

Evaluation of the Function and Quality of Life after Total Hip Arthroplasty by Different Approaches

Avaliação da Função e Qualidade de Vida após Artroplastia Total da Anca por Diferentes Vias de Abordagem



Paulo ARAÚJO^{1,2,3}, Luís MACHADO², Duarte CADAVEZ², Lisete MÓNICO³, Filipa JANUÁRIO¹, Lisete LUÍS¹, Mafalda BÁRTOLO¹

Acta Med Port 2017 Sep;30(9):623-627 ▪ <https://doi.org/10.20344/amp.7834>

ABSTRACT

Introduction: To assess the function and quality of life in patients undergoing total hip arthroplasty distinguishing two surgical approaches (posterior / anterolateral) used by the Orthopedics department of Centro Hospitalar de Leiria.

Material and Methods: Retrospective study of 94 patients subject to unilateral hip replacement surgery, using the 'Hip Osteoarthritis Outcome Score' (HOOS LK 2.0) questionnaire, the Trendelenburg test and evaluation of muscle strength of the hip abductor muscles with dynamometer. Patients were evaluated at six months, 12 months, 18 months and 24 months after surgery.

Results: The study revealed that 97.9% patients completed the rehabilitation program. The postoperative evolution (six to 24 months) does not appear to have any differences in results when comparing both approaches. At six months the patient operated by the anterolateral approach showed worse results when compared with the posterior approach, in particular in Hip Osteoarthritis Outcome Score pain, in Hip Osteoarthritis Outcome Score symptoms and Hip Osteoarthritis Outcome Score activities of daily living. After 24 months, no differences between the two surgical approaches were found. Of the 94 patients evaluated, the Trendelenburg test was positive in 31% of patients of which 81.9% corresponds to patients operated by the anterolateral approach. Muscle strength of the abductors of the operated hip was clearly lower in the anterolateral approach at six months, 12 months, and 24 months.

Discussion: This study showed that, in the first six months after total hip arthroplasty, the patients operated by the posterior approach were, according to the HOOS questionnaire, less symptomatic, and presented with better quality of life and less impact on activities of daily living and in sport and leisure when compared with the patients operated by the anterolateral approach. However, these differences were matched over the 24 months. Moreover, the results of muscle strength of the abductor muscles of the hip were clearly superior in patients operated by the posterior approach at six months, at 12 months and at 24 months compared to the patients operated by the anterolateral approach.

Conclusion: After 24 months post total hip arthroplasty there are no differences between the two approaches with regard to function or quality of life. However, the patients operated by the anterolateral approach had greater muscle strength deficits and higher percentage of positive Trendelenburg test.

Keywords: Arthroplasty, Replacement, Hip; Quality of Life; Range of Motion, Articular; Recovery of Function; Treatment Outcome

RESUMO

Introdução: Avaliar a função e qualidade de vida em doentes submetidos a artroplastia total da anca fazendo distinção quanto às duas vias de abordagem (posterior/ântero-lateral) usadas pelo Serviço de Ortopedia do Centro Hospitalar de Leiria.

Material e Métodos: Estudo retrospectivo de 94 doentes sujeitos a artroplastia unilateral da anca, através do questionário *Hip Osteoarthritis Outcome Score* (HOOS LK 2.0), teste de Trendelenburg e avaliação da força muscular dos abdutores da anca com dinamómetro. Avaliaram-se os doentes aos seis meses, 12 meses, 18 meses e 24 meses pós-operatório.

Resultados: O estudo revelou que 97,9% doentes cumpriram programa de reabilitação. A evolução pós-cirúrgica (seis a 24 meses) mostrou ter resultados diferentes nas duas vias de abordagem. Aos seis meses os doentes operados pela via ântero-lateral apresentaram piores resultados quando comparados com a via posterior, nomeadamente *Hip Osteoarthritis Outcome Score* dor, *Hip Osteoarthritis Outcome Score* sintomas e *Hip Osteoarthritis Outcome Score* atividades da vida. Aos 24 meses, não parecem existir diferenças entre as duas vias de abordagem. Dos 94 doentes avaliados no estudo, o teste de Trendelenburg foi positivo em 31% dos doentes, sendo que 81,9% corresponderam a doentes operados pela via ântero-lateral. A força muscular dos abdutores da anca operada foi inferior na via ântero-lateral aos seis meses, 12 meses e aos 24 meses.

Discussão: Este trabalho evidenciou que nos primeiros seis meses pós-artroplastia total da anca, os doentes operados por via posterior apresentaram-se, de acordo com o questionário HOOS, menos sintomáticos, com melhor qualidade de vida e com menor impacto nas atividades de vida diária e no desporto e lazer quando comparados com os doentes operados por via ântero-lateral. Contudo, estas diferenças foram-se igualando ao longo dos 24 meses. Verificou-se ainda que os índices de força muscular dos músculos abdutores da anca foram claramente superiores nos doentes operados por via posterior aos seis meses, aos 12 meses e aos 24 meses comparativamente aos doentes operados por via ântero-lateral.

Conclusão: Aos 24 meses pós-artroplastia total de anca não parecem existir diferenças entre as duas vias de abordagem no que diz respeito à função e qualidade de vida. Contudo, verificou-se que os doentes operados pela via ântero-lateral apresentaram maiores défices de força muscular e maior percentagem de testes de Trendelenburg positivos.

Palavras-chave: Amplitude de Movimento Articular; Artroplastia Total da Anca; Qualidade de Vida; Recuperação de Função; Resultado do Tratamento

1. Serviço de Medicina Física e de Reabilitação. Centro Hospitalar de Leiria. Leiria. Portugal.

2. Serviço de Ortopedia. Centro Hospitalar de Leiria. Leiria. Portugal.

3. Faculdade de Psicologia e de Ciências da Educação. Universidade de Coimbra. Coimbra. Portugal.

✉ Autor correspondente: Paulo Araújo. paulocaraujo89@gmail.com

Recebido: 08 de maio de 2016 - Aceite: 08 de maio de 2017 | Copyright © Ordem dos Médicos 2017



INTRODUCTION

Total hip replacement (arthroplasty) is one of the surgical procedures with the most successful medium-to-long term outcomes.¹

New and increasingly less invasive surgical techniques have emerged over the past few years, aimed at reducing length of hospital stay and providing patients with speedy functional recovery.² There is a global consensus that not only the length of the surgical incision should be taken into account but also the preservation of the integrity of the muscle layers and insertions in order to obtain better functional outcomes.³

Different surgical approaches have been described in literature and antero-lateral and posterior are currently the most frequently used at the Orthopaedics Department of the *Centro Hospitalar de Leiria* (CHL). The antero-lateral approach is usually associated with a lower dislocation rate and better anatomical preservation of the hip muscles.⁴ Lower hip abductor muscle strength is its main drawback, due to the tenotomy of the gluteus medius muscle, the main hip abductor.^{5,6} Even though a rare event, injury to the superior gluteal nerve can lead to the paralysis of the gluteus medius, minimus and tensor fascia lata muscles.⁶ A better anatomical exposure of the hip joint is the main advantage of the posterior approach, inducing a lower dislocation rate.⁷ Injury to the sciatic nerve may occur during surgery.⁸

The surgical approach has a great impact on hip stability and muscle strength and early onset of a rehabilitation program is crucial as muscle strength will be substantially reduced over the first weeks upon surgery.⁹ Muscle strengthening, recovery of the range of motion, hip joint stabilisation and quicker recovery of the ability for activities of daily living are the main aims of a rehabilitation program.¹⁰

This study mainly aimed at the assessment of differences in function and quality of life of patients who underwent

hip total replacement through posterior vs. antero-lateral approach.

MATERIAL AND METHODS

Patients who underwent total unilateral hip replacement due to primary osteoarthritis of the hip were included in the study. The presence of coxalgia (hip pain) and X-ray abnormalities (joint space narrowing and/or osteophytes) were used as diagnostic criteria for osteoarthritis of the hip. All the patients agreed to participate in the study and provided their informed consent.

This was a retrospective study involving post-operative follow-up assessments at six, 12, 18 and 24 months following surgery.

Each surgical procedure has been selected according with the surgeon's preference and taking into account the advantages and drawbacks of both approaches.

Patients presenting with any other lower limb prosthesis or implant, any consequence of bone fracture to the lower limb, hip dysplasia or neurological pathology were excluded from the study.

Hip abductor muscle strength of the operated and the contralateral leg, Trendelenburg's test, adherence to the rehabilitation regimen in use at the Physical and Rehabilitation Medicine Department (*Serviço de Medicina Física e de Reabilitação*) (SMFR) of the CHL Hospital have been assessed and the Hip Disability and Osteoarthritis Outcome Score (HOOS LK 2.0) has been used¹¹ for the assessment of five domains (symptoms, pain, activities of daily living, sports and recreational activities, quality of life). Results were presented as a percentage (range 0-100) and higher scores corresponded to better functional outcome.

These parameters were assessed by the same physician, in order to prevent the risk for intervariability.

Hip abductor muscle strength of the operated and

Table 1 - Rehabilitation program in use at the SMFR of the CHL

Stage I D1 – Discharge	Stage II W4 to W8	Stage III W8 to W12	Stage IV W12 to W16
<ul style="list-style-type: none"> - Pain control: - Analgesics - Non-steroidal anti-inflammatory drugs - Cryotherapy - Massage 	<ul style="list-style-type: none"> - Tensor fascia lata, triceps surae, quadriceps, hamstrings, hip flexors and adductors stretching 		
<ul style="list-style-type: none"> - Hip flexors, extensors and abductors strengthening 	<ul style="list-style-type: none"> - Hip flexors, extensors and abductors unloaded dynamic muscle strengthening 	<ul style="list-style-type: none"> - Hip flexors, extensors and abductors incremental loading, dynamic strengthening 	
<ul style="list-style-type: none"> - Passive mobilisation of the hip and active assisted mobilisation of the knee, ankle and joints of the non-operated lower limb 	<ul style="list-style-type: none"> - Range of motion techniques (Kabat techniques) 		
<ul style="list-style-type: none"> - Dynamic strengthening of the upper limbs - Dynamic strengthening of non-operated lower limb 			
<ul style="list-style-type: none"> - Balance and gait exercises (with walker or crutches) 	<ul style="list-style-type: none"> - Gait exercises with one crutch progressing to unassisted gait 		

the contralateral leg have been measured with a spring-type dynamometer (measuring range up to 15 kg; three consecutive measurements of each limb obtained by the physician and the final score corresponding to the mean score of the three measurements), with the patient lying in lateral decubitus with the hip in a neutral position.

The integrity of the hip abductor muscle function is usually assessed with the Trendelenburg's test. With the patient standing on one leg, the presence of a contralateral pelvic drop for up to 30 seconds is a positive test, corresponding to the presence of a weak gluteus medius of the standing leg.¹¹

The rehabilitation program at the SMFR of the CHL is aimed at pain control, preventing and monitoring post-surgery complications, recovery of the hip range of motion and muscle strength, as well as recovery of patient's ability to walk autonomously, promoting patient's social rehabilitation and is shown in Table 1.

SPSS, version 22 software has been used for the statistical analysis and descriptive analysis and data inference were involved.

RESULTS

In total, 94 patients were included in the study (48 patients underwent surgery through antero-lateral [mean age 69.7 ± 9.1 years] and 46 through the posterior approach [mean age 69.1 ± 10.3 years]). The rehabilitation program of the SMFR at the CHL has been completed by 97.9% of the patients.

A similar number of patients has been assessed at each post-operative follow-up. The characteristics of the patients included in the study are shown in table 2 and 3.

Different results were obtained when both surgical approaches were compared by using the HOOS questionnaire, depending on the post-operative follow-up. The largest difference has been found at six months, when better results were obtained in patients who underwent surgery through the posterior approach, namely regarding

HOOS pain (90 ± 11.27), HOOS symptoms (88.57 ± 12.49) and HOOS activities of daily living (82.43 ± 17.8), when compared to HOOS pain (65.83 ± 23.33), HOOS symptoms (67.33 ± 20.41) and HOOS activities of daily living (57.83 ± 20.82) obtained in patients submitted to surgery through the antero-lateral approach. Results are shown in table 4.

The differences between both approaches waned at 12 and at 18 months within the different HOOS domains. Better HOOS scores in activities of daily living have been obtained in patients submitted to surgery through the posterior approach at 12 months (85.07 ± 4.62), when compared to the antero-lateral approach (66.53 ± 25.66), just as regarding HOOS scores in sports and recreational activities obtained at 18 months (63.89 ± 31.60) vs. the antero-lateral approach (42.13 ± 16.81).

Closer results were found between both approaches at 24 months from surgery, with similar HOOS scores obtained within the different domains.

Better scores regarding hip abductor muscle strength were obtained with the posterior approach, particularly at six, 12 and 24 months (Table 4).

A positive Trendelenburg's test has been obtained in 31% of the 94 patients in the study and 81.9% of these were submitted to surgery through the antero-lateral approach (Table 5).

DISCUSSION

This study aimed at the assessment of outcomes of patients following total hip replacement, comparing both surgical approaches (posterior and antero-lateral). Lower symptoms were found at six months in patients submitted to surgery through the posterior approach according with the HOOS questionnaire, showing better quality of life and describing lower impact on activities of daily living and on sports and recreational activities. No significant differences were found at 24 months regarding the parameters of function or quality of life. Better scores of hip abductor muscle strength were found in patients submitted to surgery

Table 2 - Distribution of the number of patients according with the surgical approach

Post-operative follow-up	Gender	Antero-lateral approach	Posterior approach	Total
6 months	Male	3	5	8
	Female	3	2	5
12 months	Male	9	5	14
	Female	6	9	15
18 months	Male	9	4	13
	Female	3	8	11
24 months	Male	6	8	14
	Female	9	5	14
Total		48	46	94

Table 3 - Distribution of mean ages (years) according with surgical approach

Approach	n	Minimum	Maximum	Mean	Standard deviation
Antero-lateral	48	46	86	69.71	9.08
Posterior	46	38	85	69.08	10.35

Table 4 - Comparison of HOOS score and muscle strength (kg) between both surgical approaches

Post-operative follow-up	Variable	Antero-lateral approach	Posterior approach
6 months	HOOS pain	65.83 ± 23.33	90 ± 11.27
	HOOS symptoms	67.33 ± 20.41	88.57 ± 12.49
	HOOS ADL	57.83 ± 20.82	82.43 ± 17.8
	HOOS sports and recreational activities	45.83 ± 28.14	66.07 ± 28.38
	HOOS quality of life	54.33 ± 33.89	84.14 ± 18.14
	Mean muscle strength (kg)	5.39 ± 2.52	9.67 ± 3.18
12 months	HOOS pain	69.96 ± 27.97	83.31 ± 19.92
	HOOS symptoms	75.27 ± 23.51	86.07 ± 14.57
	HOOS ADL	66.53 ± 25.66	85.07 ± 14.62
	HOOS sports and recreational activities	56.40 ± 34.44	75.47 ± 19.59
	HOOS quality of life	59.80 ± 22.44	72.86 ± 27.39
	Mean muscle strength (kg)	6.00 ± 3.37	8.93 ± 2.68
18 months	HOOS pain	70.40 ± 9.14	77.22 ± 12.72
	HOOS symptoms	77.08 ± 13.89	80.42 ± 18.52
	HOOS ADL	66.50 ± 13.73	74.58 ± 18.73
	HOOS sports and recreational activities	42.13 ± 16.81	63.89 ± 31.60
	HOOS quality of life	48.65 ± 24.20	63.58 ± 25.60
	Mean muscle strength (kg)	8.92 ± 4.70	7.81 ± 4.28
24 months	HOOS pain	81.28 ± 18.41	76.73 ± 17.48
	HOOS symptoms	81.33 ± 13.02	79.62 ± 16.26
	HOOS ADL	77.20 ± 19.90	73.08 ± 20.27
	HOOS sports and recreational activities	71.58 ± 26.17	54.81 ± 26.41
	HOOS quality of life	64.07 ± 23.82	63.69 ± 23.40
	Mean muscle strength (kg)	4.58 ± 2.29	7.40 ± 2.96

ADL: activities of daily living

Table 5 - Comparison between muscle strength (kg) and Trendelenburg' test

Trendelenburg's test	Hip abductor muscle strength (kg)	Percentage
Negative	8.28	69
Positive	4.9	31*

* 82.8% of patients submitted to antero-lateral surgical approach

through the posterior approach, at six, 12 and 24 months, while better scores of muscle strength at 18 months were found in patients submitted to surgery through the antero-lateral approach, unlike what would have been expected. These results can be explained by the small size of our group of patients and by the fact that different patients were assessed at each post-operative follow-up.

A comparison between both approaches to hip total replacement surgery has been carried out by Palan *et al.* regarding patient's function and quality of life by using the *Oxford Hip Score* (OHS) questionnaire, hip dislocation rate and the need for a revision surgery. At the initial stages, which were defined by the authors between three months and one year following surgery, better scores regarding pain and functionality were found in patients submitted to posterior surgical approach when compared to those submitted to the antero-lateral approach.¹³ No significant differences were found between both approaches at two and five years following surgery. The results found in our

study were in line with these, showing higher HOOS scores at six months in patients submitted to the posterior surgical approach. These differences waned at 24 months following surgery.

A prospective and comparative study between both approaches has been carried out by Laffosse *et al.* by using the pain visual analogue scale in addition to the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and OHS questionnaires. A similar level of post-operative pain has been found in patients submitted to both surgical approaches and no differences regarding functionality were found at six weeks, at three and at six months.¹⁴

An assessment of the impact of either surgical approaches (antero-lateral and posterior) regarding the presence of gait abnormalities, dislocation, length of hospital stay and rehabilitation time has been carried out by Ritter *et al.* at 12 months post-operatively and no statistically significant differences regarding gait abnormalities were

found between both approaches, even though a higher claudication rate has been found in the group of antero-lateral patients.⁴

Better scores regarding hip abductor muscle strength in the operated leg at all post-operative follow-ups except at 18 months have been found in the group of posterior approach patients.

No injury to the abductor hip mechanism is associated to the posterior surgical approach, according with Onyemaechi *et al*, unlike what happens with the antero-lateral approach, involving a complete or partial impairment of the abductor mechanism, which can explain for the differences between both approaches as regards muscle strength.⁶

Worse gait abnormalities have been found in patients submitted to antero-lateral surgical approach at three months following surgery in the study by Hendrickx *et al*. on the effect of functional rehabilitation in patients who underwent total hip replacement.⁵

The main limitations of the study regarded the small size of our group of patients and the fact that this was a retrospective study in which different patients were assessed at each post-operative follow-up.

CONCLUSION

Better HOOS scores have been found in patients submitted to posterior surgical approach to total hip

replacement when compared to the antero-lateral surgical approach, even though no differences seemed to exist at 24 months following surgery. Higher hip abductor muscle strength has been found in patients submitted to the posterior surgical approach at almost all post-operative follow-ups.

HUMAN AND ANIMAL PROTECTION

The authors declare that the followed procedures were according to regulations established by the Ethics and Clinical Research Committee and according to the Helsinki Declaration of the World Medical Association.

DATA CONFIDENTIALITY

The authors declare that they have followed the protocols of their work centre on the publication of patient data.

CONFLICTS OF INTEREST

The authors declare that there were no conflicts of interest in writing this manuscript.

FINANCIAL SUPPORT

The authors declare that there was no financial support in writing this manuscript.

REFERENCES

- Lemmey AB, Okoro T. The efficacy of exercise rehabilitation in restoring physical function following total hip replacement for osteoarthritis: a review. *OA Musculoskeletal Med.* 2013;1:13.
- Gebel P, Oszwald M, Ishaque B, Ahmed G, Blessing R, Thorez F, et al. Process optimized minimally invasive total hip replacement. *Orthop Rev.* 2012;4:e3.
- Heynem G, Donnelly W, Schieicher I, Turnbull A, Leong A. Preliminary results from an international, prospective, randomized, multicentre 1 year follow up total hip replacement (THR) study to evaluate a minimally invasive surgical technique. *Orthopaedic Proc.* 2004;86-B:482.
- Ritter MA, Harty LD, Keating ME, Faris PM, Meding JB. A clinical comparison of the anterolateral and posterolateral approaches to the hip. *Clin Orthop Relat Res.* 2001;385:95-9.
- Hendrickx C, Hertogh W, Daele U, Mertens P, Stassijns G. Effect of percutaneous assisted approach on functional rehabilitation for total hip replacement compared to anterolateral approach: study protocol for a randomized controlled trial. *Trials.* 2014;15:392.
- Onyemaechi N, Anyanwu E, Obikili E, Ekezie J. Anatomical basis for surgical approaches to the hip. *Ann Med Health Sci Res.* 2014;4:487-94.
- Edmunds CT, Boscainos PJ. Effect of surgical approach for total hip replacement on hip function using Harris Hip scores and Trendelenburg's test: a retrospective analysis. *Surgeon.* 2011;9:124-9.
- Winther B, Husby S, Foss A, Wik S, Svenningsen S, Engdal M, et al. Muscular strength after total hip arthroplasty, a prospective comparison of 3 surgical approaches. *Acta Orthop.* 2015;86:22-8.
- Holm B, Thorborg K, Husted H, Kehlet H, Bandholm T. Surgery-induced changes and early recovery of hip-muscle strength, leg-press power. And functional performance after fast-track total hip arthroplasty: a prospective cohort study. *Plos One.* 2013;8:e62109.
- Unlu E, Eksioğlu E, Aydog E. The effect of exercise on hip muscle strength, gait speed and cadence in patients with total hip arthroplasty: a randomized controlled study. *Clin Rehabil.* 2007;21:706-11.
- Cavalheiro L, Gil JN, Nunes S, Ferreira PL, Gonçalves RS. Measuring health-related quality of life in patients with hip osteoarthritis and total hip replacement: adaption and validation of the hip disability and osteoarthritis outcome source LK 2.0 (HOOS 2.0) to the Portuguese culture. 18th Annual Conference of the International Society of Quality of Life (ISOQOL 2011). Denver: 2011;40.
- Downing D, Clark I, Hutchinson J, Colclough K, Howard P. Hip abductor strength following total hip arthroplasty-A prospective comparison of the posterior and lateral approach in 100 patients. *Acta Orthop Scand.* 2001;72:215-20.
- Palan J, Murray W, Andrew J, Nolan J. Which approach for total hip arthroplasty, anterolateral or posterior? *Clin Orthop Relat Res.* 2009;467:473-7.
- Laffosse J, Chiron P, Molinier F, Benfasi H, Puget J. Prospective and comparative study of the anterolateral mini-invasive approach versus minimally invasive posterior approach for primary total hip replacement. Early results. *Int Orthop.* 2007;31:597-603.