

Lower Incidence of Dislocations after Total Hip Arthroplasty with Larger Diameter Heads in a Brazilian Population

Thiago Sampaio Busato^{1*}, Marcelo Morozovski¹, Antonio Rogers Medeiros Holanda²
Gladyston R. Matioski Fo¹, Julian Costantini¹, Lucas Dias Godoi¹, Juan R. V. Capriotti³

¹Staff of Hip Surgery group, Centro de Reconstrução e Instituto de Pesquisa Articular, City of Curitiba, Brazil.

²Fellow of Hip Surgery group, Centro de Reconstrução e Instituto de Pesquisa Articular, City of Curitiba, Brazil.

³Chair of Hip Surgery group, Centro de Reconstrução e Instituto de Pesquisa Articular, City of Curitiba, Brazil.

**Corresponding Author: Thiago Sampaio Busato, Staff of Hip Surgery group, Centro de Reconstrução e Instituto de Pesquisa Articular, City of Curitiba, Parana State, Brazil.*

Abstract

Dislocation is the most common complication following a total hip replacement, and it's the primary cause of early revision surgery. According to the English-language literature, the use of bigger diameter heads has shown to be an effective measure to prevent this complication. We retrospectively studied the dislocation rate in 1093 cases of primary total hip arthroplasties performed by our staff with 28mm, 32mm, and 36mm diameter heads. We observed a dislocation rate of 4,38% in the 28mm group, 1,73% in the 32mm group, and only 1,07% in the 36mm group. Our data suggested a statistically significant reduction ($p < 0,01$) in the dislocation rate with the use of big heads (32mm and 36mm) when compared to 28mm heads, corroborating the literature findings.

Keywords: total hip arthroplasty, dislocation, big heads.

INTRODUCTION

Dislocation after total hip arthroplasty remains a worrying complication that occurs with a frequency ranging from about 3% to 12%. Also, up to 50% of patients with this complication may progress to recurrent dislocations, eventually leading to a surgical revision. The period of greatest incidence is from the first five weeks after surgery until the sixth month after surgery. [1, 2].

There are several known risk factors for the occurrence of dislocation, like alcoholism, osteonecrosis, higher BMI, developmental dysplasia of the hip, psychiatric disorders, inflammatory arthritis, older age, revision surgery, femoral neck fracture, and neurological pathologies. Among the technical factors involved in the risk of dislocation, errors in the positioning of the femoral or the acetabular components, failures in biomechanical reconstruction, and insufficiency of the abductor apparatus stand out. [3].

Increasing the diameter of the implanted femoral head is a useful tool in reducing postoperative dislocation

rates. However, this strategy is not unlimited, since the size of the head is restricted by the size of the acetabular component, at the expense of decreasing the thickness of the liner. There is also an increase in frictional torque for higher diameters heads; however, ceramic and crosslinked polyethylene surfaces seem to tolerate this torque well due to its mechanical characteristics of higher resistance (4). Also, the increase in frictional torque will be transferred to the Morse taper, potentially causing trunnionosis in some implants, especially with heads bigger than 36mm and with the use of different metal alloys for the cephalic component and the femoral stem.

From the mechanical point of view, the increase in the diameter of the femoral component is advantageous, as it causes a corresponding increase in the head-neck ratio (higher clearance), in the range of motion before impingement and in the jump distance; providing exceptional stability to the implants and consequently less risk of dislocation [5].

Lower Incidence of Dislocations after Total Hip Arthroplasty with Larger Diameter Heads in a Brazilian Population

Studies in English-language literature have proven the correlation between the increase in the diameter of the implanted femoral head and the decrease in the risk of hip dislocation [4,6]. Still, we have not found studies of this type in a Brazilian population.

This study investigates the incidence of postoperative dislocation in total hip arthroplasties in our series and the effect of the diameter of the prosthetic femoral head on these indexes.

MATERIAL AND METHODS

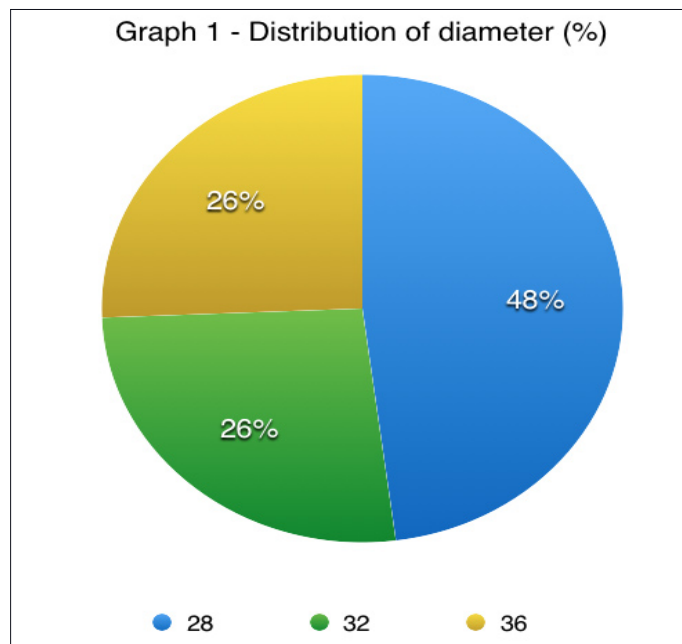
This study was approved by the Ethics and Research Committee of our institution. We retrospectively analyzed 1093 medical records of patients who underwent primary total hip arthroplasty, who completed a minimum postoperative follow-up period of six months. Surgeries were performed between January 2012 to May 2016, using the posterolateral approach by surgeons who use the same surgical technique. The re-insertion of the short external rotator muscles was performed whenever possible.

Various implant models were used between hybrid and cementless prostheses. The tribological pairs used were ceramic on ceramic, ceramic on polyethylene (conventional or crosslinked), metal on polyethylene (conventional or crosslinked). The liner of ceramics or crosslinked polyethylene was used only for the 32 and 36 mm heads.

We counted the use of heads with diameters 28, 32, 36mm, and the dislocation events presented in this period. Statistical analysis was performed using Pearson's chi-square test, using Statcalc software v.8.1.3 (AcaStat Softwares).

RESULTS

Of the 1093 primary total hip arthroplasties, 524 were performed with 28mm diameter heads, 289 with 32mm heads, and 280 with 36mm heads. Graph 1 shows the homogeneous division of the sample. There were no significant differences between the groups evaluated from sex and age.



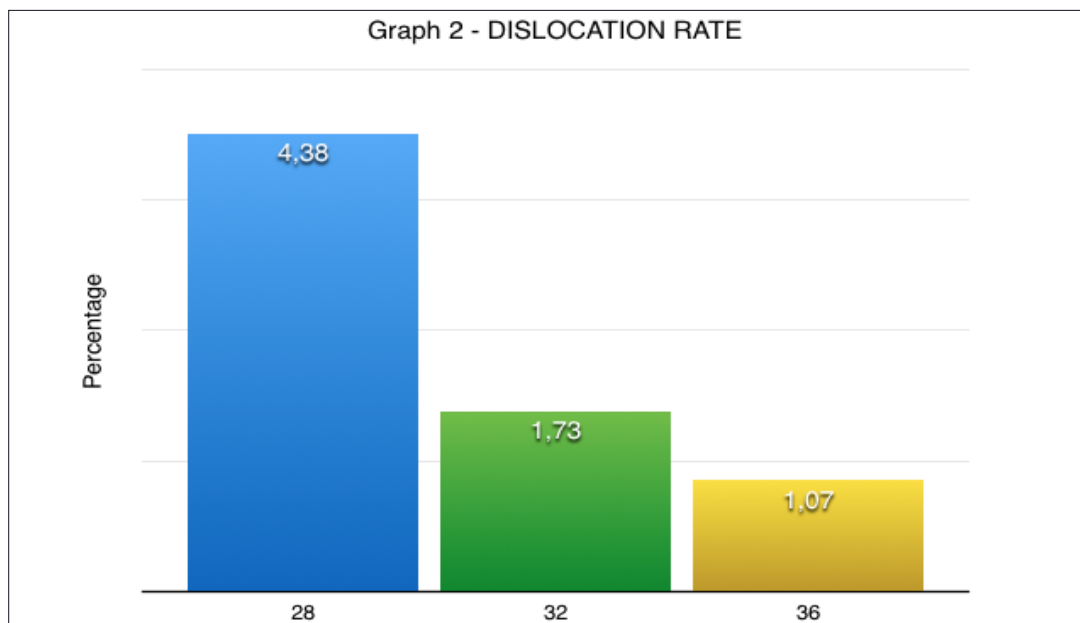
There were 31 dislocation events, 23 of them in the group using 28mm heads, 5 in the 32mm group, and 3 in the 36mm group. Three patients with recurrent dislocation required revision surgery in the head group 28, being counted for this study as three positive events. Although it was not the focus of the present study, there was a higher incidence of dislocation in patients undergoing arthroplasty

due to an initial diagnosis of neck fracture ($n = 13$), followed by osteonecrosis ($n = 7$), poor positioning ($n = 3$) and unidentifiable cause ($n = 8$). Thus, we observed a dislocation incidence of 4.38% for the group with 28mm heads, 1.73% in the 32mm head group, and 1.07% in the 36mm group. The overall rate of dislocation was 2.83%. (see Table 1 and Graph 2).

Lower Incidence of Dislocations after Total Hip Arthroplasty with Larger Diameter Heads in a Brazilian Population

Table 1. Results

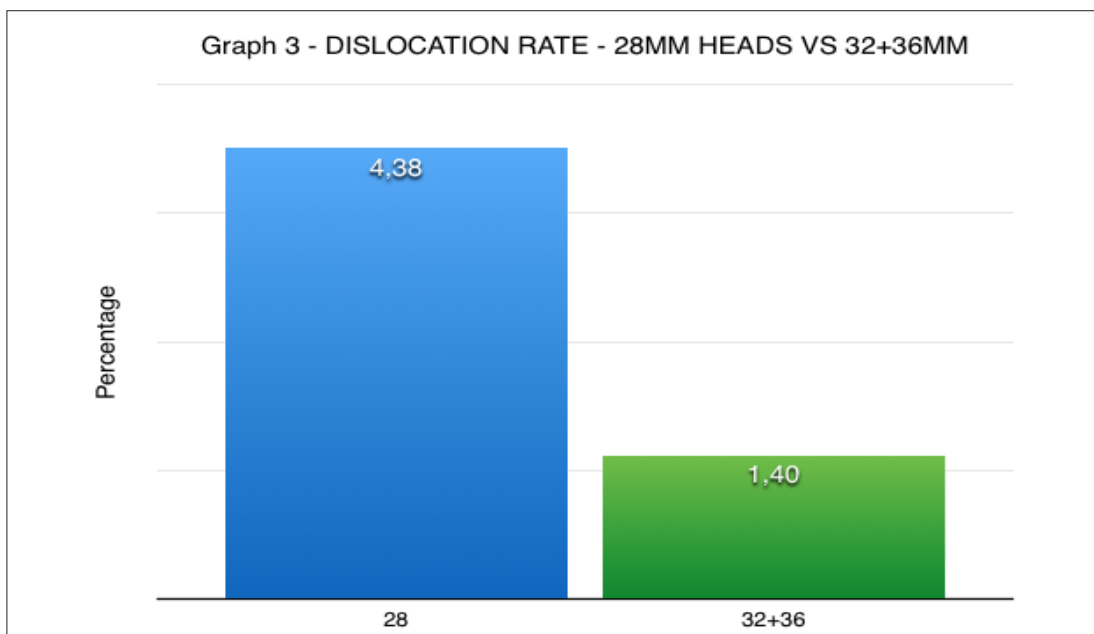
HEAD (mm)	CASES (n)	DISLOCATIONS (n)	DISLOCATIONS (%)
28	524	23	4,38
32	289	5	1,73
36	280	3	1,07
Total	1093	31	2,83



For the statistical analysis, in the first moment, we divided our sample into two groups and compared the incidence of dislocation found. The first group used “traditional” 28mm heads, and the second, “large” heads, 32 or 36mm. There was a statistically significant difference, with a reduction in the incidence of dislocation

in the 32 + 36mm head group. ($P < 0.003$) (Graph 3).

In the second moment, we compared the difference between the 32 and 36mm head groups, and although the dislocation rate was lower in the 36mm group, it was not statistically significant.



DISCUSSION

Instability after total hip arthroplasty is a complex multifactorial event [7]. Several studies have investigated the factors that contribute to prosthetic dislocation to recognize which of them the surgeon could preventively control, and perhaps avoid the dislocation [8,9].

Femoral heads with larger diameters increase the head-to-neck ratio, the range of motion free of impingement between the components, and the distance necessary for the head to exit from the liner. In this way, they generate more excellent stability to the joint [10,11].

Burroughs et al. demonstrated through studies with experimental models that larger heads increase stability. Because it has such mechanical characteristics, the femoral head's size becomes an object of interest in the management of instability. This interest reappeared with the advent of "crosslinked" polyethylene as it presented a drastic reduction in wear compared to what occurred with the use of large heads in traditional polyethylene [11].

Berry et al. [2] presented an overall dislocation rate of 4.1% in a cohort study, including 21,047 primary total hip arthroplasties performed using femoral heads of diameter 22, 28, 32 mm. For surgeries performed through the posterolateral access route, he found an incidence of dislocation for heads with 22, 28 and 32mm, respectively, of 12.1%, 6.9%, and 3.8%.

Through a multicentre randomized controlled study, Howie et al. [6] reported a notable difference in the incidence of dislocation after primary total hip arthroplasties varied with the diameter of the implanted femoral head. 4.4% dislocation when using 28mm head versus 0.8% with 36mm.

Woo and Morrey [7], showed little difference between heads of 22 and 28 mm in the incidence of dislocation. Still, an apparent gain of stability with 32 mm heads for surgeries performed by the posterolateral approach.

The present study has some limitations. We do not consider the loss of follow-up since we collect information only from those patients who followed the minimum period of 06 months in our institution. Although it is not common in our Region, some patients may have had dislocations and have been referred to another center, so the present survey could

not detect them. We do not consider the presence or absence of the acetabular rim, present in most polyethylene liners (28mm), and absent in ceramic liners and most crosslinked polyethylene liners at the time of the study (32 and 36mm). We emphasize that the elevated rim would cause a bias with a tendency to the null hypothesis in the 28mm head group, which was not observed in the study. The focus of this study was limited to only one variable: the diameter of the prosthetic head. We did not address in depth other factors that could have interfered with the dislocation index, trying to isolate only this mechanical characteristic.

Our results are similar to those of studies found in the world literature, with very similar rates of early dislocation in the three studied diameters.

CONCLUSION

The use of femoral heads with a diameter of 32 or 36mm showed a statistically significant reduction in the incidence of prosthetic dislocation after total hip arthroplasty (compared to the indexes found with 28mm heads).

REFERENCES

- [1] TRICLOT, P; GOUIN, F. **"Big-head": The solution to the problem of hip implant dislocation?**. Orthopaedics and Traumatology: Surgery and Research. 2011; 97:42-48
- [2] BERRY, Daniel J et al. **Effect of femoral head diameter and operative approach on risk of dislocation after primary total hip arthroplasty**. J Bone Joint Surg Am. 2005; 87:2456-63
- [3] PLATE, JF et al. **Risk of dislocation using large vs. small-diameter femoral heads in total hip arthroplasty**. BMC Research Notes. 2012; 5:553
- [4] MAGGE, Trevor H et al. **Effect of Femoral Head Diameter on Risk of Dislocation after Primary Total Hip Arthroplasty**. J Arthritis. 2013; 2: 109
- [5] RODRIGUEZ, JA; RATHOD, PA. **Large diameter heads, Is bigger always better?**. J Bone Joint Surg Br. 2012; 94:52-4
- [6] HOWIE, Donald W; HOLUBOWICZ, Oksana T; MIDDLETON, R. **Large femoral heads decrease**

Lower Incidence of Dislocations after Total Hip Arthroplasty with Larger Diameter Heads in a Brazilian Population

- the incidente of dislocation after total hip arthroplasty:** A randomized controlled trial. J Bone Joint Surg Am. 2012; 94:1095-1102
- [7] WOO, Ronald Y; MORREY, Bernard F. **Dislocations after total hip arthroplasty.** J Bone Joint Surg Am. 1982; 64:1295-1306
- [8] ALBERTON, GM; HIGH, WA; MORREY, BF. **Dislocation after revision total hip arthroplasty:** an analysis of risk factors and treatment options. J Bone Joint Surg Am. 2002; 84:1788-92
- [9] MORREY, Bernard F. **Instability after total hip arthroplasty.** Orthop Clin North Am. 1992; 23:237-248
- [10] GARBUZ, Donald S. et al. **Dislocation in Revision THA: Do Large Heads (36 and 40mm) Result in Reduced Dislocation Rates in a Randomized Clinical Trial?.** Clin Orthop Relat Res. 2012; 470(2):351-356
- [11] CROSS, Michael B; NAM, Denis; MAYMAN, David J. **Ideal femoral head size in total hip arthroplasty balances stability and volumetric wear.** HSSJ. 2012; 8:270-274
- [12] ALI KHAN, MA; BRAKENBURY, PH; REYNOLDS, ISR. **Dislocation following total hip replacement.** J Bone Joint Surg Br. 1981; 63-B:214-218

Citation: Thiago Sampaio Busato, Marcelo Morozovski, Antonio Rogers Medeiros Holanda, et.al. *Lower Incidence of Dislocations after Total Hip Arthroplasty with Larger Diameter Heads in a Brazilian Population.* Archives of Orthopedics and Rheumatology. 2020; 3(1): 07-11.

Copyright: © 2020 Thiago Sampaio Busato, Marcelo Morozovski, Antonio Rogers Medeiros Holanda, et.al. *This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.*