDT software (version 1.1) was applied to the original DICOM datasets prior to import into 3D Slicer, with software parameters configured to preserve the native 0.625 mm slice thickness throughout processing. The artefact-reduced series was reviewed in conjunction with the original filtered back-projection images, as recommended by the developers, since loss of resolution may occur in the immediate vicinity of large or elongated implants. During segmentation in 3D Slicer 5.6.2, residual metal artefact was further managed through multiplanar cross-checking, optimised bone-window and soft-tissue-window settings, slice-by-slice review, and conservative manual contouring. Suspected artefactual streaks were not interpreted as osteolysis unless a corresponding bone defect was demonstrable in at least two orthogonal planes and was anatomically continuous with the implant–bone or cement–bone interface.

Segmentation and volumetric calculation

Osteolytic defects were segmented manually on consecutive CT slices using the Segment Editor module in 3D Slicer 5.6.2. Thresholding and region-based tools were employed solely as visual aids when bone margins were clearly defined; final contours were manually corrected on a slice-by-slice basis. Femoral and acetabular osteolytic lesions were segmented as separate regions of interest. For each region, the segmented area across consecutive slices was converted into volume using the CT voxel dimensions recorded in the DICOM metadata. The total osteolysis volume was calculated as the sum of the femoral and acetabular volumes.

Anatomical zone assignment

The anatomical location of osteolysis was recorded independently of lesion volume. Zone assignment was performed using a two-step approach: osteolytic involvement was first evaluated on standard anteroposterior and lateral radiographs of the hip and pelvis, and subsequently confirmed and refined on the corresponding preoperative CT scans. This combined radiographic and CT-based approach was

adopted because cross-sectional imaging permits a more accurate identification and mapping of zonal involvement than plain radiography alone, particularly in regions affected by implant overlap, projectional superimposition, or limited cortical visualisation on two-dimensional views. Femoral lesions were assigned to the Gruen zones, and acetabular lesions were assigned to the DeLee and Charnley zones. A zone was considered involved when an osteolytic defect was identified within that zone on any CT slice and corroborated on the corresponding radiographic projection. Zone counts were defined as the number of involved femoral and acetabular zones. The zonal variables described the anatomical distribution of disease, whereas the volumetric variables quantified osteolytic burden.

STATISTICAL ANALYSIS

All imaging measurements were completed prior to statistical analysis. Statistical analyses were performed using IBM SPSS Statistics, version 30 (IBM Corp., Armonk, NY, USA).

Continuous variables were assessed descriptively using mean, standard deviation, median, interquartile range, minimum, and maximum values. Categorical variables were summarized as frequencies and percentages. Patients were compared according to fixation type, cemented versus cementless total hip arthroplasty. Between-group comparisons for continuous variables were performed using Welch's t-test and the Mann–Whitney U test, as appropriate, because several osteolysis-volume variables showed skewed distributions. Associations between Harris Hip Score and osteolysis-related variables were evaluated using Spearman rank correlation analysis. Paprosky acetabular defect type was treated as an ordinal variable, coded from 1 to 6, corresponding to types 1, 2A, 2B, 2C, 3A, and 3B. Multivariable linear regression was used to identify independent predictors of Harris Hip Score. The primary adjusted model included fixation type, Paprosky score, age, body mass index, and sex. Additional models included femoral, acetabular, and total osteolysis volumes. Because osteolysis-volume variables were right-skewed, log-transformed volume variables were used in regression analyses. Robust stan-

dard errors were applied to reduce the influence of heteroscedasticity. Interaction models were constructed to evaluate whether the association between Paprosky severity or osteolysis volume and Harris Hip Score differed according to fixation type. Model performance was assessed using R^2 , adjusted R^2 , Akaike information criterion, and Bayesian information criterion. Influence diagnostics were performed using leverage, standardized residuals, and Cook's distance, with Cook's distance greater than $4/n$ considered potentially influential. Sensitivity analyses were conducted by excluding influential observations, the case with the highest total osteolysis volume, the case with the lowest Harris Hip Score, and cases above the 95th percentile of total osteolysis volume. A two-sided p value < 0.05 was considered statistically significant.

RESULTS

The study included 60 patients, with 30 cemented and 30 cementless implants. The cemented group was older than the cementless group, whereas body mass index was higher in the cementless group. Harris Hip Score was significantly lower in cementless implants than in cemented implants (35.4 ± 11.42 versus 57.95 ± 9.24 ; $p < 0.001$) (Table 1).

Harris Hip Score declined progressively with increasing Paprosky defect severity in both fixation groups. In cemented implants, the mean score decreased from 76.1 in Paprosky type 1 to 43.5 in type 3B. In cementless implants, the mean score decreased from 63.0 in type 1 to 28.73 in

Table 1. Descriptive characteristics according to fixation group.

Variable	Cemented mean $\pm$ SD	Cemented median [IQR]	Cementless mean $\pm$ SD	Cementless median [IQR]	p value
Age	76.4 $\pm$ 5.97	77.5 [75.25, 79.75]	64.87 $\pm$ 9.08	66.0 [62.25, 70.75]	<0.001
Bmi	25.38 $\pm$ 2.58	25.45 [23.15, 27.82]	27.74 $\pm$ 3.87	27.65 [24.82, 30.18]	0.0255
Hhs	57.95 $\pm$ 9.24	56.35 [51.5, 62.65]	35.4 $\pm$ 11.42	33.4 [28.25, 40.3]	<0.001
Femoral Volume	6.6 $\pm$ 4.63	5.19 [2.89, 8.68]	334.86 $\pm$ 1686.54	23.61 [14.57, 34.74]	<0.001
Acetabular Volume	473.99 $\pm$ 2469.13	17.79 [12.72, 32.79]	50.77 $\pm$ 26.48	53.78 [24.94, 71.43]	<0.001
Total Osteolysis Volume	480.59 $\pm$ 2468.8	24.24 [17.15, 40.33]	385.63 $\pm$ 1679.69	72.85 [47.69, 108.13]	<0.001
Delee Zone Count	1.97 $\pm$ 0.89	2.0 [1.25, 3.0]	2.4 $\pm$ 0.72	3.0 [2.0, 3.0]	0.0518
Gruen Zone Count	2.93 $\pm$ 1.6	2.0 [2.0, 4.0]	3.8 $\pm$ 2.27	2.5 [2.0, 6.75]	0.2036

Note: Values are shown as mean $\pm$ standard deviation and median [interquartile range]. HHS indicates Harris Hip Score; BMI, body mass index.

Table 2. Primary adjusted multivariable linear regression model for Harris Hip Score.

Predictor	B	HC3 SE	95% CI	p value
Cementless fixation	-17.014	1.974	-20.972 to -13.056	<0.001
Paprosky score	-6.18	0.568	-7.319 to -5.041	<0.001
Age	0.145	0.147	-0.15 to 0.44	0.3295
BMI	-0.489	0.291	-1.072 to 0.095	0.0988
Female sex	1.743	2.578	-3.426 to 6.911	0.5019

Note: HC3 robust standard errors were used. Negative B values indicate lower Harris Hip Score.

type 3B. Figure 1 directly illustrates the functional gradient across defect categories and the lower score distribution in cementless implants.

The primary adjusted regression model confirmed that Paprosky score and fixation type were the dominant independent predictors of Harris Hip Score. Each increase in Paprosky score

was associated with a 6.18-point lower Harris Hip Score ($p < 0.001$), while cementless fixation was associated with a 17.01-point lower Harris Hip Score after adjustment ($p < 0.001$). Age, body mass index, and sex were not significant independent predictors (Table 2). Figure 2 shows the adjusted coefficients and confidence intervals.

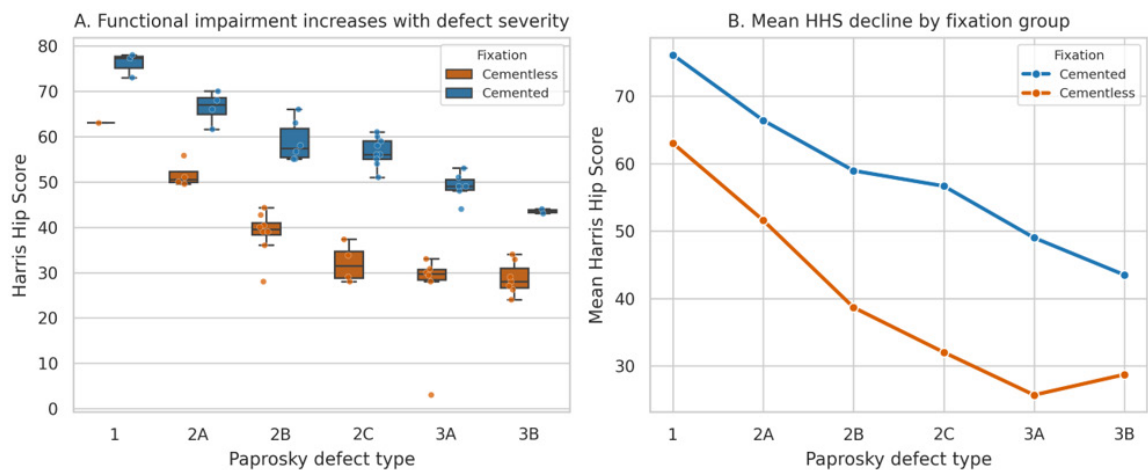


Figure 1. Harris Hip Score according to Paprosky severity and fixation type. Panel A shows individual patient distributions. Panel B shows the mean decline in Harris Hip Score across Paprosky categories.

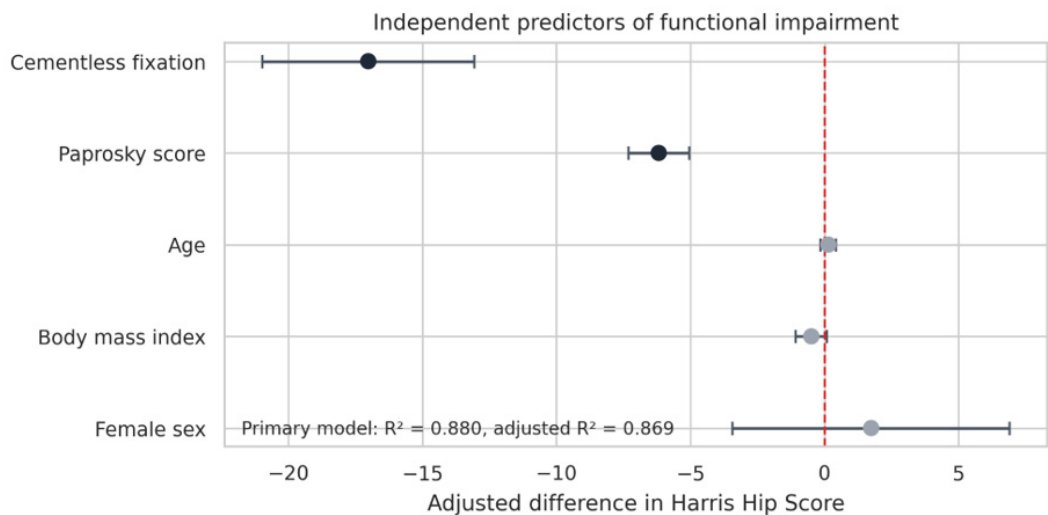


Figure 2. Adjusted coefficients from the primary multivariable model. Negative values indicate lower Harris Hip Score. Paprosky score and cementless fixation were the main independent predictors.

Osteolysis-volume analysis showed clinically meaningful anatomical patterns. In cemented implants, acetabular osteolysis was more closely related to lower Harris Hip Score. In cementless implants, femoral osteolysis was more closely related to lower Harris Hip Score. Figure 3 illustrates these fixation-specific anatomical relationships.

Adding femoral and acetabular osteolysis volumes produced minimal improvement in model performance. The primary model had R^2

$= 0.880$ and adjusted $R^2 = 0.869$. The volume-adjusted model had $R^2 = 0.881$ and adjusted $R^2 = 0.865$. Interaction models did not materially improve adjusted model fit (Table 3).

Sensitivity analyses confirmed that the two main predictors remained stable after excluding influential observations, the highest total-volume case, the lowest Harris Hip Score case, and observations above the 95th percentile of total osteolysis volume (Table 4). Figure 4 summarizes the stability of the main regression coefficients.

Table 3. Regression model performance.

Model	n	R^2	Adjusted R^2	Residual df
Primary adjusted model	60	0.88	0.869	54
Volume-adjusted model	60	0.881	0.865	52
Total-volume model	60	0.882	0.868	53
Fixation x Paprosky model	60	0.88	0.867	53
Fixation x volume model	60	0.884	0.863	50

Note: The primary model included fixation type, Paprosky score, age, body mass index, and sex.

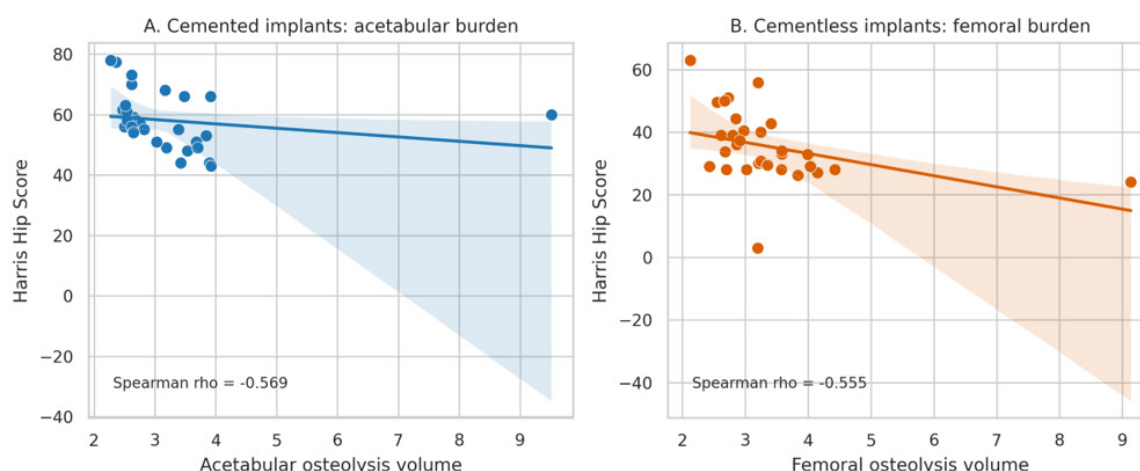


Figure 3. Fixation-specific relationship between osteolysis location and Harris Hip Score. Acetabular osteolysis was emphasized in cemented implants, while femoral osteolysis was emphasized in cementless implants.

Table 4. Sensitivity analysis of the primary adjusted model.

Dataset	n	R^2	Adjusted R^2	B cementless	p cementless	B Paprosky	p Paprosky
Full dataset	60	0.88	0.869	-17.014	<0.001	-6.18	<0.001
Exclude Cook influential rows	56	0.935	0.929	-16.346	<0.001	-5.996	<0.001
Exclude highest total-volume row	59	0.88	0.868	-16.86	<0.001	-6.202	<0.001
Exclude lowest-HHS row	59	0.917	0.909	-17.21	<0.001	-5.833	<0.001
Exclude total volume > 95th percentile	57	0.872	0.86	-16.96	<0.001	-6.269	<0.001

Note: Sensitivity analyses tested the stability of the main predictors after excluding influential or extreme observations.

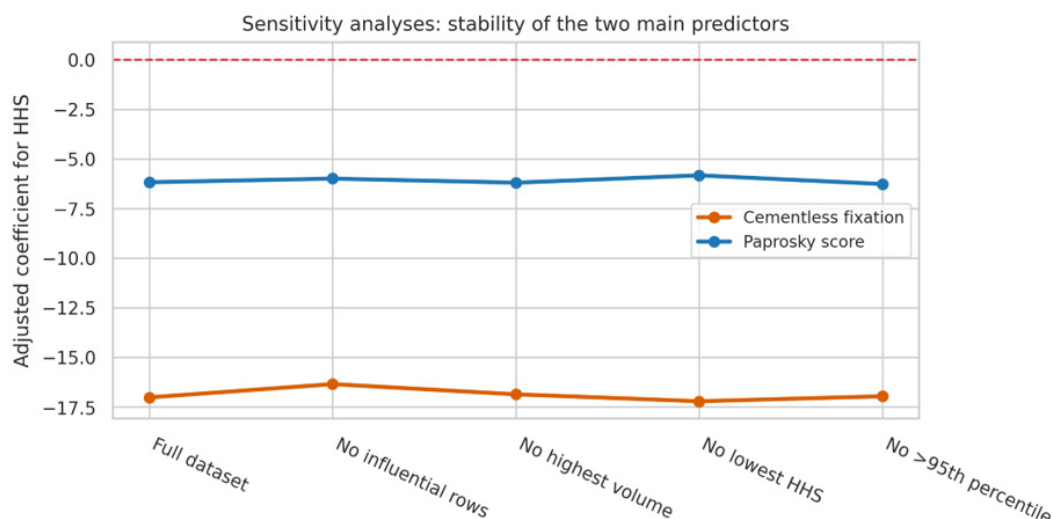


Figure 4. Sensitivity analysis showing stability of the main predictors after exclusion of influential or extreme observations.

DISCUSSION

The present study shows that functional impairment in aseptic loosening after total hip arthroplasty is strongly associated with Paprosky defect severity and fixation type. The main adjusted model explained a large proportion of the variation in Harris Hip Score, and the two dominant predictors were Paprosky score and cementless fixation. This provides a clinically coherent message: functional deterioration in aseptic loosening is not only a consequence of the presence of loosening, but is also related to the severity and anatomical pattern of the structural defect.

Our finding that functional outcome is impaired around the time of revision is consistent with the work of Aghayev et al. [3], who described the course of radiographic loosening, pain, and functional outcome around first revision total hip arthroplasty. Their study emphasized that pain and functional impairment evolve together with radiographic loosening, but do not always progress in a perfectly synchronized manner. The present results extend that concept by showing that, within a revision cohort, the magnitude of preoperative impairment can be partly explained by defect severity and fixation type. Similarly, studies evaluating revision total hip arthroplasty for aseptic loosening have shown that clinical and quality-of-life outcomes

remain important endpoints beyond implant survival alone [1, 2, 6].

Paprosky severity was the strongest independent predictor of Harris Hip Score in our analysis. This is expected from a surgical perspective because the Paprosky system summarizes acetabular bone loss, component migration, column integrity, and reconstructive complexity. Previous literature has mainly used Paprosky classification to guide revision strategy and implant selection [23-27]. Our results suggest that the classification also has functional meaning before revision surgery. In other words, a higher Paprosky category does not only describe a more difficult reconstruction; it is also associated with worse patient function. This is particularly useful for preoperative counseling, risk stratification, and comparison of revision cohorts.

The association between cementless fixation and lower Harris Hip Score should be interpreted carefully. It does not mean that cementless fixation is generally inferior. Modern cementless total hip arthroplasty has well-established advantages, and several reviews focus on improving osseointegration and preventing aseptic loosening in cementless implants [7,8,15]. However, in our revision cohort, failed cementless implants were associated with more severe functional impairment after adjustment for Paprosky severity and demographic variables. This may reflect differences in the pattern of loosening, femoral involvement, implant-bone interface failure, or the

biological behavior of osteolysis in cementless fixation. The result is therefore best understood as a cohort-specific observation about failed implants rather than a general comparison of primary fixation philosophies.

The anatomical pattern of osteolysis is one of the most clinically important findings of the study. In cemented implants, acetabular osteolysis and acetabular zone involvement were more closely related to functional impairment, whereas in cementless implants, femoral osteolysis was more strongly associated with lower Harris Hip Score. This distinction agrees with the broader literature indicating that loosening mechanisms and imaging findings vary according to implant type, fixation method, and component involved [4,5,9,10,18-22]. Studies of acetabular cup loosening after cementless arthroplasty emphasize the importance of imaging signs and component-bone interface changes [6], while other imaging studies have highlighted the value of advanced modalities for detecting subtle loosening and periprosthetic pathology [9,10,18,19]. Our results add a functional dimension by suggesting that the location of bone loss may influence the clinical expression of failure.

The role of computed tomography based volumetric osteolysis assessment should therefore not be judged only by whether it remains independently significant in the final regression model. In our analysis, adding volume variables produced only minimal improvement in model performance once Paprosky score was included. This likely reflects conceptual overlap: both Paprosky classification and osteolysis volume describe structural disease burden. However, they do so differently. Paprosky classification condenses defect severity into a clinically familiar ordinal category, while CT-based volumetry provides continuous quantification and anatomical localization. The latter is especially relevant for surgical planning, implant selection, grafting strategy, and documentation of bone loss progression [5,6,18-22,29-33].

Our results are also in line with literature emphasizing that aseptic loosening is multifactorial. Biological mechanisms related to wear debris, inflammatory tissue response, and osteoclast activation interact with mechanical factors such as micromotion, stress shielding, component position, and implant design [4,11-17,34-38]. Because of this multifactorial background, no single structural variable can be expected to

explain all functional impairment. The high explanatory power of the primary model probably reflects the combined effect of a clinically meaningful defect classification and fixation type, while residual variation may relate to pain sensitivity, muscle function, comorbidities, duration of loosening, abductor insufficiency, spine disease, or other patient-level factors not included in the present analysis.

In contrast to studies focused predominantly on postoperative outcomes following revision total hip arthroplasty [1,2,6,39-41], the present study emphasises the preoperative state. This perspective is clinically important, as preoperative functional impairment may shape patient expectations, rehabilitation potential, and the interpretation of postoperative improvement. Patients presenting with severe Paprosky defects and markedly reduced Harris Hip Score may indeed achieve meaningful gains following revision, yet they may equally face greater surgical complexity and a more protracted recovery trajectory. Building on the present findings, our research group is currently developing a computational platform for the automated detection and volumetric quantification of periprosthetic osteolytic lesions on CT imaging, with the aim of improving the reproducibility and clinical scalability of structural assessment in revision total hip arthroplasty. Future investigations should determine whether the preoperative predictors identified here also predict postoperative functional gain, complication risk, or re-revision.

Taken together, the graphical findings reinforce the statistical results and aid clinical interpretation. Figure 1 demonstrates the progressive decline in Harris Hip Score across Paprosky categories and the consistently lower scores observed in cementless implants. Figure 2 visualises the dominance of Paprosky score and cementless fixation as the principal independent predictors in the adjusted model. Figure 3 highlights the fixation-specific anatomical pattern of osteolysis, showing the predominant acetabular involvement in cemented implants and the predominant femoral involvement in cementless implants. Figure 4 confirms that the principal regression coefficients remain stable following the exclusion of influential or extreme observations, supporting the robustness of the findings.

Several limitations should be acknowledged. First, the retrospective design precludes causal inference. Second, the sample size was

modest, with 30 patients per fixation group, which limits the statistical power of interaction analyses and increases the risk of model instability. Third, osteolysis-volume distributions were skewed and included extreme values, although log transformation, robust standard errors, and sensitivity analyses were employed to mitigate their influence. Fourth, although the cemented cohort comprised a single, identical implant design, the cementless cohort included two stem designs that differed in surface coating and mode of biological fixation; this introduces a degree of within-group device heterogeneity that may exert a residual influence on patterns of femoral load transfer and on the clinical expression of failure. Fifth, formal interobserver and intraobserver reliability of the segmentation and zonal mapping protocol were not quantified within the scope of the present study; a dedicated methodological investigation, including a refined 3D Slicer-based measurement workflow with formal observer-reliability analysis, is currently in preparation by the same research group and will be reported separately. Sixth, the study focused on preoperative function and did not encompass postoperative recovery, implant survival, or longitudinal quality-of-life outcomes. Finally, unmeasured factors such as comorbidities, muscle status, pain duration, bearing surface wear, and component position may also influence Harris Hip Score.

Despite these limitations, the study has several strengths. It combines functional assessment, defect classification, CT-based volumetric osteolysis measurement, anatomical zone mapping, multivariable regression, and sensitivity analysis in a single clinically defined cohort. The consistency of the main findings across descriptive, graphical, adjusted, and sensitivity analyses supports the robustness of the conclusion. The results also provide a useful framework for future prospective studies that combine structural imaging with functional and postoperative outcomes.

CONCLUSION

Functional impairment in aseptic loosening after total hip arthroplasty is primarily associated with Paprosky defect severity and fixation type. Computed tomography based osteolysis

volume and anatomical zone mapping add clinically important structural context, particularly by showing different patterns of acetabular and femoral involvement in cemented and cementless implants. Integrated functional, radiographic, and computed tomography based assessment may improve preoperative revision planning and provide a stronger basis for counseling patients before revision surgery.

Conflict of Interest

The authors declare no conflict of interest.

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Резиме

ФУНКЦИОНАЛНО ОШТЕТУВАЊЕ КАЈ АСЕПТИЧНО РАЗЛАБАВУВАЊЕ НА ТОТАЛНА АРТРОПЛАСТИКА НА КОЛКОТ: УЛОГАТА НА ТЕЖИНАТА НА ДЕФЕКТТОТ, ОПТОВАРУВАЊЕТО ОД ОСТЕОЛИЗА И ТИПОТ НА ФИКСАЦИЈА

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Вовед: Асептичното разлабавување претставува една од водечките причини за неуспех на тоталната артропластика на колкот и останува честа индикација за ревизиската хируршка процедура. Меѓусебниот однос меѓу степенот на функционалното оштетување, тежината на структурните промени и типот на примарната фиксација е клинички значаен, но сè уште не е доволно квантитативно определен.

Цел: Да се испита дали резултатот на Харисовата скала за колк (Harris Hip Score) е независно поврзан со тежината на коскениот дефект според класификацијата на Папроски (Paprosky), со волуменот на остеолизата проценет преку компјутеризирана томографија, со анатомската распределба на остеолитичните лезии и со типот примарна фиксација кај пациентите подложени на ревизија поради асептично разлабавување.

Материјал и методи: Во ретроспективната компаративна анализа беа вклучени 60 пациенти ревидирани поради асептично разлабавување, поделени во две еднакви групи од по 30 пациенти со цементна и со бесцементна примарна фиксација. Функционалниот статус, изразен преку Харисовата скала за колк, беше анализиран во однос на типот на дефектот според Папроски, на феморалниот, на ацетабуларниот и на вкупниот волумен на остеолиза, како и на зафатеноста на Груеновите (Gruen) феморални зони и на ацетабуларните зони на ДеЛи и Чарнли (DeLee and Charnley). Беа спроведени мултиваријантна линеарна регресија, модели со интеракции, сензитивни анализи и дијагностика на влијателни опсервации со примена на IBM SPSS Statistics, верзија 30 (IBM Corp., Armonk, NY, САД).

Резултати: Харисовата скала за колк беше значително пониска кај пациентите со бесцементна фиксација отколку кај оние со цементна фиксација ($35,4 \pm 11,42$ наспроти $57,95 \pm 9,24$; $p < 0,001$), а функционалниот скор покажа постојано опаѓање со зголемување на тежината на дефектот според Папроски. Во основниот приспособен модел, скорот по Папроски беше независен предиктор на пониски вредности на Харисовата скала ($B = -6,18$; $p < 0,001$), додека бесцементната фиксација остана независно поврзана со пониски функционални вредности ($B = -17,01$; $p < 0,001$). Моделот објасни 88 % од варијабилноста на функционалниот скор. Воведувањето на варијабилите за волумен на остеолиза резултираше со само минимално подобрување на предиктивната моќ на моделот, додека сензитивните анализи ја потврдија стабилноста на главните предиктори.

Заклучок: Функционалното оштетување кај асептичното разлабавување по тотална артропластика на колкот е најсилно детерминирано од тежината на коскениот дефект според класификацијата на Папроски и од типот примарна фиксација. Волуметриската процена на остеолизата преку компјутеризирана томографија и анатомското мапирање на зоните обезбедуваат дополнителни структурни информации со практична вредност при планирањето на ревизиската операција.

Клучни зборови: асептично разлабавување, тотална артропластика на колкот, Харисова скала за колк, остеолиза, ревизиска артропластика