Original Paper

Preoperative Oral Health Screening in Patients Undergoing Hip and Knee Arthroplasty: A Cross-Sectional Study

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ABSTRACT: Aim of study was to assess the prevalence and distribution of oral infections potentially leading to bacteriemia in patients scheduled for hip and knee arthroplasty. Materials and Methods: This prospective research was performed on a study group of 51 patients (mean age 67.51+/-5.78 years; 21-males, 30-females) diagnosed with hip osteoarthritis and knee osteoarthritis, scheduled for hip or knee arthroplasty in Clinical Rehabilitation Hospital (Iasi, Romania). A dental specialist performed a standardized clinical and paraclinical intraoral examination on all patients. The following conditions were assessed as oral sources of infection: chronic periapical lesions, endo-periodontal lesions, deep periodontal pockets, residual roots, fixed prosthetic restorations with inadequate marginal adaptation. Results: All patients were diagnosed with periodontal disease. Chronic periapical lesions (23.5%) and endo-periodontal lesions (41.2%) were frequently in maxillary molars. Residual roots were detected in 84.3% of patients (mostly in mandibular molars) while ill-fitting fixed prosthetic restorations in 64.7% of patients. Periodontal treatment of deep periodontal pockets was the most commonly treatment need, followed by replacement of ill-fitted fixed prosthetic restorations, and tooth extraction. Conclusions: Oral infectious foci-associated pathologies were frequent among patients scheduled for hip or knee arthroplasty, with deep periodontal pockets being the most frequent source of oral infection, followed by residual roots and ill-fitted fixed prosthetic restorations. Our results emphasize the necessity of the preoperative oral health evaluations for patients scheduled for hip and knee arthroplasty, a therapeutic approach required especially in the case of those with comorbidities or with risk of systemic bacteriemia of dental origin.

KEYWORDS: *Hip arthroplasty, knee arthroplasty, dental focus, infection, periprosthetic joint infection.*

Introduction

End-stage degenerative joint disease is a frequent diagnosed pathology in ageing patients [1].

Hip (THA) and knee (TKA) total joint arthroplasty are effective techniques in restoring joint functions for this category of patients with excellent medium and long-term outcome [2].

However, complications can occur, periprosthetic joint infection (PJI) diagnosed in 1-2% of total joint arthroplasties, being the most frequent cause of failure [3].

PJI occur 0.5% and 2% in total knee arthroplasty (TKA) [4,5], and between 0.5%-1% in hip artrhroplasty [5,6].

The greatest incidence of PJI occurs during the first two years post-surgery [6].

At 15-year follow-up, the cumulative incidence of TKA was 6.1%, while the risk of revision or reoperation due to PJI was 2.0% [7].

A research group reported that, when compared to aseptic revision TKA, PJI revisions increase the risk of death between 3.25 times [8] and 3.52 times [9].

Thus, revision TKA due to PJI lead to greater risk of short-term morbidity and mortality and also imposes high costs and use of healthcare resources.

Other complications include disability, reinfection, and disarticulation [10].

In this context, prevention of PJI is crucial, including preoperative patient optimization, medical optimization, antibiotic prophylaxis [11].

Despite increased awareness on necessity to prevent PJI, it was not reached a significant decrease of PJI prevalence, although mortality after PJI has declined [12].

In order to reduce the incidence of PJI, patients must be screened preoperatively, while postoperative sepsis prophylaxis must include the detection and treatment of remote infections, including oral infections (other origins are skin, respiratory, gastrointestinal, and urogenital infections) [13].

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In this context, health authorities and organizations worldwide emphasize the importance of oral health as a key component of overall well-being, advocating for the integration of dental care into general health care practices [14,15].

However, compartmentalized care culture, unclear responsibilities, poor awareness and low prioritization by care providers and patients were recognized as issues that must be addressed to improve the integration of oral healthcare in general (basic) health care [16].

These subthemes, all focusing on the low-level AD facilities, were leadership intervention, supportive personality of the caregivers, and ownership of patients.

In the last two decades, the role of oral health in preoperative care has gained growing recognition in patients undergoing joint arthroplasty procedures such as THA and TKA replacements.

This shift highlights a broader awareness of the connection between oral health and general health.

The available literature on the involvement of oral pathogens in the PJI etiology is inconsistent, with estimated incidence ranging from 0.03%-0.04% [17,18] to 6%-13% [11,19,20].

The aim of study was to assess the prevalence and distribution of oral infections potentially leading to bacteriemia in patients scheduled for hip and knee arthroplasty.

Material and Methods

This prospective research was performed on a study group of 51 patients (mean age 67.51+/-5.78 years; 21-males, 30-females) diagnosed with hip osteoarthritis and knee osteoarthritis, scheduled for hip or knee arthroplasty in Clinical Rehabilitation Hospital (Iasi, Romania).

Inclusion criteria were: age of over 50 years, diagnosis of hip or knee osteoarthritis, scheduled for primary total hip or knee arthroplasty, availability of complete medical and dental records.

Exclusion criteria were: revision arthroplasty or previous joint prosthesis, presence of active systemic infection at the time of evaluation, known immunosuppressive conditions such as HIV infection or ongoing chemotherapy, complete edentulism, and absence of preoperative dental documentation or incomplete medical records.

The research was carried out in accordance with the ethical principles of the Declaration of Helsinki and received approval from the Ethics Committee of Clinical Rehabilitation Hospital Iasi (463/4.07.2024).

All patients were informed about the study objectives and provided written informed con-sent.

Table 1 shows features of the study group. The study group included a total of 51 patients.

Of these, 21 (41.2%) were male and 30 (58.8%) were female.

Regarding place of residence, 30 patients (58.8%) lived in urban areas, while 21 (41.2%) came from rural environments.

Table 1. Features of study group.

		n	%
Sex	Male	21	41.2
	Female	30	58.8
Residence	Urban	30	58.8
	Rural	21	41.2
Age group	50-65 years	21	41.2
	over 65 years	30	58.8
Smoker	NO	39	76.5
	YES	12	23.5
Systemic pathology	NO	23	45.1
	YES	28	54.9
Obesity	NO	13	25.5
	YES	38	74.5
Orthopedic diagnostic	Hip osteoarthritis	21	41.2
	Knee osteoarthritis	30	58.8
Scheduled surgery	Arthroplasty right knee	22	43.1
	Arthroplasty left knee	8	15.7
	Arthroplasty right hip	13	25.5
	Arthroplasty left hip	8	15.7
OHI Index	0	4	7.8
	1	12	23.5
	2	35	68.6
Total		51	100.0

In terms of age distribution, 21 patients (41.2%) were between 50 and 65 years old, and 30 patients (58.8%) were over 65 years of age.

With respect to smoking status, 12 patients (23.5%) were active smokers, while the majority-39 patients (76.5%)-were non-smokers.

Systemic comorbidities were present in 28 individuals (54.9%), whereas 23 (45.1%) had no reported systemic conditions.

Obesity was recorded in 38 patients (74.5%), while 13 (25.5%) had a normal body mass index.

In terms of orthopedic diagnosis, 21 patients (41.2%) were diagnosed with hip osteoarthritis, and 30 (58.8%) with knee osteoarthritis.

The distribution of planned surgeries was as follows: 22 patients (43.1%) were scheduled for right knee arthroplasty, 8 (15.7%) for left knee arthroplasty, 13 (25.5%) for right hip arthroplasty, ad 8 (15.7%) for left hip arthroplasty.

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Oral hygiene status, was assessed by the Oral Hygiene Index (OHI).

OHI is calculated by combination of debris index (DI) and calculus index (CI).

Each index evaluates the amounts of debris or calculus on the dental buccal and lingual surfaces.

DI and CI are quantified by a 4-point scale (0,1,2,3) with an appropriate score assigned to each [21].

OHI revealed that 4 patients (7.8%) had a score of 0 (excellent hygiene), 12 patients (23.5%) had a score of 1 (good hygiene), and 35 patients (68.6%) had a score of 2 (poor hygiene).

The analyzed data were collected from anamnesis, clinical and paraclinical orthopedic assessment and dental consultation.

Diagnosis of Hip and Knee Osteoarthritis

Hip and knee osteoarthritis (OA) was diagnosed by an orthopedic surgeon based on clinical and radiographic criteria.

Clinical diagnosis included chronic joint pain, stiffness, restricted joint mobility, and crepitus during movement. Radiographic diagnosis was based on the Kellgren-Lawrence classification.

Eligible subjects were on the waiting list for primary total hip or knee arthroplasty due to unresponsive end-stage symptomatic OA unresponsive to conservative [22].

Diagnosis of oral pathology (foci of dental infection)

A dental specialist performed a standardized clinical and paraclinical intraoral examination on all patients.

Clinical oral examination consisted of visual and tactile examination performed under adequate lighting and aseptic conditions.

Examination for subclinical lesions was documented using radiographic imaging (panoramic radiographs, periapical radiography).

The following conditions were observed as sources of oral infection:

Chronic periapical lesions (CPLs).

The periapical lesions were located at the apex of the affected tooth and exhibited a well-defined, corticated peripheral border.

Radiographically, the CPL had a curved or circular shape and a radiolucent internal structure, consistent with a chronic inflammatory process [23].

Endo-perio lesions *(EPLs)*-identified by combining clinical findings (deep periodontal pockets extending to or near the apex, presence of pus drainage, increased mobility) with radiographic evidence of vertical bone loss along the root and/or periapical radiolucency [24].

EPLs diagnostic was based on major diagnostic criteria: (1) periodontal probing depth (PPD)≥4mm, (2) clinical attachment loss (CAL)≥3mm, and (3) patients with pulp symptoms, such as spontaneous pain history or negative or altered pulp vitality tests [25].

Pulp vitality testing and percussion sensitivity were used as complementary diagnostic tools.

All radiographic assessments were performed using standardized digital periapical radiographs.

Periodontal disease

The anamnestic data were collected from patient files, while clinical and radiographic oral examinations were performed before scheduling patient for arthroplasty.

The periodontal clinical parameters were PPD (periodontal pocket depth) and BOP (bleeding on probing).

PPD were measured at 4 sites of all teeth using a manual periodontal probe (Click-Probe®, Kerr, Bioggio, Switzerland). PPD≥4mm were considered foci of dental infection.

Marginal bone loss (MBL) was evaluated on orthopantomograms with a millimeter graded ruler under ×2 magnification using a magnifying viewer.

The marginal bone level distance was measured from the cemento-enamel junction (CEJ) to the alveolar bone crest, at the mesial and distal proximal tooth sites, values being rounded off to the nearest 0.1mm.

It was recorded also the stage and grading of periodontal disease according to the 2017 World Workshop on the Classification of Periodontal and Periimplant Diseases, as follows: staging (I, II, III and IV) and grading (A, B and C) (Tonetti et al., 2018) [26,27].

Advanced periodontal disease in stages III or IV (grades B/C) were considered oral sources of infection.

Root remnants-residual root fragments, either untreated or previously treated, or fractured roots left in the alveolar socket after extraction, and found to be associated with chronic periapical infection.

Fixed prosthetic restorations with inadequate marginal adaptation and active periodontal pockets-detected through clinical

examination by an explorer and confirmed by radiographic assessment; also, considered at risk for secondary caries or apical chronic inflammatory response [28].

The dental treatment needs were assessed based on the clinical and radiographic identification of specific oral pathologies, including the treatment of deep complicated and non-complicated carious lesions, periapical pathology, the necessity for endodontic retreatment, treatment of endo-periodontal lesions, root extractions (due to residual root fragments or advanced dental mobility), non-invasive or surgical treatment of periodontal disease, as well as replacement of fixed prosthetic restorations with poor marginal adaptation.

Statistical analysis

Patient information was collected and included sociodemographic data (age, sex, place of residence), lifestyle factors (smoking status), and relevant systemic medical history (e.g., diabetes, cardiovascular disease, rheumatoid arthritis).

Sources of dental infection were recorded per patient and per tooth, and their distribution was analyzed by tooth group (anterior vs. posterior), jaw location (maxillary vs. mandibular), and type of lesion. Statistical analysis was carried out using SPSS 29.0.

The frequency and percentage of foci of dental infection were calculated for the overall group.

The quantitative variables (age, number of remnant teeth and infected teeth) were characterized through descriptive statistics.

The sources of oral infection were compared by tooth group and jaw location using the McNemar non-parametric test for proportions.

A p-value<0.05 was considered statistically significant and a p-value <0.01 was considered statistically highly significant.

Instruments, devices, software

Clinical oral examination was carried out with standard dental instruments (mouth mirror, explorer, tweezers) (*Aesculap AG*, Tuttlingen, Germany).

The periodontal examination was performed using a manual periodontal probe (*Click-Probe*®, Kerr, Bioggio, Switzerland), calibrated in millimeters for measuring pocket depth.

Radiographic imaging included standardized panoramic and periapical radiographs obtained with a digital dental X-ray unit (*Planmeca ProX*®, Planmeca Oy, Helsinki, Finland).

Marginal bone loss (MBL) was assessed using a millimeter-graded ruler under ×2 magnification with a handheld magnifier (*Eschenbach Mobilux LED Magnifier*, Eschenbach Optik, Nuremberg, Germany).

Statistical analysis was performed using *IBM SPSS Statistics for Windows, Version 29.0* (IBM Corp., Armonk, NY, USA).

Results

The study group of patients scheduled for hip or knee arthroplasty had a mean of 16.69±6.03 remaining teeth per patient, of which an average of 5.24±2.30 teeth were identified as foci of dental infection (Table 2).

Table 2. Foci of dental infection (mean values/patient).

	N	Mean	Std. dev.	Minimum	Maximum	Median
Remnant teeth	51	16.69	6.025	4	28	17.00
Dental foci of dental infection	51	5.24	2.303	0	10	5.00

The tables 3-6 show prevalence and distribution of foci of oral infections.

In the study group of 51 patients, CPLs were identified in 12 individuals, representing 23.5% of the total, while 39 patients (76.5%) showed no signs of such pathology.

With respect to dental group, CPLs were most frequently located in molars, accounting for 25.5% of cases, while premolars were affected in 7.8% of cases; no lesions were observed in anterior teeth.

Regarding jaw distribution, lesions were predominantly found in the maxilla (33.3%), with only 7.8% located in the mandible.

All the recorded differences between the CPL ratios were statistically highly significant (Table 3).

In the study group of 51 patients, endo-periodontal lesions were identified in 21 individuals, representing 41.2% of the total, while 30 patients (58.8%) showed no evidence of such pathology.

In terms of tooth group distribution, the lesions were most commonly found in molars

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(23.5%) and less frequently in anterior teeth (7.8%), with no cases identified in premolars.

Regarding jaw localization, the maxilla was more frequently affected, with 23.5% of lesions, compared to 7.8% in the mandible.

All the recorded differences between the endo-periodontal lesions ratios were statistically highly significant (Table 4).

In the study group of 51 patients, residual roots were identified in 43 individuals, accounting for 84.3% of the total, while only 8 patients (15.7%) showed no such findings.

With respect to the dental group involved, residual roots were most frequently found in molars (33.3%) and premolars (23.5%), with no cases observed in anterior teeth.

As for jaw distribution, the mandible was more commonly affected, with 41.2% of cases, compared to 15.7% in the maxilla.

All the recorded differences between the residual roots ratios were statistically highly significant (Table 5).

In the study group of 51 patients, fixed prosthetic restorations (FPR) with poor marginal adaptation were identified in 33 individuals, representing 64.7% of the total, while 18 patients (35.3%) had no such prosthetic issues.

Regarding the distribution by dental group, the anterior teeth were most commonly affected, with 56.9% of cases, while only 7.8% involved molars.

In terms of jaw localization, the maxillary areas were significantly more affected, with 56.9% of cases, compared to just 7.8% in the mandible.

Again, these identified differences in ratios were evaluated as statistically highly significant (Table 6).

Table 3. Prevalence of chronic periapical lesions (at patient level).

Chronic periapical lesions (CPL):		n	%	McNemar test:	Z	p-value
Study group	YES	12	23.5			
Dental group:						
Anterior		-	-	Anterior vs. Premolars	17.493	<0.001**
Premolars		4	7.8	Anterior vs. Molars	16.971	<0.001**
Molars		13	25.5	Premolars vs. Molars	-2.777	0.005**
Location (Mx/Md):						
MX		17	33.3	Maxillar vs. Mandible	3.569	<0.001**
MD		4	7.8			
Total		51	100.0			

Table 4. Prevalence of endo-periodontal lesions (at patient level).

Endo-periodontal lesions:		n	%	McNemar test:	Z	p-value
Study group	YES	21	41.2			
Dental group:						
Anterior		4	7.8	Anterior vs. Premolars	-17.493	<0.001**
Premolars		-	-	Anterior vs. Molars	-2.828	0.005**
Molars		12	23.5	Premolars vs. Molars	17.029	<0.001**
Location (Mx/Md):						
MX		12	23.5	Maxillar vs. Mandible	2.828	0.005**
MD		4	7.8			
Total		51	100.0			

Table 5. Prevalence of residual roots (at patient level).

Residual roots:		n	%	McNemar test:	Z	p-value
Study group	YES	43	84.3			
Dental group:						
Anterior		-	-	Anterior vs. Premolars	17.146	<0.001**
Premolars		12	23.5	Anterior vs. Molars	16.432	<0.001**
Molars		17	33.3	Premolars vs. Molars	-3.207	0.001**
Location (Mx/Md):						
MX		8	15.7	Maxillar vs. Mandible	-5.345	<0.001**
MD		21	41.2			
Total		51	100.0			

Table 6. Fixed prosthetic restorations (FPR) with poor marginal adaptation (at patient level).

FPR with poor marginal adaptation:		n	%	McNemar test:	Z	p-value
Study group	YES	33	64.7			
Dental group:						
Anterior		29	56.9	Anterior vs. Molars	6.155	<0.001**
Molars		4	7.8			
Location (Mx/Md):						
MX		29	56.9	Maxillar vs. Mandible	6.155	<0.001**
MD		4	7.8			
Total		51	100.0			

In the study group of 51 patients, periodontal disease showed a high prevalence across various dental and anatomical locations.

The anterior teeth were most frequently affected, with 84.3% involvement, followed by molars at 68.6% and premolars at 43.1%.

Regarding jaw distribution, periodontal involvement was equally present in both the maxilla (MX) and mandible (MD), each accounting for 76.5% of cases.

These differences between the periodontal disease prevalence related to the assessed parameters were again classified as statistically highly significant.

When analyzing the number of sites with probing pocket depth (PP) greater than 4mm, 4 patients (7.8%) had one such site, 5 patients (9.8%) had two, 16 patients (31.4%) had three, 9 patients (17.6%) had four, 13 patients (25.5%) had five, and 4 patients (7.8%) had six affected sites.

In terms of periodontitis staging, most patients were classified as stage 3 (74.5%), followed by stage 4 (17.6%) and stage 2 (7.8%).

Regarding progression (grade), most patients fell into grade B (58.8%), 33.3% into grade C, and 7.8% into grade A (Table 7).

Table 7. Prevalence of periodontal disease (at patient level).

Periodontal disease:	n	%	McNemar test:	Z	p-value
Study group	51	100%			
Dental group:					
Anterior	43	84.3	Anterior vs. Premolars	6.548	<0.001**
Premolars	22	43.1	Anterior vs. Molars	3.988	<0.001**
Molars	35	68.6	Premolars vs. Molars	-3.024	0.002**
Location (Mx/Md):					
MX	39	76.5	Maxillar vs. Mandible	2.822	0.005**
MD	39	76.5			
PP>4mm (number):					
1	4	7.8			
2	5	9.8			
3	16	31.4			
4	9	17.6			
5	13	25.5			
6	4	7.8			
Stage:					
2	4	7.8			
3	38	74.5			
4	9	17.6			
Grade (Progression):					
A	4	7.8			
B	30	58.8			
C	17	33.3			
Total	51	100.0			

Among patients scheduled for hip or knee arthroplasty, 17.6% presented with periapical lesions requiring endodontic treatment.

Endodontic retreatment was indicated in 23.5% of cases, while same percentage of patients (23.5%) were diagnosed with endo-periodontal lesions requiring complex therapy.

Tooth extractions were necessary in 33.3% of patients due to residual root fragments and in 41.2% of cases due to advanced dental mobility.

Periodontal treatment was the most common treatment need, being identified in 92.2% of

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patients, while 74.5% required the replacement of fixed prosthetic restorations due to poor marginal adaptation or secondary complications (Table 8).

Table 8. Need for dental treatment in patients scheduled for hip/knee arthroplasty.

	n	%
Treatment of periapical lesions	9	17.6
Endodontic retreatment	12	23.5
Treatment of endo-periodontal lesions	12	23.5
Extraction (radicular rest)	17	33.3
Extraction (advanced dental mobility)	21	41.2
Periodontal treatment	47	92.2
Replacement of fixed prosthetic restoration	38	74.5
Total	51	100.0

In our study, 91% of all patients had oral pathology associated to infectious dental sources.

According to necessities of dental treatment to remove sources of oral infections, 33.3% of patients required treatment for deep carious lesions, 17.6% for periapical lesions, 23.5% needed endodontic retreatment, and 23.5% required treatment for endo-periodontal lesions.

Extractions due to residual roots were indicated in 33.3% of cases, while 41.2% needed extractions due to advanced dental mobility.

Periodontal treatment was necessary in 92.2% of patients, while 74.5% required replacement of fixed prosthetic restorations.

The mean age of patients eligible for arthroplasty as well as ratio between females and males were very similar to that provided by Dye et al. (2015) and other research groups.

Also, diabetes and osteoarthritis were encountered in our study group.

Older adults (mean age 67 years), the category most affected by hip or knee osteoarthritis, has a high prevalence of dental caries and radicular rests [29].

Most TKAs were performed in female patients (59.5%) and patients aged 65 to 74 years (39.9%) [30].

A research group reported a percentage of 56% of patients with PJI after hip and knee arthroplasty presenting comorbidities, such as diabetes or rheumatoid arthritis [31].

The results of this research demonstrated a high rate of chronic infectious oral pathologies among patients admitted for hip and knee arthroplasty.

Chronic periapical lesions (23.5%) and endo-periodontal lesions (41.2%) were common, most often found in posterior teeth and predominantly in the maxilla.

These sites typically involve roots with complex anatomy, which are more prone to retained or undiagnosed pathology, providing a strong argument for careful radiographic evaluation of molar teeth prior to surgery.

Residual roots were identified in the majority of patients (84.3%), commonly in the molar/premolar regions, indicating incomplete dental treatment or neglected chronic infections.

The high prevalence of these residual tissues, especially in the mandible, highlights the risk of asymptomatic periapical infections that may serve as hematogenous PJI sources if left untreated.

Fixed prosthetic restorations with inadequate marginal fit were observed in two-thirds of the patients (64.7%) and were mainly localized in the anterior maxillary region.

These restorations can serve as reservoirs for bacterial biofilm and are often overlooked during routine dental examinations, emphasizing the importance of thorough prosthetic evaluation during the preoperative phase.

The most prevalent condition was periodontal disease, affecting more than 90% of patients, with a significant proportion classified as stage 3 (74.5%) and grade B (58.8%).

Given the involvement of multiple sites in both the maxilla and mandible and the high number of probing pockets over 4mm, this reflects an advanced and generalized periodontal burden.

Such a condition not only compromises oral health but may also contribute to systemic inflammation and influence surgical risk assessment.

Oral pathology has been described in 12-23% of the patients on the waiting list for hip or knee surgery [30,31].

It was reported a higher prevalence (30-50%) of the oral pathology among the aged population in the United States [31].

Untreated dental caries were more frequent in some subgroups such as institutionalized elderly, smokers, people who consume frequently carbonated beverages, those diagnosed with diabetes or low socioeconomical groups.

Tokarski et al. (2014) suggested that dental clearance should only be specifically necessary for a more limited group of patients, and proposed their selection by a preoperative screening questionnaire before hip or knee arthroplasty [32].

They found that 12% of patients needed dental extraction and/or endodontic treatment,

while 19% requested also treatment of dental caries.

The same research group found risk factors associated to infectious dental sources as follows: old age (30-50% of older patients present some form of dental disease and increased susceptibility to infection [32]), smokers (significant risk of caries and need of endodontic treatment or dental extractions due to active dental infections, prompting the need for dental screening of smokers [32]), history of treated dental pathology (i.e., extractions, poor oral hygiene) [32], not using a dental floss daily [32], and non-regular dental visits in last year [32].

In our study, the prevalence of periodontal disease was highly prevalent among this category of patients while its presence was associated with high mean values of OHI.

A research group investigating 137 (60.1%) patients allocated for hip replacement and 91 (39.9%) allocated for knee replacement (mean age 66.8±12.2 years; 36.4% men, 63.6% women) found clinically relevant diseases in 28.5% of patients.

All of the patients had periodontal disease while most of them had poor oral hygiene [33].

Periodontal disease has been linked to diabetes, which can further complicate perioperative management of knee or hip arthroplasty.

Diabetes increases the risk of chronic inflammation around prosthesis (aseptic loosening), which can lead to complications and revision of hip and knee arthroplasty [34,35].

The extent of periodontitis has been associated with an increased risk of progressing to diabetes mellitus (DM) [36].

Periodontal treatment increases glycemic control through reduction of systemic inflammation, particularly the circulating levels of pro-inflammatory factors such as TNF-α and IL-6 [37].

Thus, integrating periodontal evaluation into the standard care of patients with diabetes and strengthening collaboration between dental and medical practitioners can help reduce endogenous risk factors for both metabolic and postsurgical complications.

Vuorinen et al. (2018) performed a study on a group of 952 patients undergoing elective joint arthroplasty.

Oral health status was evaluated and patients were asked for possible risk factors for dental infections.

It was reported a percentage of 29.4% diagnosed with infectious dental sources.

Endodontic pathology requesting treatment was found in 4.4% of patients, while 5.1% were diagnosed with severe periodontitis.

Independent risk factors of dental infectious pathology were as follows: history of root canal therapy, smoking, and dental visit in the past 6 months, while regular visits to a dentist were a protective factor [38].

Research groups reported variable data regarding the potential of bacteremia resulting from foci of oral infections to lead to postoperative complications.

A research group estimated that 11% of the reported infections and 0.2% of all total knee arthroplasy surgeries were associated to PJI of dental origin during the study timeframe [38].

Other research groups concluded that PJI risk in this category of patients was not increased following dental procedures and was unaffected by antibiotic prophylaxis [40-43].

However, seven case-control studies, in patients scheduled to hip arthroplasty, reported infections associated to non-invasive (dental scaling and polishing) or invasive (dental extraction) dental procedures [44-50].

Also, routine oral hygiene procedures, such as tooth brushing or dental flossing can introduce bacteria into the bloodstream, potentially increasing the risk of PJI [51,52].

Considering the burden of infectious dental sources in patients scheduled for hip and knee arthroplasty as reported by our study and the literature data, we consider that comprehensive dental examination and treatment planning may be an integral preparation for all arthroplasty patients.

In daily practice this is not a common approach due to the significant implications for patients in terms of expenses and inconvenience.

This highlights the necessity of at least a limited medical screening performed by the orthopedic surgeon to ascertain relevant risk factors and, if necessary, to refer the patient for an appropriate dental assessment [54].

Preoperative dental screening is regarded as a necessary stage, especially in patients with comorbidities and risk factors of PJI. Preoperative dental treatment is indicated for some oral pathologies (dental infections, teeth to be extracted, root canal treatment, severe periodontal disease, extended carious lesions).

After clearance of the oral cavity, the patient can then go on to arthroplasty of the joint. If no risk factors are present, the patient can be

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scheduled for joint replacement without dental therapeutic intervention [53].

The American Joint Replacement Registry (AJRR) supports proper oral health management in individuals undergoing orthopedic surgeries to minimize the risk of PJI [54].

A research group reported that most frequent dental treatments given before orthopedic surgery (to eliminate foci of dental infection) include scaling-polishing (38% of cases), dental extraction (24% of cases), and dental coronal restoration (18% of cases) [55].

Also, Barrere et al. (2019) recommend to preoperative dental assessment to support proper oral hygiene as well as to reduce the infectious risk factors in patients scheduled for hip and knee arthroplasty [55].

The combined management of patients by the orthopedic surgeon and the dentist is necessary to detect oral infection sites such as severe periodontal disease (deep periodontal pockets), or teeth that are in need of extraction or endodontic therapy before elective arthroplasty.

A universal preoperative dental assessment checklist has the potential to minimize the risk factors for PJI, particularly in patients with multiple comorbidities.

Multidisciplinary processes might require the sharing of electronic health records and routine consultations among specialists for better coordination of care.

A preventive approach to oral health becomes important, helping to avoid postoperative infection.

Standard communication between orthopedic surgeons, dentists, and other health care professionals must be established for coordinated care.

Conclusions

The findings of this study indicate a high frequency of foci of dental infection in patients awaiting hip or knee replacement surgery. Pathologies linked to oral infection were variable in type and distribution, with periodontal disease the most common condition.

Chronic periapical and endo-periodontal lesions were also frequently found, mostly in maxillary molars.

Residual roots (mostly in mandibular arch) as well as maxillary poorly adapted prosthetic restorations were the also common findings associated to oral infection sources.

The periodontal treatment was the most frequent required followed by replacement of fixed prosthetic restorations and teeth extraction due to severe mobility.

These data endorse the need for an organized preoperative dental examination for patients who are to be treated with hip or knee arthroplasty, with special emphasis on periodontal examination, endodontic status, and prosthetic evaluation in order to eliminate oral infection sites and reduce potential postoperative complications.

Author Contributions

Conceptualization, D.N.M., N.F.; Methodology, D.N.M., P.D.S., N.F., N.F..; Investigation, D.N.M., L.S., N.F; Data analysis, C.D..; Manuscript writing and initial draft preparation, D.N.M., N.F.; Manuscript review and editing, L.S., N.F.; Supervision, L.S., N.F. All authors read and approved the final manuscript.

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Conflicts of interest

The authors declare no competing interests.

Institutional Review Board

The study was conducted according to the guidelines of the Declaration of Helsinki; the study and the protocols utilised therein were approved by the Ethics Comitee of Clinical Recovery Hospital Iasi (463/04.07.2024).

Consent Statement

All human subjects involved in this study provided a written informed consent prior to participation, including the consent of publishing their anonymized data.

Data availability

All data presented in the manuscript are available from the authors upon request.

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