PATIENT INFORMATION SHEET

TYPES OF HIP REPLACEMENTS AND BEARING SURFACES

Hip replacement is a highly successful procedure in the majority of cases, but the artificial joint can wear out and fail. There are two main modes of mechanical failure of a hip replacement:

1. Loss of fixation between the artificial joint and your bone (often called aseptic loosening).
2. Wear of the bearing surfaces, which may cause debris that, in turn, may precipitate loosening of the replacement and damage to the bone or soft tissues around the bones. It can also lead to dislocation of the joint.

Research is continuing to help minimise these risks and has lead to a number of different types of replacement being available.
There are advantages and disadvantages to each type of replacement. No single type of replacement is better than another in all circumstances and not all replacements are suitable for all patients.

The decision as to which replacement is best for you is complex and dependant on a number of factors - your surgeon will discuss this with you.

Currently there are three main types of replacement, categorised by the way the replacement is fixed to bone. These types may be further categorised by the bearing surfaces that they employ.

(1) Cemented Hip Replacements

This is the type of hip replacement that first came into common clinical usage in the 1960s; they are the most tried and tested with the longest clinical results. The arthritic head of the femur (the 'ball' of the hip joint) is removed and replaced by a metal ball that is fixed by means of a stem inserted into the

shaft of the femur. The socket of the hip is lined by a polyethylene cup. Both components are held in place by a plastic cement called polymethyl methacrylate.

An example of a Cemented hip Replacement

The Metal Stem and Plastic Socket

An X-ray showing it in place

There are a number of such cemented hip replacement designs that have clinical results of over 20 years; Exeter, Charnley and Stanmore are just some of the designs you may have heard about.

How long do they last?

It is impossible to guarantee how long an individual's replacement will last, but many studies have shown that in older people:

95% will last 10 years
70-75% will last 20 years
60-70% will last 20-25 years.

Thus it is unlikely that older people will require any further surgery. However in younger people who tend to be more active there is a greater chance that these hip replacements will wear out; sometimes even before 10 years.

It was initially thought that the polymethyl methacrylate cement was the problem and so uncemented hip replacements were designed.

(2) Uncemented Hip Replacements.

The design of these replacements is similar to that of cemented replacements with the exception that no cement is used. A special coating is applied to the stem that encourages bone to grow onto the replacement and hold it in place. A metal liner that also has a special coating is used for the socket and a plastic socket fits into this to form the bearing surface.

An example of an Uncemented Hip Replacement

The Metal Stem with coating

An X-ray showing it in place

There are now good long-term follow up data on these types of replacement. Results up to 10 years are almost equivalent to cemented replacements and there are suggestions that they may be giving better results up to 15 years. Very long-term results over 20 years however are not yet available.

Despite these good results this type of replacement may not be suitable for all patients. Because they depend on bone ingrowth they may not be indicated in all patients especially those who have osteoporosis or have rheumatoid arthritis; in these patients a cemented replacement may be more appropriate. In some people their bone does not grow on to the metal and so the hip can become loose at an early stage and would therefore have to be replaced.

(3) Hip Resurfacing Replacements.

Although the idea for hip resurfacing is not new, the ability to make a successful model is recent. This type of hip replacement uses a metal socket like an uncemented hip replacement socket, but with no plastic liner. Instead of cutting off the femoral head (the 'ball' of the hip) the surface is milled and covered with a metal cap that fits over the head.

It is **not suitable** for everyone and in general is considered a replacement for younger males (under 60years old). The advantages are that the bone is preserved the femoral head remains the same size, theoretically reducing the chance of dislocation and allowing greater activity.
The bone within the hip has to be very good quality (no osteoporosis) as there is a risk of fracture to the neck of the femur below the metal cap. The operation is slightly bigger as more tissues have to be cut; this can make recovery longer.

An example of a Hip Resurfacing Replacement

The Metal Socket and Metal Cap

An X-ray showing it in place

The published results up to about 10 years are good in men but not so good in women. Some remain of the opinion that the case for this replacement has yet to be proven. It is no longer recommended in women due to the high risk of developing an allergy to the metal.

BEARING SURFACES

The ideal bearing for an artificial hip would have the following qualities:

1. It would have a diameter similar to that of the normal hip, thereby reducing the risk of dislocation
2. It would have minimal friction
3. It would show no wear with time

Unfortunately there is no manmade bearing that meets all these criteria and compromises have to be made. The available options are as follows:

(1) Metal Ball / Polyethylene Socket.
The traditional hip bearing is a plastic socket with a metal ball. To reduce the amount of wear in the socket the ball needs to be made quite small and this increases the chance of the hip dislocating. Furthermore even with a reduced head diameter there is significant wear of the plastic cup after 10 years. This will cause debris which may lead to a tissue reaction which damages the bone and causes loosening of the hip. Dislocation is more likely in a worn hip.
This has prompted the search for better bearing surfaces.

(2) Altered Polyethylene Socket – The plastic cup may be made stronger by using 'highly cross-linked polyethylene.' Laboratory studies have shown promising results, but clinical results are awaited. One possible concern is that whilst being stronger this type of polyethylene is more brittle and might therefore be more prone to breaking up.

(3) Ceramic Head / Polyethylene Socket. The artificial ball may be made of ceramic which reduces both friction and wear when tested in the laboratory. This theoretical advantage has yet to be shown in clinical studies. Early models of ceramic head occasionally shattered but recent design of ceramic head do not appear to be prone to this form of failure.

(4) Ceramic Head / Ceramic Socket. With the ceramic ball and sockets there is very little if any debris produced and this means that in theory the joint will not wear out or cause a tissue reaction so last for a very long time.
Downsides - There is a very rare risk of the ball or liner fracturing leading to immediate hip failure. The ceramic liner has to clip into a metal socket which is attached to the bone. At present, for technical reasons, this means that the ball head size cannot be made as large as the metal balls so there is a theoretically higher risk of dislocation. There is also a small risk of the joint squeaking.

(5) A Metal Head / Metal Socket. Theoretically a metal on metal articulation appears to confer significant advantages. Wear is minimal and the ball may be made large reducing the risk of dislocation. This means the hip is less likely to wear out and

allows normal levels of activity.

There are significant down sides - a small amount of metal from this articulation will dissolve causing an elevation the level of metal ions (particularly cobalt and chromium) in the patient's blood stream.
It is possible that metal allergy might develop with this type of bearing. If this type of allergy does develop, a reaction around the hip occurs with internal swelling and pain which in severe cases can lead to muscle and soft tissue damage. If this occurs the hip would need to be revised.

In **women** this reaction is much more common than in men, being up to 5% or more, and therefore **metal bearings are <u>not</u> now recommended in women.**
There is a theoretical risk that this may affect the body over a long period of time and possibly increase the risk of cancer. Metal implants have been used in orthopaedic practice over the last 50 years and to date there has been no reported increased incidence of cancer.

CONCLUSION:

Research continues to try and find an artificial hip that will allow normal activity and will last a lifetime. No hip replacement available is perfect but they all should allow almost normal activity and likely to last in excess of 10 years; it is hoped that modern replacements will last even longer. However it is unlikely that a hip replacement will ever be quite as durable as a normal hip and it is sensible to take some simple precautions.

Activities that you would be expected to be able to do after hip replacements are:-

(1) Walking
(2) Swimming
(3) Cycling, exercise bike or normal bicycle
(4) Golf
(5) Visiting the gym.

But……..patients should **avoid impact activities** such as running and any high impact aerobics (although aqua-aerobics is acceptable). We do not advise badminton or squash, although gentle 'doubles' tennis is possible. People who are experienced skiers can consider skiing again. The use of most gym machines is safe; in fact **exercising in a non-impact way is very important**.

Further Information:

National Joint Registry (NJR) website
http://www.njrcentre.org.uk

National Institute for Health and Clinical Excellence (NICE)
http://www.niceguidance.org.uk

NHS Website
http://www.nhs.uk

British Orthopaedic Association Website
http://www.boa.ac.uk

Hampshire Hospitals NHS Foundation Trust
www.northhampshire.nhs.uk