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EDITORIAL

Dual mobility in hip arthroplasty

WHAT EVIDENCE DO WE NEED?

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The British Editorial Society of Bone & Joint Surgery

Instability is the leading complication in the first year after primary and revision total hip arthroplasty (THA) according to the England and Wales National Joint Registry report.[1] Instability is also an ongoing problem throughout the lifetime of any hip prosthesis, particularly in high-risk groups.[2] Large diameter bearings, dual mobility and constrained liners are increasingly used to minimise the risk of instability after THA and revision THA.[3]

Bousquet and Rambert[4] introduced dual mobility (DM) bearing system more than 40 years ago. Dual mobility is a combination of two brilliant ideas in total hip arthroplasty, the low friction principle from Sir John Charnley,[5] and large diameter mobile component in a highly polished acetabular liner seen in the McKee-Farrar prosthesis.[6] In theory, this system can provide increased stability by adding an extra articulating interface without causing significant restriction in range of movement, unlike constrained liners. Biomechanical studies confirm the stability advantage of these implants compared with other options.[7]

Early clinical reports, mainly from France, showed that DM can reduce dislocation rates in primary THA.[8,9] This is supported by more recent data from newer DM hips.[10] It seems increasingly clear that using dual mobility is likely to offer advantages to patients. This would include particularly those patients who are at higher risk of instability, either due to lack of muscle control, neuromuscular issues, soft-tissue problems, or spinopelvic balance problems.[11,12]

We are increasingly faced with elderly fractured neck of femur patients who require THA, and these patients would be ideal for the further study of this problem. There have been difficulties delivering such studies,[13] but healthcare systems that have rotas in place to deliver THA acutely for fracture may allow us to do those studies and, ultimately, understand the safety, efficacy and the cost-effectiveness of using dual mobility in high-risk populations.[14]

Emerging clinical results of DM bearing systems used in revision THA show better mid-term survival and a lower dislocation rate compared with standard fixed bearings used for revision THA.[3,10,15] Good short- and mid-term clinical outcomes have encouraged surgeons to use DM more frequently. In one European joint registry, DM systems have been used in two thirds of first time revision THAs for instability.[16]

In theory, DM bearing surface made of a large polyethylene (PE) ball articulating with a smaller size head in its core and a polished acetabular liner on its outer surface, could cause more volumetric wear compared with standard THA, and in turn, it could cause more aseptic loosening. In newer generations of DM hips, highly cross-linked PE has been used to minimise PE wear in both inner and outer bearing interfaces. Examination of retrieved PE liners used in modern DM hips has shown similar wear rates as PE liners used in standard THA.[10,17,18] Reduced PE wear at the inner head/PE ball interface has also contributed to a reduction of intra-prosthetic dissociation (IPD), a complication almost specific to DM systems. IPD is disarticulation of the small head from the inner side of the large PE ball. PE wear and failure of coupling mechanism between the 22 mm head and the PE ball were the main reasons for IPD. Using larger heads (28 mm instead of 22 mm) in the newer generations of the dual mobility bearings with highly cross-linked PE liners has almost completely eliminated IPD.[10]

There are now multiple designs available, some cemented and some as liners to be inserted into cementless shells. Most new designs take 28 mm heads and smaller.[10] Only a few have a proven track record and there is no long-term published clinical data on many designs. There are few comparative clinical studies on the expanded clinical use

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doi: 10.1302/2046-3758.78.BJR-2018-0217

Bone Joint Res 2018;7:508–510.

of DM bearing that demonstrate superior clinical outcomes compared with THA with a fixed bearing, particularly when larger diameter heads (32 or 36 mm) are used. Whilst clinical studies are rare in the literature, biomechanical studies on DM bearings conclude wider acetabular safe zone and larger jump distance for these implants.[19,20] Any conclusion of these studies that suggests the biomechanical advantage of DM bearings should not create the wrong impression that it can compensate for a lack of surgical skill. It is important that surgeons still implant the components in the best possible position for each individual patient.[21]

Adverse soft-tissue reactions to metal debris have however become a concern, with caution regarding the release of metal ion levels in dual mobility hips,[22] particularly with the increased use of these implants in cementless shells, and with our increased understanding of taper corrosion.[23,24] However, Tarity et al[25] reported no particular pattern of corrosion or fretting on the retrieved components from 18 dual mobility hips. Similarly, Barlow et al[26] assessed metal ion levels in four different bearing systems in THA, including dual mobility (excluding metal on metal hips), and concluded that metal ion levels in modern THA systems were not significantly different, although THA with a metal head showed higher metal ion levels compared with THA with ceramic heads. Thus, it is worth considering the use of ceramic or 'ceramicized' metal heads in this setting.

The use of DM may also vary depending on the size of the patient. There may, for example, be limited benefits in patients with small acetabular components. In such patients, the use of a large head will probably afford similar protection.

With good reported clinical outcomes and particularly low dislocation rates, as well as improved design of the implants in order to minimise the known complications, DM bearings have become more and more popular. However, despite the increasing use of DM bearings, the English language literature is lacking robust evidence to refine clinical indications for DM in primary and revision hip arthroplasty. In a recent systematic review, almost all of the included studies on DM were retrospective case series.[11]

In dual mobility, we have a clever established solution that helps in both primary and revision hip arthroplasty.[10] It has transitioned from a niche product to one in regular use, but requires careful scrutiny of the data on the currently available implants, high-level studies, and review of registry data in order to ensure that we are not creating new problems. It is our responsibility to embrace this technology and ensure that it is applied effectively. The need for more data should not delay its responsible introduction into clinical practice, provided surgeons continue to choose their implants judiciously, apply good surgical technique, and select implants and patients appropriately.

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Funding Statement
- None declared

Conflict of Interest Statement
- None declared