Hip replacements What the GP needs to know

MICHAEL O'SULLIVAN FRACS (Orth); MATT HOFMANN FRACS (Orth)

Hip replacement surgery is restoring mobility to many thousands of Australians every year. A national registry has tracked the performance of every hip replacement implant performed in Australia since 1999, providing vital data to enhance patient safety. What is the latest thinking about benefits of types of prostheses and approaches to surgery, and what can patients expect after surgery?

he treatment of arthritic conditions with hip arthroplasty surgery has evolved from primitive and experimental beginnings. In the early 1800s and in the pre-anaesthetic era, simple hip excision surgery became popular. This was followed by attempts to preserve the joint using interposition arthroplasty surgery. The surgeons used fascial layers, muscle, rubber struts, silver and gold plates and even pig bladders to cushion the arthritic joint surfaces.¹

MedicineToday 2018; 19(3): 14-17

Mr O'Sullivan is an orthopaedic surgeon who practises at the Mater Clinic and operates at the Mater Hospital, Sydney, NSW. He is also President of the Arthroplasty Society of Australia. Dr Hofmann is a graduate of the Australian Orthopaedic Training Program and has an interest in lower limb arthroplasty. He worked as Arthroplasty Fellow with Mr O'Sullivan at the Mater Hospital, Sydney, in 2017 and is currently working in Canberra, ACT. In the late 19th century and early 20th century, European surgeons experimented with ivory ball and socket joints. In the 1940s and 1950s, metal implants were used on both sides of the Atlantic and dental acrylic cement was introduced to fix components in place. The success of these implants was often short lived at best, and a solid scientific base to arthroplasty surgery was still missing.

British surgeon Sir John Charnley (1911–1982) achieved the quantum leap to successful hip arthroplasty surgery through pioneering the concept of low-friction arthroplasty. He is regarded as the founding father of modern hip arthroplasty surgery. Through his work, hip replacement surgery transformed into a reliable and reproducible surgical option to restore quality of life for patients with arthritis. Today, the ability to deliver a successful result in the vast majority of cases has earned hip replacement surgery the label 'operation of the century'.²

Hip replacements in Australia

Almost 45,000 hip replacement surgeries were performed in Australia in 2015.³ These procedures are recorded on the Australian Orthopaedic Association National Joint Replacement Registry (AOANJRR),



which was established in 1999 and is used to track the performance of every hip replacement implant performed in Australia. The AOANJRR has recorded 498,660 hip procedures up to 2015.³ The collected data are an invaluable resource for researchers and surgeons, and increase



KEY POINTS

- Hip replacement surgery has been described as the operation of the century for its ability to restore quality of life to patients affected by arthritis.
- After successful arthroplasty surgery, a patient should expect to return to normal everyday life with only very minor limitations.
- A wide range of implants and implant combinations is on the Australian market. All are monitored for their performance and safety by the government-funded Australian Orthopaedic Association National Joint Replacement Registry.
- The registry publishes yearly reports and its data contribute greatly to research and development worldwide.
- There are several comparable options for the implantation of a hip replacement, with varying surgical approaches, types of implants and fixation methods.
- Surgeons are the best source of information to advise on hip replacement options. They will base their reasoning on the best available scientific literature.

patient safety by identifying underperforming devices at an early stage.

Total hip arthroplasty

Prostheses can vary in respect to modularity, fixation techniques, bearing surfaces, geometry and sizes to accommodate differing clinical needs, surgical preferences and philosophies. The initial concept for fixation of both prosthetic components relied on the use of bone cement. Bone cement, or polymethylmethacrylate, transforms via an exothermic reaction to a solid material. It interdigitates with trabecular bone and, acting as a grout, holds the implant securely in place.

In today's practice, depending on the surgeon's preference and the patient's anatomy, cemented and cementless methods are used for fixing the femoral component. Cemented fixation (Figure 1) is often indicated for femoral components in elderly patients with osteoporotic bone stock. Less common clinical scenarios favouring femoral cementation include suspected malignancies or irradiated bone and femora with capacious intramedullary canals. Cementless fixation refers to specially coated implants that are press fitted for initial stability. Biological fixation occurs over weeks to months as the host bone bonds to the implant.

Bearing surfaces for femoral and acetabular components can be manufactured from ceramic, cobalt chromium and highly crosslinked polyethylene (Figures 2 and 3). The aim in choosing the correct bearing is to minimise friction and debris creation, which can provoke biological reactions that negatively affect the implant's performance and lifespan. Combinations of bearing surfaces currently used include highly crosslinked polyethylene and ceramic on the acetabular side, which can be coupled with a metal or ceramic femoral head.

Previously popular metal-on-metal bearing surfaces have mostly been abandoned and are now only used in a narrow patient population of men who have osteoarthritis and large femoral head sizes. This change in practice is largely due to the monitoring work of the AOANJRR, which in 2006 was the first body to publish concerns about higher-than-expected revision rates for a metal-on-metal bearing implant, the articular surface replacement (ASR) manufactured by Depuy Orthopaedics.⁴ Other large-head metal-on-metal implants have met a similar fate and are no longer used.

Resurfacing total hip replacement (THR) remains an option in men younger than 55 years who have osteoarthritis and a normal anatomy. Resurfacing THR in

Downloaded for personal use only. No other uses permitted without permission. © MedicineToday 2018.



Figure 1. Fully cemented hip replacement.

women has been shown to have an unacceptably high failure rate and its use is not supported.⁵ The decision on whether resurfacing THR is appropriate should be discussed with the treating surgeon. An important point is that there is no difference in activity level between patients who have had a resurfacing THR and patients who have had a conventional THR.⁵

The aim of every arthroplasty procedure is to eliminate the patient's pain and restore their quality of life. The surgeon's ultimate goal is to perform a minimal risk procedure and implant a highly durable artificial joint that feels and functions much like its natural equivalent. The AOANJRR now has 15 years of follow-up data on primary hip replacements. These data show that the revision rate for the best performing primary hip implant combinations is 1.9% at 10 years and 4.3% at 15 years.³

Approaches for arthroplasty surgery

A surgical approach constitutes a safe and tested way of gaining access to the hip joint while minimising the risk of damage to the surrounding tissues. Approaches are commonly described according to the anatomical route taken to enter the joint



Figure 2. Modern press-fit prosthesis, hydroxylapatite coated with ceramic head and press-fit type of acetabular component.

(Figure 4). Several surgical access routes have been described for implanting the prosthesis. Common approaches for arthroplasty surgery include the anterior, the anterolateral, the lateral, the medial and the posterior approach. A specific approach can be executed in a standard or a minimally invasive fashion or several approaches can be used in combination.

In the process of surgical dissection and to access the joint, the surrounding anatomical structures are parted and sometimes detached from bone, which can necessitate postoperative restrictions to allow the repaired structures to heal. For example, in a posterior approach, the posterior capsular and muscular attachment are detached from the femoral neck during surgery, so internal rotation and concomitant flexion of the hip should be avoided as these movements stress the repair of these structures during the postoperative healing process.

In the setting of an anterior approach, the anterior hip capsule is a weak spot because it is split and potentially resected during surgery. Hyperextension of the hip can cause anterior hip dislocation in this scenario. The lateral approach violates the abductor mechanism insertion around the greater trochanteric region. In order for the repair to heal, a patient might be required to use a stick to support the healing musculature and protect the repaired tendon insertion. Each of these approaches offers specific advantages and risks.



Figure 3. Examples of modern acetabular systems: a press-fit acetabular component with several bearing options, (left to right) metal on poly, ceramic on poly and ceramic on ceramic.

Surgical approaches have received varying levels of coverage in the scientific and non-scientific literature. Currently the direct anterior approach is attracting considerable attention. A 2017 study found that patients' perceptions of the benefits and risks of this approach are shaped by interactions with relatives and friends rather than by interactions with healthcare professionals.⁶ There is no evidence in peer-reviewed scientific literature supporting claims that the direct anterior approach has superior long-term outcomes.⁷⁻¹³

There is also a significant learning curve for the direct anterior approach during which revision rates are higher than expected. A 2015 study of data from the Australian Orthopaedic Association National Joint Replacement Registry found that to be the case for the first 50 procedures using the direct anterior approach.¹⁴ In October 2017, the Australian Arthroplasty Society issued a position statement to all hip arthroplasty surgeons emphasising that there is no level 1 evidence that one single approach has superior results to another.¹⁵

What to expect after surgery

After surgery, the patient will stay in hospital for three to five days and then have rehabilitation as inpatient or outpatient. The incision wound will take about 14 days to heal. Prophylactic anticoagulation is recommended for three to six weeks to minimise the risk of postoperative thromboembolic complications.¹⁶

Sometimes patients are asked to



© CHRIS WIKOFF, 2018

observe hip precautions, such as using crutches and avoiding sitting in low chairs, to allow the repaired periarticular soft tissues structures to heal.

Once the operative wounds and soft tissue structures have healed, the patient will be able to return to normal activities. These activities can even include sports such as tennis, jogging, horseback riding and skiing, but patients should be advised that minimising high-impact activities will maximise the life span of the implant. Patients are usually allowed to drive about 4-6 weeks after the surgery.

Red flags

The surgeon should be made aware of postoperative concerns so they can review the patient. Early review is especially warranted if the patient complains of symptoms raising the possibility of infection, such as swelling, redness, fevers or rigors associated with an increase in pain, sudden loss of range of movement and the inability to bear weight (Box).

Future outlook

More research and development, coupled with increasing data collection from

international scientific literature, will result in further improvements in hip replacement surgery. Computational advances are enhancing our ability to extract valuable information from large data sources, such as combined registries. Advances in material science are improving biocompatibility of implants and revision rates. Advanced 3D manufacturing will allow implant manufacturers to account for local anatomy and can pave the way for more customisation of implants and tools for surgical accuracy. Improvements in surgical technique will make the implantation process less traumatic. Robotics combined with imaging and mapping techniques will add superhuman precision. Pre-surgery and rehab techniques, as well as anaesthetic

ONLINE CPD JOURNAL PROGRAM

Is resurfacing total hip replacement an option in women?

Review your knowledge of this topic and earn CPD points by taking part in MedicineToday's Online CPD Journal Program. Log in to www.medicinetoday.com.au/cpd

RISKS OF TOTAL HIP REPLACEMENT

Early complications include but are not limited to:

dislocations

Figure 4. Approaches

posterior, lateral and

to the hip from a

anterior direction.

- pulmonary embolus
- deep infection
- haematoma formation, bleeding and transfusion
- symptomatic or asymptomatic deep vein thrombosis
- fracture and leg length discrepancy
- neurovascular injury
- medical complications such as pneumonia, cardiovascular incidents and urinary tract infections

Late complications include but are not limited to:

- limping
- heterotopic ossifications
- residual pain
- aseptic loosening

progress, will help to reduce the length of hospital stay.

Conclusion

Hip arthroplasty surgery is a successful and well-established treatment modality that restores quality of life to patients. Arthroplasty surgery is also a very diverse field that is evolving and changing. The opinion of an experienced surgeon is invaluable when making decisions related to hip arthroplasty surgery. MI

References

A list of references is included in the online version of this article (www.medicinetoday.com.au).

COMPETING INTERESTS: None.



Hip replacements What the GP needs to know

MICHAEL O'SULLIVAN FRACS (Orth); MATT HOFMANN FRACS (Orth)

References

1. Gomez PF, Morcuende JA. Early attempts at hip arthroplasty: 1700s to 1950s. Iowa Orthop J 2005; 25: 25-29.

2. Learmonth ID, Young C, Rorabeck C. The operation of the century: total hip replacement. Lancet 2007; 370: 1508-1519.

3. Australian Orthopaedic Association (AOA) National Joint Replacement Registry. Annual Report. Adelaide: AOA; 2016.

4. Graves SE. What is happening with hip replacement? Med J Aust 2011; 194: 620-621.

5. Smith AJ, Dieppe P, Howard PW, Blom AW; National Joint Registry for England and Wales. Failure rates of metal-on-metal hip resurfacings: analysis of data from the National Joint Registry for England and Wales. Lancet 2012; 380: 1759-1766.

 Trousdale WH, Taunton MJ, Mabry TM, Abdel MP, Trousdale RT. Patient perceptions of the direct anterior hip arthroplasty. J Arthroplasty 2018; 32: 1164-1170

 Barrett WP, Turner SE, Leopold JP. Prospective randomized study of direct anterior vs postero-lateral approach for total hip arthroplasty. J Arthroplasty 2013; 28: 1634-1638.

8. Higgins BT, Barlow DR, Heagerty NE, Lin TJ. Anterior vs. posterior approach for total hip arthroplasty, a systematic review and meta-analysis. J Arthroplasty 2015; 30: 419-434.

9. Malek IA, Royce G, Bhatti SU, Whittaker JP. A comparison between the direct anterior and posterior approaches for total hip arthroplasty. Bone Joint J 2016; 98-B: 754-760

10. Poehling-Monaghan KL, Kamath AF, Taunton MJ, Pagnano MW. Direct anterior versus miniposterior THA with the same advanced perioperative protocols: Surprising early clinical results. Clin Orthop Relat Res 2015; 473: 623-631.

11. Restrepo C, Parvizi J, Pour AE, Hozack WJ. Prospective randomized study of two surgical approaches for total hip arthroplasty. J Arthroplasty 2010; 25: 671-679.e1.

12. Rodriguez JA, Deshmukh AJ, Rathod PA, et al. Does the direct anterior approach in THA offer faster rehabilitation and comparable afety to the posterior approach? Clin Orthop Relat Res 2014; 472: 455-463.

 Taunton MJ, Mason JB, Odum SM, Springer BD. Direct anterior total hip arthroplasty yields more rapid voluntary cessation of all walking aids: a prospective, randomized clinical trial. J Arthroplasty 2014; 29 Suppl: 169-172.
Steiger RN, Lorimer M, Solomon M. What is the learning curve for the anterior approach for total hip arthroplasty? Clin Orthop Relat Res 2015; 473: 3860-3866.

15. Arthroplasty Society of Australia. Position statement on surgical approach for hip arthroplasty. Adelaide: (ASA); 2016. Available from: https://www.aoa.org.au/docs/default-source/states/approaches-position-statement-2016. pdf?sfvrsn=16edc904 2. (Accessed February 2018)

16. Arthroplasty Society of Australia. Guidelines for VTE prophylaxis for hip and knee arthroplasty. Adelaide: (ASA); 2016. Available from: https://www.aoa.org. au/docs/default-source/ecm-files/guidelinesvteprophylaxis_050511_2. pdf?sfvrsn=2 (Accessed February 2018).