



Original article

Do patients lose weight after total knee replacement?☆



Carlos Roberto Schwartzmann^{a,b,*}, Alexandre Moreira Borges^b,
Geraldo Luiz Schuck de Freitas^b, Eduardo Zaniol Migon^b, Gustavo Kaempf de Oliveira^b,
Marcos Wainberg Rodrigues^b

^a Universidade Federal de Ciências da Saúde de Porto Alegre (UFCSPA), Porto Alegre, RS, Brazil

^b Complexo Hospitalar da Santa Casa de Porto Alegre, Porto Alegre, RS, Brazil

ARTICLE INFO

Article history:

Received 4 November 2015

Accepted 29 March 2016

Available online 24 January 2017

Keywords:

Obesity

Knee arthroplasty

Body mass index

ABSTRACT

Objective: Several studies show that patients undergoing total knee arthroplasty (TKA) tend to maintain or gain weight after the procedure, which would result in increased wear of the prosthesis and new surgical interventions in a smaller period of time in comparison with patients with adequate body mass index (BMI). The aim of this study was to investigate the effect of TKA surgery on these patients' BMI.

Methods: Initially the records were analyzed, chosen at random from 91 patients undergoing TKA during the period from August 2011 to July 2013. Patients were stratified by BMI as normal weight (BMI between 20 and 25), overweight (BMI between 25 and 30), and obesity (BMI > 30). They were re-evaluated in a minimum period of 18 months.

Results: The mean age of the sample population was 68.1 years; 69.1 for men and 67.2 for women. The mean preoperative BMI was 27.24 kg/m². Among the study participants, in the preoperative period, 17 patients had normal weight, 65 were overweight, and nine were obese. Postoperative analysis showed weight loss in 41 patients (46%), and weight gain in 50 patients (54%). The mean postoperative BMI was 27.16 kg/m², in general, experiencing a slight decline in the mean BMI of 0.08 kg/m².

Conclusion: Patients who underwent TKA did not achieve significant reduction in BMI after surgery.

© 2017 Published by Elsevier Editora Ltda. on behalf of Sociedade Brasileira de Ortopedia e Traumatologia. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

☆ Study conducted at the Santa Casa de Porto Alegre, Serviço de Ortopedia e Traumatologia, Porto Alegre, RS, Brazil.

* Corresponding author.

E-mail: schwartzmann@santacasa.tche.br (C.R. Schwartzmann).

<http://dx.doi.org/10.1016/j.rboe.2017.01.003>

2255-4971/© 2017 Published by Elsevier Editora Ltda. on behalf of Sociedade Brasileira de Ortopedia e Traumatologia. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Os pacientes emagrecem após artroplastia total de joelho?

R E S U M O

Palavras-chave:

Obesidade
Artroplastia do joelho
Índice de massa corporal

Objetivo: Diversos estudos demonstram que pacientes submetidos à artroplastia total do joelho (ATJ) tendem a manter ou a ganhar peso corporal após o procedimento, o que acarretaria aumento no desgaste da prótese e novas intervenções cirúrgicas em um tempo inferior àqueles que se mantêm em índice de massa corporal (IMC) adequado. O objetivo deste estudo foi investigar o efeito da cirurgia de ATJ no IMC desses pacientes.

Métodos: Inicialmente foram analisados os prontuários, escolhidos ao acaso, de 91 pacientes submetidos à ATJ de agosto de 2011 a julho de 2013. Os pacientes foram estratificados pelo IMC como peso normal (IMC entre 20-25), sobrepeso (IMC entre 25-30) e obesidade (IMC > 30) e reavaliados em 18 meses no mínimo.

Resultados: A média de idade da população amostral foi de 68,1 anos, 69,1 para homens e 67,2 para mulheres. O IMC médio pré-operatório foi de 27,24 kg/m². Entre os participantes do estudo, no período pré-operatório, 17 pacientes apresentavam peso normal; 65, sobrepeso e nove, obesidade. A análise pós-operatória demonstrou diminuição no peso em 41 pacientes (46%) e ganho ponderal em 50 (54%). O IMC médio pós-operatório foi de 27,16 kg/m², de forma geral, ocorreu uma ligeira queda do IMC médio em 0,08 kg/m².

Conclusão: Os pacientes submetidos à ATJ não obtiveram redução significativa do IMC após o procedimento cirúrgico.

© 2017 Publicado por Elsevier Editora Ltda. em nome de Sociedade Brasileira de Ortopedia e Traumatologia. Este é um artigo Open Access sob uma licença CC BY-NC-ND (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

Obesity is a serious problem in both developed and developing countries. It is likely one of the factors that is most associated with the increase in the morbimortality of the global population nowadays.¹ The increase in obesity will likely cause an increase in the incidence of knee osteoarthritis and hence in the number of total knee arthroplasties (TKA).²

Evidence indicates that the relative risk to undergo a TKA varies from 3.20 for overweight individuals to 32.73 in individuals with morbid obesity grade III.³ High body mass index (BMI) has been shown to be a risk factor for worsening of knee osteoarthritis.¹⁻⁵ The relationship between arthroplasty and increased BMI is therefore increasingly important in relation to the outcomes in the postoperative period and the expectations of patients.⁵

To date, the gold standard treatment for obese patients with knee osteoarthritis remains the subject of debate, since patients with a high BMI (>30 kg/m²) are at higher risk of developing complications after TKA.⁶ Kerkhoffs et al.⁷ suggest that these patients should first undergo a body weight control program in order to reduce the risk of postoperative complications, which is why many surgeons are reluctant to perform TKA in this population.⁸ The impact of body weight on TKA has not been fully explored. Clinically significant body weight gain after TKA could pose potentially harmful health risks.⁹

However, preoperative weight loss in TKA is an important measure that should be strongly encouraged, since high BMI has been shown to be a risk factor for worsening knee osteoarthritis.¹⁰⁻¹⁵ The benefits of weight loss include decreased surgical risk and increased longevity of the prosthetic implant. However, several studies have demonstrated

that patients who undergo TKA tend to maintain or gain body weight after the surgical procedure when compared with the period before the placement of the prosthesis, which leads to an accelerated increase in prosthesis wear. Therefore, the obese patient will have to undergo a new surgical intervention in a shorter time interval than those with an adequate BMI.^{1,3,4}

The rate of obesity among the adult population has increased in epidemic proportions. Statistical data support the hypothesis that obesity rates will continue to grow until 2030.¹⁶ According to the medical literature, the obese and overweight populations, assessed by BMI, are more likely to have conditions such as knee osteoarthritis.^{1-3,14} In the present study, it was observed that the vast majority of patients eligible for TKA are above their ideal weight (82%).

The significant improvement in joint pain and functional limitations after TKA^{14,15} does not change the patients' lifestyle habits.¹⁷⁻²⁰

The results of these studies are alarming, since the number of young patients undergoing knee arthroplasty is gradually increasing.^{13,16} Furthermore, a higher-than-ideal BMI raises concerns regarding the lower durability of the prosthesis.^{13,20}

The present study aimed to investigate the effect of TKA on the BMI of patients undergoing this procedure.

Material and methods

Through a retrospective analysis, the medical records of 100 patients who underwent TKA from August 2011 to July 2013 were analyzed. As this was a retrospective study, the institution did not require approval from the Ethics Committee. The inclusion criteria were: male and female patients with a diagnosis of knee osteoarthritis, BMI greater than or equal to 20,

who underwent knee arthroplasty, with a minimum 1.5 years of post-operative follow-up. Patients with incomplete data and records and those who were not weighed (in either the pre- or postoperative periods) were excluded. Of the 100 records analyzed, 91 met the aforementioned criteria. Of these, 21 (24%) were men and 70 (76%) were women. In the preoperative period, the mean age of the sample population was 68.1 years (SD ± 2); 69.1 ± 2 for men and 67.2 ± 2 for women.

Both weight and height in the preoperative period were measured on a conventional scale with a height gauge. BMI was calculated using the body mass/height² formula. The current weight of the patients was assessed again at least 1.5 years after surgery. Patients were stratified by BMI as follows: normal weight (between 20 and 25), overweight (between 25 and 30), and obese (over 30), as proposed by the World Health Organization.^{11,12}

Data were analyzed by SPSS software for Windows, version 17; descriptive statistics and frequency distribution were observed. Groups were correlated using the Mann-Whitney test. BMI variations were compared between male and female patients, and a comparison of the groups stratified according to BMI was also made.

Results

Mean preoperative BMI was 27.24 kg/m². As shown in Table 1, in the preoperative period 17 patients had normal weight (BMI 20–25), 65 were overweight (25–30), and nine were obese (>30).

Postoperative analysis showed a decrease in weight in 41 patients (46%) and weight gain in 50 (54%). Mean postoperative BMI was 27.16 kg/m²; overall, a slight decrease of 0.08 kg/m² was observed. Therefore, mean BMI of the study population remained practically unchanged.

Fig. 1 presents the BMI variation within each group. In the group with preoperative BMI from 20 to 24.9, a slight tendency toward increased BMI was observed, with a rise of 0.04 kg/m² (23.91 vs. 23.95). The same pattern was observed in the group with BMI from 25 to 29.9; the preoperative mean was 27.1 and the postoperative mean was 27.12, i.e. an increase of 0.02 kg/m². Conversely, a downward trend was observed in those with preoperative BMI greater than 30 kg/m², with a fall of 0.42 kg/m² (31.66 vs. 31.24). Once again, the mean BMI remained practically unchanged.

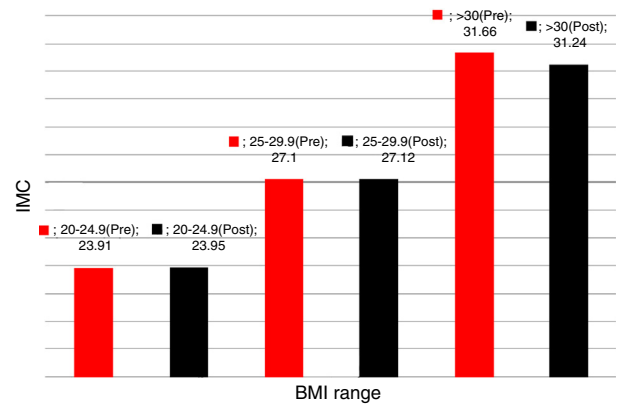


Fig. 1 – Comparison between pre- and postoperative body mass index (BMI).

Discussion

As observed in the present study, there was no significant reduction in body mass after surgery, and 54% of the patients presented weight gain. Of the three groups, only the group of patients with preoperative BMI above 30 kg/m² presented a trend of body mass reduction. Some studies reported that a post-operative weight gain of more than 5%–10% had a negative impact on pain and function.^{21,22} According to Teichtahl et al.,²² a significant predictor of postoperative weight loss is worse preoperative function. The present study is in agreement with a study published by Zeni et al., in which 47% of the patients studied presented weight gain one year after the surgical procedure.²³ A similar trend of maintenance of BMI levels above the ideal was observed in men and women. Other studies have observed a greater tendency of women to lose weight post-surgery and a lower propensity for men to either lose or gain weight in both the pre- and postoperative periods, in addition to a lower propensity for weight gain in older patients.^{24,25} Stets et al.²⁶ also found that only 21.5% of their patients presented a reduction in BMI; in the other patients, weight was maintained (59.2%) or increased (19.9%). Regarding obese patients, Järvenpää et al.²⁷ observed a lower loss of periprosthetic bone mineral density in the postoperative period, probably related to a greater induced stress due to high body weight.

The present study corroborates the findings retrieved in the literature, in which no significant decrease in BMI is observed.^{17,18,20}

The limitations observed in the present study include the lack of a control group and data on nutrition, physical activity level, socioeconomic profile, and educational level of the studied patients. Although some studies did not show significant difference in the impact of preoperative weight loss on surgical site infection and hospital readmission rates,²⁸ the present study shows the importance of the decrease in BMI immediately in the preoperative period, since there is a tendency to increase or maintain weight among patients submitted to knee replacement.^{5,6}

Regardless of weight and BMI prior to the procedure, contrary to what was believed, the improved mobility obtained with arthroplasties did not lead to a reduction in the

Table 1 – Stratification of patients by pre- and post-operative body mass index.

Pre-operative classification	Post-operative classification
Normal weight (20–25 kg/m ²): 17	Normal weight (20–25 kg/m ²): 15 Overweight (25–30 kg/m ²): 2 Obese (>30 kg/m ²): 0
Overweight (25–30 kg/m ²): 65	Normal weight (20–25 kg/m ²): 2 Overweight (25–30 kg/m ²): 61 Obese (>30 kg/m ²): 2
Obese (> 30 kg/m ²): 9	Normal weight (20–25 kg/m ²): 0 Overweight (25–30 kg/m ²): 2 Obese (>30 kg/m ²): 7

anthropometric measurements in patients with BMI between 20 and 30 kg/m²; however, in patients who were obese prior to surgery, there was a slight trend toward a reduction in BMI.

The reasons why patients undergoing TKA cannot lose weight need to be better evaluated and may be the subject of future studies.

Conclusion

Patients who underwent TKA did not obtain a significant reduction of BMI after the surgical procedure. Of these, 46% lost and 54% gained weight in the postoperative period.

Conflicts of interest

The authors declare no conflicts of interest.

REFERENCES

- Vasarhelyi EM, MacDonald SJ. The influence of obesity on total joint arthroplasty. *J Bone Joint Surg Br.* 2012;94 11 Suppl. A:100-2.
- Samson AJ, Mercer GE, Campbell DG. Total knee replacement in the morbidly obese: a literature review. *ANZ J Surg.* 2010;80(9):595-9.
- Bourne R, Mukhi S, Zhu N, Keresteci M, Marin M. Role of obesity on the risk for total hip or knee arthroplasty. *Clin Orthop Relat Res.* 2007;465:185-8.
- Hrnack SA, Skeen N, Xu T, Rosenstein AD. Correlation of body mass index and blood loss during total knee and total hip arthroplasty. *Am J Orthop (Belle Mead NJ).* 2012;41(10):467-71.
- Kandil A, Novicoff WM, Browne JA. Obesity and total joint arthroplasty: do patients lose weight following surgery? *Phys Sportsmed.* 2013;41(2):34-7.
- Poolman RW, van Wagenveld BA. Osteoarthritis of the knee: lose weight first? *Ned Tijdschr Geneesk.* 2013;157(14):A6043.
- Kerkhoffs GM, Servien E, Dunn W, Dahm D, Bramer JA, Haverkamp D. The influence of obesity on the complication rate and outcome of total knee arthroplasty: a meta-analysis and systematic literature review. *J Bone Joint Surg Am.* 2012;94(20):1839-44.
- Hamoui N, Kantor S, Vince K, Crookes PF. Long-term outcome of total knee replacement: does obesity matter? *Obes Surg.* 2006;16(1):35-8.
- Riddle DL, Singh JA, Harmsen WS, Schleck CD, Lewallen DG. Clinically important body weight gain following knee arthroplasty: a five-year comparative cohort study. *Arthritis Care Res (Hoboken).* 2013;65(5):669-77.
- Jiganti JJ, Goldstein WM, Williams CS. A comparison of morbidity in total joint arthroplasty in obese and non obese patient. *Clin Orthop Relat Res.* 1993;(289):175-9.
- World Health Organization (WHO). Expert Committee on Physical Status. The Use and Interpretation of Anthropometry. WHO Technical Report Series No. 854. Geneva: WHO; 1995.
- Shenkman Z, Shir Y, Brodsky JB. Perioperative management of obese patients. *Br J Anaesth.* 1993;70(3):349-59.
- Gelber AC, Hochberg MC, Mead LA, Wang NY, Wigley FM, Klag MJ. Body mass index in young men and the risk of subsequent knee and hip osteoarthritis. *Am J Med.* 1999;107(6):542-8.
- Murphy L, Schwartz TA, Helmick CG, Renner JB, Tudor G, Koch G, et al. Lifetime risk of symptomatic knee osteoarthritis. *Arthritis Rheum.* 2008;59(9):1207-13.
- Marks R. Obesity profiles with knee osteoarthritis: correlation with pain, disability, disease progression. *Obesity (Silver Spring).* 2007;15(7):1867-74.
- Niu J, Zhang YQ, Torner J, Nevitt M, Lewis CE, Aliabadi P, et al. Is obesity a risk factor for progressive radiographic knee osteoarthritis? *Arthritis Rheum.* 2009;61(3):329-35.
- Donovan J, Dingwall I, McChesney S. Weight change 1 year following total knee or hip arthroplasty. *ANZ J Surg.* 2006;76(4):222-5.
- Woodruff MJ, Stone MH. Comparison of weight changes after total hip or knee arthroplasty. *J Arthroplasty.* 2001;16(1):22-4.
- Fitzgerald JD, Orav EJ, Lee TH, Marcantonio ER, Poss R, Goldman L, et al. Patient quality of life during the 12 months following joint replacement surgery. *Arthritis Rheum.* 2004;51(1):100-9.
- Heisel C, Silva M, dela Rosa MA, Schmalzried TP. The effects of lower-extremity total joint replacement for arthritis on obesity. *Orthopedics.* 2005;28(2):157-9.
- Mackie A, Muthumayandi K, Shirley M, Deehan D, Gerrand C. Association between body mass index change and outcome in the first year after total knee arthroplasty. *J Arthroplasty.* 2015;30(2):206-9.
- Teichtahl AJ, Quirk E, Harding P, Holland AE, Delany C, Hinman RS, et al. Weight change following knee and hip joint arthroplasty a six month prospective study of adults with osteoarthritis. *BMC Musculoskelet Disord.* 2015;16:137.
- Zeni JA, Snyder-Mackler L. Most patients gain weight in the 2 years after total knee arthroplasty: comparison to a healthy control group. (NIH Public Access Manuscript) *Osteoarthritis Cartilage.* 2010;18(4):510-4.
- Inacio MC, Silverstein DK, Raman R, Macera CA, Nichols JF, Shaffer RA, et al. Weight patterns before and after total joint arthroplasty and characteristics associated with weight change. *Perm J.* 2014;18(1):25-31.
- Ast MP, Abdel MP, Lee YY, Lyman S, Ruel AV, Westrich GH. Weight changes after total hip or knee arthroplasty: prevalence, predictors, and effects on outcomes. *J Bone Joint Surg Am.* 2015;97(11):911-9.
- Stets K, Koehler SM, Bronson W, Chen M, Yang K, Bronson M. Weight and body mass index change after total joint arthroplasty. *Orthopedics.* 2010;33(6):386.

-
27. Järvenpää J, Soininvaara T, Kettunen J, Miettinen H, Kröger H. Changes in bone mineral density of the distal femur after total knee arthroplasty: a 7-year DEXA follow-up comparing results between obese and nonobese patients. *Knee*. 2014;21(1):232-5.
 28. Inacio MC, Kritz-Silverstein D, Raman R, Macera CA, Nichols JF, Shaffer RA, et al. The impact of pre-operative weight loss on incidence of surgical site infection and readmission rates after total joint arthroplasty. *J Arthroplasty*. 2014;29(3):458-64.