

CLINICAL AND FUNCTIONAL ANALYSIS AFTER TOTAL KNEE ARTHROPLASTY

ANÁLISE CLÍNICA E FUNCIONAL APÓS ARTROPLASTIA TOTAL DE JOELHO

HELDER ROCHA DA SILVA ARAUJO^{1,2} , RENAN SIMOES HEYN¹ , MARCELO RODRIGUES TORRES¹ , HALLEY PARANHOS JUNIOR¹ ,
ULBIRAMAR CORREA DA SILVA JUNIOR¹ , ENIO CHAVES OLIVEIRA² 

1. Centro Estadual de Reabilitação e Readaptação Dr. Henrique Santillo, Goiânia, GO, Brazil.

2. Universidade Federal de Goiás, Faculty of Medicine, Institute of Orthopedics and Traumatology, Knee Group, Goiás, GO, Brazil.

ABSTRACT

Osteoarthritis is a major cause of disability worldwide. Objective: To evaluate the effects of Total Knee Arthroplasty of subjects with knee osteoarthritis by the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). Methods: Prospective, non-randomized study with convenience sampling. We included subjects with knee osteoarthritis with indication for surgical treatment. We used WOMAC to evaluate the level of pain, joint stiffness, physical activity, and quality of life in the preoperative and postoperative phase six months after unilateral surgery. We compared WOMAC to the factors age, gender, Body Mass Index and the type of angular deformity of the knee. Results: In total, we analyzed 58 patients with significant improvements in pain relief, joint stiffness, level of physical activity, and quality of life six months after total knee arthroplasty according to WOMAC. Conclusion: Total knee arthroplasty showed positive effects on the quality of life of patients with knee osteoarthritis. **Level of Evidence II, Cohort Study.**

Keywords: Osteoarthritis. Arthroplasty, Replacement, Knee. Quality of Life.

RESUMO

A Osteoartrite é uma das principais causas de incapacidade mundial. Objetivo: Avaliar os efeitos da Artroplastia Total de Joelho (ATJ) de sujeitos com osteoartrite de joelho com o Índice de Osteoartrite WOMAC (Western Ontario and McMaster Universities). Métodos: Estudo prospectivo não randomizado, com amostragem de conveniência. Foram incluídos sujeitos com diagnóstico de osteoartrite de joelho com indicação de tratamento cirúrgico. Foi utilizado o WOMAC para avaliar o nível de dor, rigidez articular, atividade física e qualidade de vida na fase pré-operatória e no pós-operatório com seis meses após a realização da cirurgia (unilateral). O WOMAC foi comparado aos fatores idade, sexo, Índice de Massa Corpórea (IMC) e o tipo de deformidade angular do joelho. Resultados: Foram analisados 58 pacientes, observou-se melhoras significantes na dor, rigidez articular, nível de atividade física e qualidade de vida, seis meses após a artroplastia total de joelho de acordo com o WOMAC. Conclusão: A ATJ apresentou efeitos positivos na qualidade de vida dos pacientes com osteoartrite de joelho. **Nível de Evidência II, Estudo de Coorte.**

Descritores: Osteoartrite. Artroplastia do Joelho. Qualidade de Vida.

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INTRODUCTION

The focus of osteoarthritis (OA) treatment should involve aspects such as pain, joint stiffness, and quality of life.¹⁻³ Among the treatment modalities, different studies present the benefits of clinical and surgical treatment.⁴⁻⁷ Regarding surgical treatment, scientific evidence shows the efficacy of total knee arthroplasty (TKA) in the aforementioned aspects. Regardless of the technique, the current literature indicates positive effects in short-, medium-, and long-term.^{4,6,7} Different factors are related to the positive effects produced by total arthroplasty. Aspects such as gender, age, body mass index (BMI), socioeconomic status, comorbidities, anxiety, depression, and pain catastrophizing can influence pain after surgery.⁸

The literature shows several studies on survival time and implants alignment, which does not necessarily correlate with absence of pain and improvement of function, therefore, it is important to use instruments that measure the clinical effectiveness of TKA in individuals with OA, the impact of surgery on function and on quality of life (QOL). Among the different instruments that assess quality of life are the Medical Outcomes Study Short Form 36 (SF-36), and the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC).⁹ WOMAC is a specific questionnaire for individuals with osteoarthritis and can be used to assess pain, joint stiffness, level of physical activity, and quality of life before and after surgery. Thus, our study aimed to evaluate the effects of TKA in individuals with OA, using the WOMAC.

All authors declare no potential conflict of interest related to this article.

The study was conducted at Centro Estadual de Reabilitação e Readaptação Dr. Henrique Santillo.

Correspondence: Helder Rocha da Silva Araujo. Av. Ver. José Monteiro, 1655, Goiânia, GO, Brazil, 74653230. drhelderrocha@hotmail.com

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MATERIAL AND METHODS

This prospective non-randomized study with convenience sampling, conducted from April 2017 to December 2017, was approved by the Research Ethics Committee of the Institution (CEP 2.854.059). All selected individuals agreed to participate in the study. Individuals with gonarthrosis referred to surgical treatment were included, as illustrated in Figure 1. The individuals were evaluated in the pre- and postoperative phase (six months) after TKA procedure with Rotaflex® prosthesis (Víncula, Brazil). Clinical evaluation was performed using the WOMAC Osteoarthritis Index. WOMAC Osteoarthritis Index was compared with age, gender, BMI, and type of knee deformity. Individuals of all genders, aged between 55 and 80 years, were included in the study. Individuals with secondary gonarthrosis to rheumatoid arthritis, fracture sequelae, or infection were excluded.

Statistical analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS) software, version 23.0. The Shapiro-Wilk test was used to verify data normality. In the inferential analysis, paired Student's t-test (parametric data) or Wilcoxon (nonparametric data) were performed to compare pain, joint stiffness, level of physical activity, and QOL before and after TKA. Student t-tests for independent samples (parametric data) or Mann-Whitney U (nonparametric data) were used to compare pain, joint stiffness, level of physical activity, and general QOL before and after TKA in the subgroups gender (women × men), age (< 65 years × ≥ 65 years), BMI and kind of deformity (valgus × varus). A 95% confidence interval and a P < 0.05 significance level were established.

RESULTS

In total, 58 individuals participated in the study, 42 (72.4%) women and 16 (27.6%) men. Out of the total, 43 (74.1%) had varus deformity and 15 (25.9%) valgus deformity. Table 1 shows the general

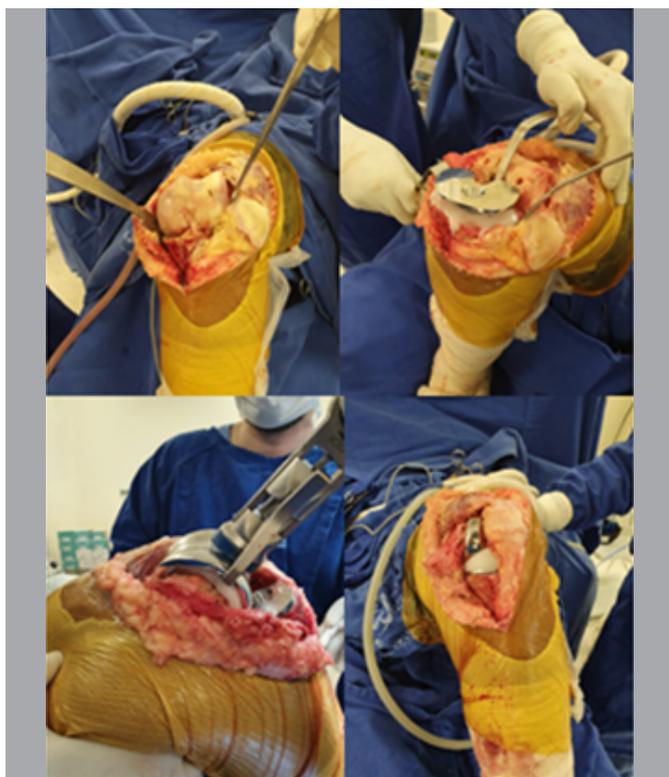


Figure 1. Total knee arthroplasty.

characteristics of the sample. Regarding age, the sample was composed of older adults (66.89 years ± 6.34), presenting:

Table 2 shows the comparison of QOL before and after TKA. Note that, all domains showed improvements (P < 0.05).

Table 3 shows the comparison of QOL—before and after TKA—in the gender subgroup (women × men). Notably, all gender showed improvement in all evaluated domains (P < 0.05). No differences were found between genders.

Table 4 shows the comparison of QOL before and after TKA in the age subgroup (older than 65 years × younger than 65 years). Both subgroups presented positive outcomes regarding pain relief, joint stiffness, physical activity, and QOL (P < 0.05) after surgical treatment. The results showed differences between participants younger or older than 65 years in the domain of physical activity and QOL before TKA, with those older than 65 years showing better results (P < 0.05). We found no differences in pain intensity, joint stiffness, physical activity, and QOL after surgery. Table 5 shows the comparison of QOL before and after TKA, in the BMI subgroup (< 30 kg/m² × ≥ 30 kg/m²). Both subgroups presented improvements in all WOMAC domains (P < 0.05).

We found differences between participants with BMI < or > 30 kg/m² in the domains pain intensity, joint stiffness, physical activity,

Table 1. General characteristics (N = 58).

Characteristic	Mean (SD)
Age (years)	66.89 (6.34)
Weight (kg)	80.79 (16.52)
Height (m)	1.63 (0.09)
BMI (kg/m ²)	30.02 (5.14)

SD: standard deviation.

Table 2. Quality of life before and after total knee arthroplasty evaluated by WOMAC (N = 58).

WOMAC	Arthroplasty		Difference (95% CI)	P*
	Before Mean (SD)	After Mean (SD)		
Pain	12.72 (4.25)	4.93 (3.51)	-7.78 (6.07 - 9.48)	< 0.001
Joint stiffness	4.78 (2.1)	1.76 (1.93)	-3.02 (2.23 - 3.8)	< 0.001
Physical activity	45.02 (12.16)	17.54 (10.95)	-27.47 (23.03 - 32.92)	< 0.001
Overall score	62.52 (17.02)	24.24 (14.66)	-38.28 (32.06 - 44.50)	< 0.001

WOMAC: Western Ontario and McMaster Universities.

*Student's t-test

Table 3. Quality of life before and after total knee arthroplasty evaluated by WOMAC regarding gender (N = 58).

WOMAC	Gender		Difference (95% CI)	P
	Women Mean (SD)	Men Mean (SD)		
Pain (0-2)	12.74 (4.64) ^a	11.81 (4.67) ^c	0.93 (-1.81 - 3.66)	0.501
	5.23 (3.4) ^a	4.33 (3.79) ^c	0.89 (-1.34 - 3.13)	0.426
Joint stiffness (0-8)	4.95 (2.26) ^b	4.19 (2.1) ^d	0.76 (-0.54 - 2.07)	0.181
	1.97 (2.07) ^b	1.33 (1.58) ^d	0.63 (-0.59 - 1.85)	0.321
Physical activity (0-68)	43.14 (14.66) ^a	43.75 (12.62) ^c	-0.61 (-8.93 - 7.71)	0.884
	18.81 (9.73) ^a	14.93 (13.1) ^c	3.87 (-3.04 - 10.79)	0.103
Overall score (0-96)	60.83 (20.27) ^a	59.75 (17.99) ^c	1.08 (-10.5 - 12.67)	0.852
	26 (13) ^a	20.6 (17.54) ^c	5.4 (-5.17 - 15.97)	0.096

a: paired Student's t-test (P < 0.05); b: Wilcoxon test (P < 0.05); c: paired Student's t-test (P < 0.05); d: Wilcoxon test (P < 0.05).

and general QOL before TKA, and subjects with BMI < 30 kg/m² showed the best results (P < 0.05). The results showed no differences in these parameters after TKA. Table 6 shows the comparison of QOL before and after surgery regarding deformity. Both groups improved their overall WOMAC score (P < 0.05). We found no differences between the subjects with varus and valgus in the domains pain intensity, joint stiffness, physical activity, and QOL before and after TKA.

DISCUSSION

We observed positive effects of TKA on pain relief, joint stiffness, physical activity level, and QOL of individuals with gonarthrosis after six months. Regarding the positive effects, our results corroborate three systematic meta-analysis reviews aimed to show the best scientific evidence related to the effects of this surgery.^{4,6,7}

Shan et al.⁶ and Zhou et al.⁷ found a significant clinical effect of TKA at medium- and long-term on pain relief, joint stiffness, level of physical activity, and QOL. Also, regarding positive effects, the results of this study corroborate several randomized controlled¹⁰⁻¹² and uncontrolled trials^{13,14} that evaluated these outcomes at different moments.

Gooch et al.¹⁰ and Tasker et al.¹² showed the medium-term effects of TKA on different aspects. The former compared the effects

Table 6. Quality of life before and after total knee arthroplasty evaluated by WOMAC regarding deformity (N = 58).

WOMAC	Deformity		Difference (95% CI)	P
	Varus Mean (SD)	Valgus Mean (SD)		
Pain (0-2)	12.28 (4.46) ^a	13.64 (4.87) ^c	-1.36 (-4.18 - 1.45)	0.336
	4.89 (3.24) ^a	5.1 (4.55) ^c	-0.21 (-2.77 - 2.35)	0.869
Joint stiffness (0-8)	4.81 (2.2) ^b	4.71 (2.33) ^d	0.1 (-1.28 - 1.47)	0.91
	1.67 (1.78) ^b	2.1 (2.47) ^d	-0.43 (-1.83 - 0.97)	0.826
Physical activity (0-68)	44.56 (13.61) ^a	41.43 (14.02) ^c	3.13 (-5.32 - 11.58)	0.473
	18.47 (10.84) ^a	14.2 (11.24) ^c	4.27 (-3.59 - 12.14)	0.28
Overall score (0-96)	61.65 (18.94) ^a	59.79 (19.96) ^c	1.86 (-9.96 - 13.69)	0.761
	25.03 (14.09) ^a	21.4 (17.06) ^c	3.63 (-7 - 14.25)	0.495

a: paired Student's t-test (P < 0.05); b: Wilcoxon test (P < 0.05); c: paired Student's t-test (P < 0.05); d: Wilcoxon test (P < 0.05).

of surgery performed with standard care versus specific care, whereas the latter study compared the effects of conventional versus minimally invasive arthroplasty, both found positive effects of TKA regardless of the method.

Regarding the correlations in the different subgroups of the study, the results showed that TKA benefited subjects regardless of gender, age, BMI, or deformity. No differences were found among subgroups. Different studies reviewed if aspects such as gender,^{8,15} age,⁸ BMI,^{16,17} and type of deformity are related to better functioning after the surgery.

O'Connor's study¹⁸ shows the absence of gender differences regarding surgery satisfaction, corroborating the results of our study.⁸ Regarding functioning, the systematic review with meta-analysis by Kuperman et al.¹⁹ indicated no differences in pain and functioning after TKA between young and older individuals, corroborating our results. Among the different characteristics of the individuals, BMI is the most studied factor in the literature. Our results showed that non-obese and obese people benefit from TKA and we found no functional differences after surgery. Different studies show that non-obese subjects have better functioning after TKA, however this difference is small and no differences occur in most studies regarding gains after surgery between these populations.^{16,17}

We suggest that future studies evaluate the effect of TKA on other variables such as patient satisfaction and central sensitization, employing a larger sample size. The studies by Kuperman et al.,¹⁹ Boyce et al.,¹⁶ and Kerkhoffs et al.¹⁷ indicate that postoperative pain is one of the main factors for patient dissatisfaction and that central sensitization is a risk factor for dissatisfaction and persistent pain. Thus, we also suggest future studies with longer follow-up time to verify whether such similarities in functioning will be maintained over time. Future studies should also compare other treatment modalities, and even non-surgical approaches to analyze if TKA is the best intervention.

CONCLUSION

TKA shows positive effects on pain relief, joint stiffness, level of physical activity, and general QOL in individuals with gonarthrosis. Individuals' quality of life improved regardless of gender, age, obesity, or knee deformity.

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Table 4. Quality of life before and after total knee arthroplasty evaluated by WOMAC regarding age (N = 58).

WOMAC	Age (years)		Difference (95% CI)	P
	≤ 65 Mean (SD)	> 65 Mean (SD)		
Pain (0-2)	13.76 (3.3) ^a	12.1 (4.66) ^c	1.66 (-0.93 - 4.25)	0.204
	5 (3.14) ^a	4.9 (3.77) ^c	0.1 (-2.08 - 2.29)	0.921
Joint stiffness (0-8)	5.29 (1.4) ^b	4.48 (2.4) ^d	0.81 (-0.47 - 2.1)	0.155
	1.41 (1.41) ^b	1.97 (2.17) ^d	-0.55 (-1.74 - 0.63)	0.354
Physical activity (0-68)	50.59 (9.79) ^a	41.76 (12.38) ^c	8.83 (1.74 - 15.91)	0.016 ^e
	19.35 (8.37) ^a	16.48 (12.22) ^c	2.87 (-3.89 - 9.63)	0.397
Overall score	69.65 (13.41) ^a	58.34 (17.72) ^c	11.30 (1.27 - 21.33)	0.028 ^e
	25.76 (11.37) ^a	23.34 (16.41) ^c	2.42 (-6.68 - 11.52)	0.595

a: paired Student's t-test (P < 0.05); b: Wilcoxon test (P < 0.05); c: paired Student's t-test (P < 0.05); d: Wilcoxon test (P < 0.05); e: Student's t test (P < 0.05).

Table 5. Quality of life before and after total knee arthroplasty evaluated by WOMAC regarding body mass index (N = 58).

WOMAC	BMI		Difference (95% CI)	P
	< 30 Mean (SD)	≥ 30 Mean (SD)		
Pain (0-2)	11.17 (4.92) ^a	14.25 (3.32) ^c	-3.08 (-5.52 - -0.64)	0.014
	4.35 (3.24) ^a	5.52 (3.75) ^c	-1.17 (-3.25 - 0.91)	0.262
Joint stiffness (0-8)	4.17 (2.2) ^b	5.42 (1.95) ^d	-1.25 (-2.45 - -0.41)	0.043
	1.3 (1.39) ^b	2.22 (2.29) ^d	-0.92 (-2.04 - 0.21)	0.2
Physical activity (0-68)	38.04 (12.01) ^a	51.71 (10.26) ^c	-13.67 (-20.16 - -7.17)	0.001
	14.78 (9.41) ^a	20.3 (11.86) ^c	-5.52 (-11.88 - 0.84)	0.087
Overall score (0-96)	53.38 (17.2) ^a	71.38 (14.69) ^c	-18 (-27.29 - -8.7)	0.001
	20.43 (12.43) ^a	28.04 (15.97) ^c	-7.6 (-16.11 - 0.89)	0.078

a: paired Student's t-test (P < 0.05); b: Wilcoxon test (P < 0.05); c: paired Student's t-test (P < 0.05); d: Wilcoxon test (P < 0.05); e: Student's t-test, Mann-Whitney U test (P < 0.05).

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