

Impact of using a local protocol for preoperative screening exams in hip arthroplasty surgeries: cross-sectional study

Impacto do uso de protocolo local para exames de triagem pré-operatória em cirurgias de artroplastia do quadril: estudo transversal

Impacto del uso de un protocolo local para los exámenes preoperatorios de cribado en cirugías de artroplastia de cadera: estudio transversal

DOI:10.34119/bjhrv7n3-391

Submitted: May 17th, 2024

Approved: Jun 07th, 2024

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ABSTRACT

Purpose: To evaluate the adoption of a protocol for patients undergoing primary total hip arthroplasty (PTA). **Methods:** 72 medical records of patients undergoing ATPQ were evaluated between 2016 and 2022. This is a cross-sectional retrospective study. The eligible patients were divided into two groups: group 1 – 36 arthroplasties before the adoption of the protocol; group 2 – 36 arthroplasties after the adoption of the protocol. Statistical analysis was performed using SPSS 13.0. **Results:** The mean age of the patients was 61 ± 11.7 years, being 42 males and 30 females. Pre-existing comorbidities were: systemic arterial hypertension (58%) and diabetes (18%) patients. The dominant side was operated on in 65% of cases. Patients were treated with cementless prosthesis (54%) of the cases and with hybrid prosthesis (40.3%). Only nine (12.5%) patients had infection. A significant difference was observed with the presence of infection in the group after the implementation of the protocol with a lower incidence. There was a lower infection rate in group 2 submitted to the application of the protocol, however, statistically the significance was not confirmed. **Conclusion:** It is concluded that the design of the institutional protocol has the potential to reduce postoperative infections in hip arthroplasty surgeries.

Keywords: arthroplasty, hip prosthesis, osteoarthritis, hip, complications.

RESUMO

Objetivo: Avaliar a adoção de protocolo para pacientes submetidos à artroplastia total primária do quadril (ATP). **Métodos:** Foram avaliados 72 prontuários de pacientes submetidos a ATPQ entre 2016 e 2022. Trata-se de um estudo transversal retrospectivo. Os pacientes elegíveis foram divididos em dois grupos: grupo 1 – 36 artroplastias antes da adoção do protocolo; grupo 2 – 36 artroplastias após adoção do protocolo. A análise estatística foi realizada no SPSS 13.0. **Resultados:** A média de idade dos pacientes foi de $61 \pm 11,7$ anos, sendo 42 do sexo masculino e 30 do sexo feminino. As comorbidades pré-existentes foram: hipertensão arterial sistêmica (58%) e diabetes (18%). O lado dominante foi operado em 65% dos casos. Os pacientes foram tratados com prótese não cimentada (54%) dos casos e com prótese híbrida (40,3%). Apenas nove (12,5%) pacientes apresentaram infecção. Foi observada diferença significativa com a presença de infecção no grupo após a implantação do protocolo com menor incidência. Houve menor taxa de infecção no grupo 2 submetido à aplicação do protocolo, porém estatisticamente a significância não foi confirmada. **Conclusão:** Conclui-se que o desenho do protocolo institucional tem potencial para reduzir infecções pós-operatórias em cirurgias de artroplastia de quadril.

Palavras-chave: artroplastia, prótese de quadril, osteoartrite, quadril, complicações.

RESUMEN

Objetivo: Evaluar la adopción de un protocolo para pacientes sometidos a artroplastia total de cadera (ATC) primaria. **Métodos:** Se evaluaron 72 historias clínicas de pacientes sometidos a ATP entre 2016 y 2022. Se trató de un estudio transversal retrospectivo. Los pacientes elegibles se dividieron en dos grupos: grupo 1: 36 artroplastias antes de la adopción del protocolo; grupo 2: 36 artroplastias después de la adopción del protocolo. El análisis estadístico se realizó en SPSS 13.0. **Resultados:** La edad media de los pacientes fue de $61 \pm 11,7$ años, 42 eran varones y 30 mujeres. Las comorbilidades preexistentes fueron hipertensión arterial sistémica (58%) y diabetes (18%). En el 65% de los casos se operó el lado dominante. Los pacientes fueron tratados con una prótesis no cementada (54%) y una prótesis híbrida (40,3%). Sólo nueve (12,5%) pacientes presentaron una infección. Se observó una diferencia significativa con la presencia de infección en el grupo tras la aplicación del protocolo con menor incidencia. Hubo una menor tasa de infección en el grupo 2 sometido al protocolo, pero no se confirmó la

significación estadística. Conclusión: Se puede concluir que el diseño del protocolo institucional tiene potencial para reducir las infecciones postoperatorias en las cirugías de artroplastia de cadera.

Palabras clave: artroplastia, prótesis de cadera, artrosis, cadera, complicaciones.

1 INTRODUCTION

The total hip arthroplasty procedure undeniably ranks among the most frequently performed and successful surgical interventions in the annals of orthopedic surgery. Globally, millions of individuals undergo total hip arthroplasty, which not only ameliorates their distressing symptoms but also ushers in a marked enhancement in their overall quality of life.¹ In the United States alone, an estimated 350,000 total hip prostheses are implanted annually.² However, it is undeniable that several challenges persist as the focus of extensive research efforts, particularly in the domain of reducing postoperative complications.

Infection within the purview of total hip arthroplasties is unequivocally the most frequently reported and profoundly debilitating postoperative complication. It bestows upon patients an extended period of hospitalization, necessitates multiple surgical procedures, often culminates in enduring physical ramifications, imparts substantial economic and financial burdens, and, on occasion, culminates in fatality.^{3,4}

The preeminent predisposing factors for these complications, as elucidated in extant literature, encompass advanced age, malnutrition, obesity, diabetes mellitus, advanced-stage HIV infection, the presence of distant infectious foci, and a history of prior joint infections or arthroscopy. Any factor retarding the healing process of the surgical wound, be it ischemic necrosis, hematoma, cellulitis, or wound abscess, heightens the risk of infection, as the deep tissues proximate to the prosthesis lack inherent local defense mechanisms.⁵

Within this context, the preoperative assessment of candidates slated for primary arthroplasty has been exalted in the extant literature as of paramount significance in the sphere of averting postoperative infections. The aim of this practice is to detect and mitigate dormant foci of infection, concurrently stabilizing any comorbidities and, where feasible, curtailing the administration of immunosuppressive medications.⁶

Consequently, with the imperative of elevating patient care standards for individuals scheduled for primary total hip arthroplasty within the ambit of the Orthopedics and Traumatology department at Clinics Hospital of Federal University of Pernambuco (HC-

UFPE), a preoperative protocol has been instituted for the purpose of conducting primary total hip arthroplasty surgeries. The explicit intention is to reduce the incidence of postoperative surgical site infections. In light of this, the primary objective of this study is to evaluate whether the implementation of this protocol instrumentally reduces the incidence rate of postoperative infections.

2 METHODOLOGY

This is a cross-sectional study conducted at the HC-UFPE. Medical records of patients who received treatment and underwent total hip arthroplasty from January 2014 to July 2019 were reviewed between January 2021 and December 2021. The research was submitted for review by the Institutional Ethics Committee (CAAE: 14621319.4.0000.8807).

Included in the study were patients who underwent the procedure by the same surgical team, consisting of three experienced hip surgery specialists practicing in the Orthopedics and Traumatology Department of HC-UFPE, with the presence of appropriately completed pre-anesthetic evaluation forms, adequate medical record documentation of the entire patient's progress, and postoperative in-hospital and outpatient follow-up. All patients were informed about the study and provided informed consent.

Excluded from the study were patients who experienced pre or postoperative complications that did not involve infection, such as periprosthetic fracture, prosthesis dislocation, deep vein thrombosis, pulmonary embolism, aseptic loosening, or death. Patients with inadequately filled pre-anesthetic evaluation forms and medical records, as well as those who underwent revision hip arthroplasty, were also excluded.

The eligible medical records were randomized to obtain two homogeneous groups. Group 1 consisted of arthroplasties performed before the adoption of the infection prevention protocol, and Group 2 included arthroplasties performed after the protocol's adoption. The protocol was developed in 2016 by the clinical staff of the Orthopedics and Traumatology Department at HC-UFPE in collaboration with the Hospital Infection Control Committee of HC-UFPE. The protocol was introduced in 2016 and encompasses various aspects during the preoperative assessment of patients undergoing primary total hip replacement (Table 1).

Table 1 - Protocol developed for preoperative assessment of patients candidates for primary THA surgery

Nasal swab for testing *Staphylococcus aureus*, CPE, ESBLs and VRE
Urine culture with antibiogram + urine summary
Rapid HIV test
Hepatitis B surface antigen (HBsAg)
Hepatitis B surface antibody (Anti-Hbs)
Antibody to hepatitis B core antigen (anti-HBc)
Anti-hepatitis C virus antibody (anti-HCV Ab)
Quantitative venereal disease research laboratory (VDRL quantitative)
Blood count
Urea
Creatinine
Coagulogram
Ionogram
Fasting blood glucose
Glycated hemoglobin
Albumin
Erythrocyte sedimentation rate (ESR)
C-Reactive Protein (CRP)
Panoramic radiograph of the dental arch
Chest x-ray
Opinion of the Hospital Infection Control Committee
Opinion of the UFPE Dentistry Service
Opinion of the UFPE Stomatology Service
Opinion of the Anesthesiology Service
Opinion of the Cardiology Service
Opinion of Hospital Social Service

Legend. CPE: Carbapenamase-Producing Enterobacterales, ESBLs: Extended-spectrum beta-lactamases,
VRE: Vancomycin-Resistant Enterococci

Source: author's

For clinical and laboratory criteria for the diagnosis of early post-arthroplasty hip infection, we considered the presence of pain upon surgical site palpation and hip mobilization, hyperemia, local warmth, erythema, persistent wound drainage irrespective of purulence, delayed healing or superficial dehiscence of the surgical wound, active cutaneous fistula involving the joint, abscess, extensive necrosis, and hip stiffness or reduced range of motion.⁷ For laboratory criteria, a C-reactive protein level greater than 100 mg/dL was indicative of early acute infection.⁸

Statistical analysis was performed using SPSS 13.0 (Statistical Package for the Social Sciences) for Windows and Excel 2010. All tests were applied with a margin of error, i.e., a significance level of 5%. Results are presented in tabular form with respective absolute and relative frequencies. Numerical variables are represented by measures of central tendency and dispersion. The existence of significant differences between groups for categorical variables was assessed using the Pearson Chi-square test or Fisher's exact test. Values of $p < 0.05$ were considered significant.

3 RESULTS

In this study, 72 patients were included, with an average age of 61 ± 11.7 years, comprising 42 males and 30 females. Regarding pre-existing comorbidities, 58.3% of the patients had hypertension (HTN), and 18.1% were diabetic. The dominant side was operated on in 65% of the cases.

Patients were treated with non-cemented prostheses in the majority of cases (54.2%), followed by hybrid prostheses (40.3%) and cemented prostheses (5.5%). In the entire study sample, only nine (12.5%) patients developed infections. Further details can be found in Table 2.

Table 2 – Description of the sample's intrinsic data

Variables	n	%
Sex		
Male	42	58,3
Female	30	41,7
Systemic arterial hypertension		
Yes	42	58,3
No	30	41,7
Diabetes mellitus		
Yes	13	18,1
No	59	81,9
Type of prosthesis		
Cemented	4	5,5
Non cemented	39	54,2
Hybrid	29	40,3
Operated side		
Righ	47	65,3
Left	25	34,7
Infection		
Yes	9	12,5
No	63	87,5
Age (mean \pm SD)	61,1 \pm 11,7	
Length of Hospital Stay (days) (mean \pm SD)	3,2 \pm 0,6	

Legend: SD: Standard Desviation

Source: Author's

After stratifying the patients by group, intrinsic variables were compared concerning potential sample characteristics that might introduce significant differences due to selection bias. No differences were observed regarding gender, comorbidities, and other selection characteristics.

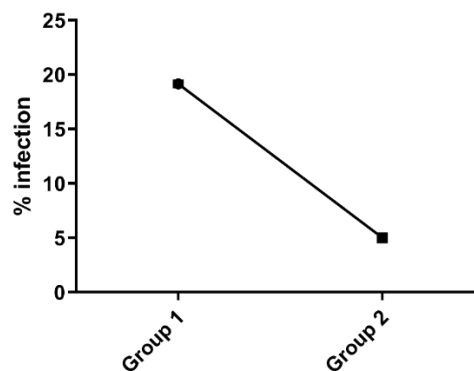
Regarding the infection variable, it is highlighted that the percentage was substantially higher in group 1, when compared to group 2, (19.4% x 5.6% respectively). However, there was no significant difference ($p > 0.05$) between the groups. (Table 3, Figure 1).

Table 3 – Description of the comparison between groups evaluated according to intrinsic characteristics, operated side and presence of infection

Variables	Groups		p-value
	1 n (%)	2 n (%)	
Sex			
Male	20 (55,6)	22 (61,1)	0,633*
Female	16 (44,4)	14 (38,9)	
Systemic arterial hypertension			
Yes	20 (55,6)	22 (61,1)	0,633*
No	16 (44,4)	14 (38,9)	
Diabetes mellitus			
Yes	6 (16,7)	7 (19,4)	0,759*
No	30 (83,3)	29 (80,6)	
Operated side			
Righ	21 (58,3)	26 (72,2)	0,216*
Left	15 (41,7)	10 (27,8)	
Infection			
Yes	7 (19,4)	2 (5,6)	0,151**
No	29 (80,6)	34 (94,4)	

*Chi-Square Test, **Fisher's Exact Test.
Source: Author's

Figure 1. Graph representing the percentage of infection cases in the groups evaluated.



Source: Author's

4 DISCUSSION

In this study, it is suggested that the adoption of the institutional protocol significantly reduced the incidence of infection compared to the group of patients who were not assessed preoperatively using the instrument.

The hip joint is one of the largest weight-bearing joints in the body, second only to the knee joint, and is commonly affected by osteoarthritis (OA)⁹. Current accepted understanding of hip OA is that while joint cartilage is primarily affected, the entire joint is also involved. The OA process involves the progressive loss of joint cartilage, subchondral cysts, osteophyte formation, periarticular ligament laxity, muscle weakness, and possible synovial inflammation.

There is a growing consensus that OA is not the result of a singular process affecting the joints but rather the result of various distinct conditions, each associated with unique etiological factors and potential treatments that share a common final pathway. The effects of OA on the major joints of the lower extremities, including the hips, can lead to reduced mobility and significant physical impairment, potentially resulting in loss of independence and increased healthcare utilization.^{10,11} As such, OA can profoundly impact activities of daily living, leading to substantial disability and dependence, particularly when walking, climbing stairs, and rising from a seated position. In this study, all included patients reported impairments and features consistent with hip arthrosis due to progressive joint wear in elderly patients and, in younger patients, by femoroacetabular impingement.¹²⁻¹⁴

The prevalence of hip OA is higher in men under 50 years of age, whereas women have the highest prevalence after the age of 50, which reinforces the data gathered in our research, where younger patients were mostly male. This finding may be attributed to post-menopausal changes and is supported by observations from several studies reporting protective effects of estrogen replacement therapy on hip OA.^{10,12-14}

In hip surgery, especially in primary total arthroplasty, due to the surgical anatomy, it determines good exposure of the osteomuscular structures, although occasional expansion of the operative field, particularly with respect to the acetabulum, is required without technical difficulty. Some authors suggest that the use of the posterior approach is related to a higher degree of prosthesis instability, leading to an increased incidence of dislocations,¹⁵ a phenomenon not observed in this study, which yielded positive results, in line with the averages from international publications.^{13,14}

In the current research, the types of prostheses implanted had a similar distribution in both groups, being homogeneous in terms of being non-cemented or hybrid. This did not significantly impact the criteria to be evaluated. Although a recent study analyzing data from the National Joint Registry for England and Wales, the world's largest orthopedic registry, suggested that non-cemented prostheses may be associated with lower mortality than cemented prostheses, evidence is lacking to determine their real superiority over other available options.¹² In the present study, this factor did not have a significant impact on the presence or absence of infection.

The complications that occurred had a low incidence in the group that underwent preoperative evaluation with the protocol, which is comparable to the literature.^{5,6} In Group 2, the infection rate was high, around 20%. Mangram et al.¹⁶ reported that the preoperative evaluation of patients undergoing primary arthroplasty is of paramount importance in

preventing postoperative infections, aiming to identify and treat quiescent infection foci, stabilize comorbidities, and reduce the use of immunosuppressive drugs whenever possible.

Similarly, Lima & Oliveira¹⁷ described that infections in joint prostheses are increasing worldwide in parallel with the growth of procedures performed. They are worrisome events in any of their presentations, not only due to their potential seriousness but also due to the high cost to patients and the entire healthcare system. The crucial action to be taken in the indication of such surgeries is always the prevention of such infections, meticulously observing all factors that can contribute to an increased risk of this complication. Once an infection is established, rapid clinical and laboratory diagnosis, coupled with appropriate measures, greatly increases the possibility of definitive resolution of the process. Imbelloni et al.¹⁸ concluded that the use of a postoperative acceleration protocol, assessing perioperative risk factors, can reduce fasting time, length of hospital stay, and provide faster hospital discharge, preventing infections in elderly patients with femur fractures.

All these studies reinforce the importance of meticulous preoperative assessment aimed at predicting potential risk factors for complications arising from total hip arthroplasty. In our research, the implementation of this protocol was of utmost importance, significantly reducing the incidence of postoperative infection.

5 CONCLUSION

It is concluded that the design of the institutional protocol has the potential to reduce postoperative infections in hip arthroplasty surgeries. However, this relationship was not possible to be statistically proven in the present study, requiring more research on the topic.

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