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On Fixation of Hip Resurfacing Implants

AKADEMISK AVHANDLING

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av

Raed Itayem

Leg. Läkare

Huvudhandledare:

Professor Toni Arndt
Gymnastik och Idrottshögskolan

Bihandledare:

Docent Arne Lundberg
Karolinska Institutet
Institutionen CLINTEC
Enheten för Ortopedi och Bioteknik

Fakultetsopponent:

Docent Leif Ryd
Lunds Universitetet

Betygsnämnd:

Docent Ville Mattila
Tampere Universitetet

Professor Torsten Wredmark
Karolinska Institutet
Institutionen CLINTEC
Enheten för Ortopedi och Bioteknik

Docent Svein Kleiven
Kungliga Tekniska Högskolan
Skolan för Teknik och Hälsa
Division Neuronic Engineering

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ABSTRACT

Hip resurfacing became a recognized entity in hip replacement in the 1970's. This generation of resurfacing implants was abandoned due to loosening and debris. The interest in resurfacing was renewed due to the need of a bone conservative solution for young active patients with osteoarthritis, and a new generation metal on metal (MoM) resurfacing implants was introduced in the late 1990's using the same alloy as in earlier MoM total hip replacements (THR's). Although sharing similar resurfacing features, they could differ in aspects such as fixation method, design features and manufacturing process.

Radiostereometric analysis (RSA) is the golden standard method to study micromotion in hip and knee implants; early micromotion is a strong indicator for loosening and poor long term survival. No RSA studies had been performed on earlier MoM THR's. This meant that it was important to perform RSA studies on the new MoM resurfacing implants. In Studies I-II, RSA examinations were performed on the Birmingham Hip Resurfacing Implant (BHR), to investigate whether translation and or rotation occurred early postoperatively (Study I) and at mid term (Study II). In Study III, a two year RSA follow - up was performed on the Birmingham Mid Head Resection (BMHR) implants. The results demonstrated stable implants during the periods studied, indicating that fixation and stability should not contribute to eventual failure.

One MoM resurfacing device, the Articular Surface Replacement (ASR) was recalled from clinical use in 2010 due to inferior outcome. Femoral head implant loosening and femoral neck fractures indicating instability of fixation were dominant causes at short term. The cementing technique for ASR fixation (high viscosity (HV), indirect) differed from the technique used for clinically successful resurfacing implants (low viscosity (LV), direct). Study IV was an investigation using a cadaver model, to clarify morphological differences between the HV and LV cementing techniques on ASR implants. The results demonstrated a superficial fixation with the HV technique, which in traditional hip and knee implants has been demonstrated to be favourable, but may in the ASR be insufficient to maintain adequate stable fixation.

The use of the resurfacing method has declined since the ASR withdrawal, although other issues concerning the long term effects of elevated ion levels also contributed to the decline. The ASR experience underlines the importance of thorough studies of factors such as migration and wear before general market introduction of new implants.

Key words: Hip resurfacing, hip arthroplasty, radiostereometric analysis, implant fixation, implant migration, cementing techniques, metal on metal, BHR, BMHR, ASR.

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