DOI: 10.1590/1809-2950/e22012823en

ORIGINAL RESEARCH

Association between the level of functional independence and the subjective experience of pain in older adults after hip replacement

Associação entre nível de independência funcional e percepção subjetiva da dor em idosos no pós-operatório de artroplastia de quadril

Asociación entre el nivel de independencia funcional y la percepción subjetiva del dolor en adultos mayores en el postoperatorio de artroplastia de cadera

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ABSTRACT | Hip replacement (HR) is a surgery that replaces the injured joint with a prosthesis. The postoperative period can reduce functional independence and affect the subjective experience of pain in older adults. This study evaluated the association between the level of functional independence and the subjective experience of pain in older adults who underwent HR. This cross-sectional descriptive quantitative association study used the functional independence measure (FIM) to assess the level of functional independence and the visual analogue scale (VAS) to analyze the subjective experience of pain. Spearman's correlation test was used to evaluate the association between FIM and VAS and simple linear regression to analyze the influence of one variable on another ($p \leq 0.05$). This study evaluated 48 older adults, with a mean age of 71.5±9 years, of which 37.5% (n=18) were men and 62.5% (n=30) were women. The mean VAS and FIM values were 3.5 (±1.6) and 107 (±17.82), respectively, and they had a significant and inverse association ($p=0.006$; $r=-0.389$; $R^2=0.142$). This study showed an inversely proportional relationship between the subjective experience of pain and the level of functional independence in older patients who underwent HR. Therefore, health professionals should pay more attention to pain in these patients in order to optimize their functional recovery and increase their functional independence.

Keywords | Elderly; Arthroplasty, Replacement, Hip; Functional Status.

RESUMO | A artroplastia de quadril (AQ) é um procedimento cirúrgico que consiste na substituição da articulação lesionada por uma prótese. O pós-operatório pode reduzir a independência funcional e repercutir na percepção subjetiva da dor em idosos. O estudo avaliou a associação entre o nível de independência funcional e a percepção subjetiva da dor em idosos submetidos à AQ. Trata-se de um estudo transversal, descritivo, quantitativo e de associação. A medida de independência funcional (MIF) foi utilizada para avaliar o nível de independência funcional, e a escala visual analógica (EVA) foi empregada para avaliar a percepção subjetiva da dor. O teste de correlação de Spearman foi utilizado para verificar a associação entre a MIF e a EVA, e uma regressão linear simples, para analisar a influência de uma variável sobre a outra ($p \leq 0,05$). Um total de 48 idosos foram avaliados, com média de idade de 71,5±9 anos, em que 37,5% (n=18) pertenciam ao sexo masculino e 62,5% (n=30) ao feminino. A avaliação da EVA mostrou uma média de 3,5 (±1,6), enquanto a MIF, 107 (±17,82). Observamos uma associação significante e inversa com $p=0,006$ e com r de $-0,389$, com R^2 de 0,142. Este estudo mostrou que há uma relação inversamente proporcional entre a sensação subjetiva da dor e o nível de independência funcional de idosos no pós-operatório de AQ. A partir disso, é necessário que os profissionais

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da saúde deem mais atenção ao quadro álgico desses idosos, visando otimizar sua recuperação funcional a fim de aumentar sua independência funcional.
Descritores | Idoso; Artroplastia de Quadril; Estado Funcional.

RESUMEN | La artroplastia de cadera (AC) es un procedimiento quirúrgico que reemplaza la articulación lesionada por una prótesis. El postoperatorio puede reducir la independencia funcional y afectar la percepción subjetiva del dolor en el anciano. Este estudio evaluó la asociación entre el nivel de independencia funcional y la percepción subjetiva del dolor en ancianos sometidos a AC. Se trata de un estudio transversal, descriptivo, cuantitativo y de asociación. La medida de independencia funcional (MIF) se utilizó para evaluar el nivel de independencia funcional, y la escala visual analógica (EVA), para estimar la percepción subjetiva del dolor. Se aplicaron la prueba de correlación de Spearman para verificar la asociación entre MIF y EVA, y una regresión lineal simple para analizar la influencia de una variable sobre la otra (p≤0,05). Participaron 48 ancianos, de edad media de 71,5±9 años; de los cuales el 37,5% (n=18) eran del sexo masculino y el 62,5% (n=30) del sexo femenino. La media de la evaluación de EVA fue de 3,5 (±1,6), mientras que la de MIF, de 107 (±17,82). Hubo una asociación significativa e inversa con p=0,006 y con r de −0,389, con R^2 de 0,142. Este estudio demostró una relación inversamente proporcional entre la sensación subjetiva de dolor y el nivel de independencia funcional de los ancianos en el postoperatorio de AC. Por lo tanto, es necesario que los profesionales de la salud tengan mayor atención al dolor de esta población, con el objetivo de optimizarle la recuperación funcional y, así, aumentar su independencia funcional.
Palabras clave | Anciano; Artroplastia de Reemplazo de Cadera; Estado Funcional.

INTRODUCTION

Hip replacement (HR) is a surgery that replaces the components of the acetabulum and/or proximal femur, usually used when the hip is damaged due to, for example, osteoarthrosis of the hip or proximal femur fracture, which are common conditions in older patients[1]. This surgery has two modalities: partial hip replacement (PHR), when only the femur is replaced, preserving the acetabulum, and total hip replacement (THR), when both—the acetabulum and the proximal femur—are replaced[2].

With the growth in the older population and the injuries to which these individuals are susceptible, HR has become an increasingly common surgery. Despite its high cost to the health system, this procedure can improve functionality, reduce pain, and positively affect the quality of life of patients[3]. In 2021, the costs of PHRs to the health system were around R$ 14,992,946.42, whereas THRs cost R$ 892,895.19[4].

The level of functional independence of an individual after HR is directly influenced by diagnosis, type of surgery, pain, the presence of comorbidities, among other conditions that affect functional recovery[5]. Physical therapy during this period aims to provide a quick and effective recovery and return to daily and work activities[6]. The postoperative period of orthopedic surgeries may increase pain[7] and, in the case of HR, reduce functional independence in older adults. Thus, understanding the behavior of these variables is important to provide information and help physical therapists in the recovery process[8].

Pain after HR in older adults is a limiting condition for their functional recovery, negatively affecting its completeness, delaying hospital discharge, and decreasing the functional independence of patients. Identifying postoperative pain level and its effect on the recovery process is important[9], since it contributes to the functional rehabilitation of patients and optimizes hospital discharge in order to increase bed turnover and reduce the chances of complications due to prolonged hospital stay[10]. This study aimed to evaluate the association between the level of functional independence and the subjective experience of pain in older adults who underwent HR.

METHODOLOGY

This cross-sectional descriptive quantitative association study was developed in the trauma and orthopedic ward of the University Hospital of the Universidade Federal do Maranhão (HU-UFMA), São Luís, MA. Data were collected from December 2016 to May 2017.

Participants and/or their companions were informed of the objectives and risks of the study and signed an informed consent form. Older adults, both men and

women, who underwent elective HR (THR, PHR, and/or review) with a minimum stay of three days in the HU-UFMA ward were included. Older adults who underwent any other associated surgery and/or surgical reapproach within the studied period, as well as patients with exacerbated and difficult-to-control pain or medical restriction to start motor physical therapy, were excluded.

This study was performed in the HU-UFMA trauma and orthopedic ward because patients were referred directly from the anesthesia recovery room to this sector of the hospital—patients were referred to the ICU only in case of postoperative complication. While hospitalized, older patients received the treatment recommended by the unit's team of physical therapists, which included health education, early mobilization, and gait training[11]. Pain and functional independence were assessed on the third postoperative day in order to exclude a subjective experience of exacerbated pain immediately after surgery[7]. Patients also received analgesic medication according to medical prescription to control pain during the postoperative hospitalization period.

After surgery, patients were initially evaluated by an interview with questions about sociodemographic and nosological characteristics, complemented with information extracted from the patient's medical records, when necessary. All evaluations were performed with patients at rest by a single trained physical therapist with extensive experience.

The level of functional independence was analyzed using the functional independence measure (FIM) during interviews. This tool is widely used in clinical research, in the most diverse conditions, and can be applied to older patients in the postoperative period of HR[12]. FIM assesses motor, cognitive, and social aspects and the higher the score, the greater the patient's functional independence. It includes 18 items and its score ranges from 18 to 126—score 7 corresponds to complete independence while score 1 corresponds to complete dependence. The total score is estimated from the sum of the points assigned to each item[13,14]. The subjective experience of pain was assessed by the modified visual analogue scale (VAS), which includes a horizontal line numbered 0 to 10, in which 0 corresponds to complete absence of pain and 10 to the maximum pain experienced by the patient[15].

Data were tabulated in Microsoft Excel version 2015 and analyzed using IBM© SPSS version 24. The sample was calculated based on the FIM score, one of the main outcomes of the study, by the G*Power statistical software, version 3.1.3 (Franz Faul, Universität Kiel, Germany). According to the sample calculation, 40 older patients who underwent HR were required. The calculation had an experimental power of 95%, for $p<0.05$, $\alpha=0.05$, $\beta=0.95$, and an effect size of 1.18, in line with the study by Silva et al.[16]. Considering possible sample losses during the study, 20% more patients were added, totaling 48. Descriptive statistical analysis was used to characterize the sample, using means and standard deviation for numerical variables and absolute and relative frequency for categorical variables. Inferential statistics were used to evaluate the association between the nonparametric variables FIM and VAS, by Spearman's correlation test, and simple linear regression was applied to assess how subjective experience of pain influenced the functional independence of the sample, with a significance level $p\leq0.05$.

RESULTS

In total, 48 patients were evaluated during their postoperative period. Table 1 shows the characterization of the sample.

Table 1. Sociodemographic characterization of older adults who underwent hip replacement

		n	%
Sex	Men	18	37.5
	Women	30	62.5
Age (years old)	71±9		
Ethnicity/skin color	White	12	25
	Mixed-race	26	54.1
	Black	10	20.8
Origin	São Luís	18	37.5
	Interior of the state	30	62.5
Income	1 minimum wage	40	83.3
	2 minimum wages	8	16.6
Schooling level	Illiterate	15	31.5
	Incomplete primary education	21	43.7
	Complete primary education	2	4.2
	Incomplete secondary education	1	2.1
	Complete secondary education	7	14.5
	Higher education	2	4.2

Table 2 shows the nosological profile of the sample, such as diagnosis, type of surgery, and the presence of comorbidities.

Table 2. Characterization of the sample regarding diagnosis, surgery, comorbidities, and length of hospital stay after hip replacement

		n	%
Diagnosis	Fracture	30	62.5
	Osteoarthritis	16	33.3
	Prosthesis loosening	2	4.2
Surgery	PHR	24	50
	THR	22	45.8
	Review	2	4.2
Comorbidities	SAH	29	60.4
	DM	12	25
	Schizophrenia	1	2.1
	Parkinson's disease	1	2.1
No comorbidity		5	10.41
Affected limb	Right	22	45.8
	Left	26	54.1
Mean length of hospital stay (days)	5±3		
VAS	3.5±1.6		
FIM	107±17.8		

PHR: partial hip replacement; THR: total hip replacement; SAH: systemic arterial hypertension; DM: diabetes mellitus; VAS: visual analogue scale; FIM: functional independence measure.

Figure 1 shows the evaluation of the criteria separately, performed using FIM three days after surgery to analyze the level of functional independence.

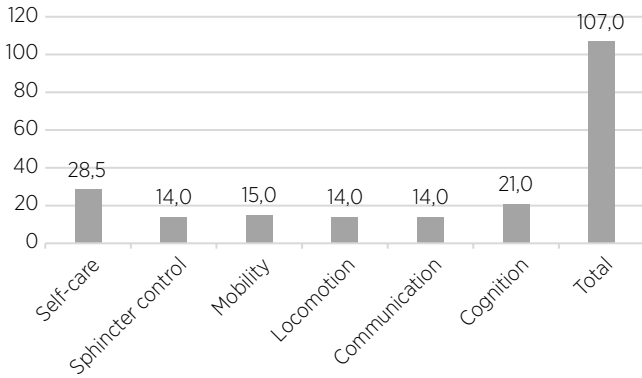

Figure 1. Level of functional independence of older adults who underwent hip replacement

Figure 2 presents the association between VAS and FIM. The correlation between the variables showed that the association between FIM and VAS was statistically significant and inverse, with p=0.006 and r=−0.389.

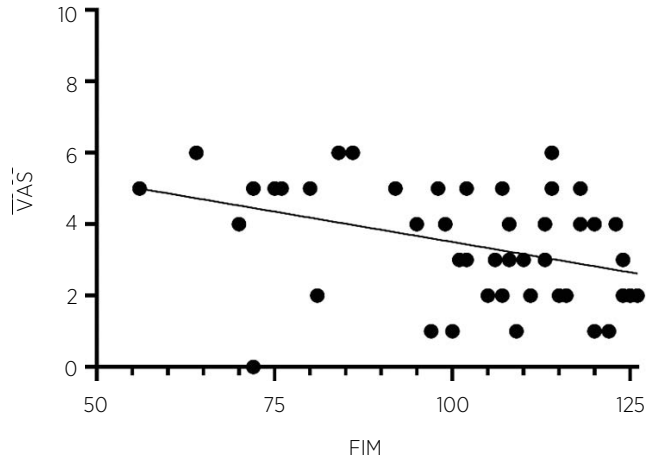

Figure 2. Association between the subjective experience of pain and the level of functional independence of older adults who underwent hip replacement

VAS: visual analogue scale; FIM: functional independence measure.

Table 3 presents the simple linear regression model, which showed that the subjective experience of pain had a 14% influence (R^2=0.142) on the functional independence of older patients after HR.

Table 3. Linear regression analysis to evaluate the influence of the subjective experience of pain on the functional independence of older adults who underwent hip replacement

Variable	β coefficient	Standard error	p-value	Confidence interval
FIM	−0.377	0.12	0.008	−0.59 to −0.009

Adjusted R^2=0.142; F=7.620.

DISCUSSION

This study aimed to evaluate the association between the level of functional independence and the subjective experience of pain in older adults who underwent HR. For the data analyzed, we found a statistically significant and inverse association, which shows that the higher the subjective experience of pain, the lower the functional independence of older patients after HR.

The degree of functional dependence of these patients tends to increase as they age, and, under the condition of undergoing HR, their level of dependence can increase even more[17]. The mean VAS score of participants was 3.5, a moderate value, which may have been influenced by the evaluation performed on the third postoperative day, since the pain immediately after surgery could have already decreased[7]. Moreover, the administration of analgesic

medication may have contributed to improve the quality of life and reduce the length of hospital stay of patients, as this is a common practice and adjuvant factor in early recovery[18]. However, we did not consider the type of analgesic medication nor the administered dosage, which was a limitation of this study.

Pain is an important limiting condition for performing daily activities and negatively affects the functional independence of older adults with hip osteoarthrosis and/or proximal femur fracture[9,19]. After surgery, pain prior to the procedure can reduce, in accordance with the VAS results in another study[20].

The mean level of total functional independence of participants was high, however, specific aspects, such as mobility and locomotion, deserve attention, as their means were 15 and 14, respectively. After HR, patients need to be careful about certain postures, such as hip adduction, and not flexing the operated joint above 90°[21]. These factors may have influenced the low means on these items in this study. While hospitalized in the HU-UFMA trauma and orthopedic ward, patients received the treatment recommended by the unit's team of physical therapists in partnership with the multidisciplinary team, including isometric and metabolic exercises, early withdrawal of the bed, orthostasis, walking, and health education[11]. The protocol adopted by the team may have influenced the total mean FIM.

Health education after HR is essential for the effective recovery of patients and should be adapted to the needs of each individual[16]. In this study, 31.5% of older adults were illiterate, which draws attention to the use of appropriate language so that patients understand postoperative care. The percentage of illiterate individuals in the sample may be related to the MIF communication domain, which presented a score of 14 as the mean.

The inverse association between the level of functional independence and the subjective experience of pain highlights the importance of pain during recovery from HR[22], as well as the measures used for its control. The surgery itself is already responsible for reducing pain in older patients and early mobilization should be implemented to optimize functional recovery, aiming at hospital discharge and higher bed turnover[23]. The functional independence of patients is a key point for their functional recovery and minimizing the barriers to this achievement is an important role of the multidisciplinary team[8]. Thus, starting physical therapy during hospitalization decreases its length, reducing the risks of prolonged hospital stay, such as the onset of opportunistic infections and/or pressure ulcers, and preventing injuries and events to which older adults are susceptible, such as falls[24,25].

Simple linear regression showed that the subjective experience of pain influenced the level of functional independence of older patients who underwent HR by 14%. This percentage may have been due to the optimization of the early mobilization protocol established by the unit's team of physical therapists and/or the data collection period (the third postoperative day). We could not control these biases in this study, since physical therapy after HR is necessary for the functional recovery of older patients[26].

Among the limitations of this study, the use of analgesic medication may have influenced pain assessment. Moreover, we adopted the interview evaluation method due to the schooling level of some participants, who could not read, in order to standardize data collection.

CONCLUSION

This study showed a statistically significant and inverse association between the level of functional independence and the subjective experience of pain in older patients who underwent HR. The level of functional independence was high, however, specific aspects, such as locomotion and mobility, had low means. On the other hand, the subjective experience of pain was moderate and may have been influenced by the administration of analgesic medication. However, for an effective recovery, pain control is important. Therefore, further research, with a larger and controlled population, is needed to establish the best treatment to reduce subjective pain and increase the functional independence of older adults after HR.

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