

The role of head size in total hip arthroplasty: dislocation, wear and cup stability

Akademisk avhandling

Som för avläggande av medicine doktorexamen vid Sahlgrenska akademien, Göteborgs universitet kommer att offentlig försvaras i Boken R-hus, Mölndals sjukhus, den 26:e i mars 2021, klockan 14:00

av Georgios Tsikandylakis, leg.läkare

Fakultetsopponent:
Professor Steven McDonald
Western University, Kanada

Avhandlingen baseras på följande delarbeten

- I. Tsikandylakis G, Karrholm J, Hailer NP et al. No Increase in Survival for 36-mm versus 32-mm Femoral Heads in Metal-on-polyethylene THA: A Registry Study. *Clin Orthop Relat Res*. 2018 Dec;476(12):2367-78.
- II. Tsikandylakis G, Karrholm J. N, Hallan G et al. (2020). Is there a reduction in risk of revision when 36-mm heads instead of 32 mm are used in total hip arthroplasty for patients with proximal femur fractures? *Acta Orthop* 2020; 91(4): 401-407.
- III. Tsikandylakis G, Mortensen KRL, Gromov K et al. Does the use of the largest possible metal head increase the wear of vitamin E-doped cross-linked polyethylene? Two-year results from a randomized controlled trial. *In manuscript*.
- IV. Bunyoz K, Tsikandylakis G, Mortensen KRL et al. No difference in whole blood metal ions for 32 mm versus 36-44 mm femoral heads in metal-on-polyethylene Total Hip Arthroplasty: A 2-year report from a randomized control trial. *In manuscript*.
- V. Tsikandylakis G, Mortensen KRL, Gromov K et al. The Use of Porous Titanium Coating and the Largest Possible Head Do Not Affect Early Cup Fixation: A 2-Year Report from a Randomized Controlled Trial. *JB JS Open Access*. 2020;5(4):e20.00107.

**SAHLGRENKA AKADEMIN
INSTITUTIONEN FÖR KLINISKA VETENSKAPER**



The role of head size in total hip arthroplasty: dislocation, wear and cup stability

Georgios Tsikandylakis

Department of Orthopaedics, Institute of Clinical Sciences, Sahlgrenska Academy, University of Gothenburg, Sweden, 2021

Abstract

Large heads are used in total hip arthroplasty, with the aim of reducing the risk of dislocation, but there are concerns related to polyethylene wear, corrosion and cup loosening. Paper I is an observational study that aimed to investigate whether the transition from 28-mm to 32-mm heads and thereafter to 36-mm heads in patients undergoing total hip arthroplasty (THA) after osteoarthritis has been followed by a reduction in dislocation rates in the Nordic countries. The results showed that the use of 32-mm rather than 28-mm heads reduced the risk of revision due to dislocation. A further increase from 32- to 36-mm heads was not associated with any further reduction in the risk of revision due to dislocation. Paper II is an observational study that investigated whether there is a difference in the risk of revision due to dislocation between 2 propensity score matched groups of patients that had received a 36-mm or a 32-mm THA after femoral neck fracture. The results showed no difference. Paper III is a randomized, controlled trial that aimed to compare polyethylene wear, measured with roentgen stereophotogrammetry (RSA), between patients that underwent a THA with the largest possible metal head (36-44 mm) and patients with a 32-mm THA. There was no difference in polyethylene wear. Paper IV aimed to compare whole-blood cobalt, chromium and titanium levels between patients that had randomly received either the largest possible cobalt-chromium head (36-44 mm) or a 32-mm cobalt-chromium head on a titanium stem. Whole-blood ion levels, as an indicator of taper corrosion, were very low and did not differ between the groups. Paper V aimed to investigate whether the increased frictional torques that are generated by the largest possible metal heads (36-44 mm) on highly cross-linked polyethylene bearings would compromise the fixation of cementless cups, compared with 32-mm heads. Using RSA, no difference in cup migration was found.

The thesis concludes that the use of 32-mm heads in routine THA has provided greater stability than 28-mm heads. The use of 36-mm heads did not provide any additional stability. In patients with a femoral neck fracture, the use of 36-mm heads did not provide any additional stability either. In order to achieve even greater stability, even larger heads are probably required. The concerns about polyethylene wear, taper corrosion and cup loosening could not be confirmed by the results of the thesis, but longer-term results are warranted before drawing any definite conclusions about the safety of larger heads.

Keywords: arthroplasty, head, dislocation, wear, corrosion, cup migration

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