

2.6 Revision Strategy for Ceramic Implant Failures

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Revision of a total hip made totally or partially of alumina ceramics is not very different from regular hip revision. However there are some special features that must be known by the orthopaedic surgeon who will perform the revision. It is these specific problems or issues that we would like to address here.

As alumina on alumina provides few debris, reasons for revisions are rather different than those for regular material.

Reasons are usually not related to osteolysis or poor bone support but to either material fracture, mechanical aseptic loosening of acetabular component with good bone support, recurrent dislocation, some impingement problems that could resume in metallic debris, and also some unexplained pain, as regular total hip. Lack of osteolysis permitted usually to perform a limited revision, leaving the femoral component in place. The limited wear of ceramics component allotted sometimes revision that retain even the ceramic head and sometimes in our experience that will only resume in cementing a cementless alumina ceramics component.

Lets look at these different situations.

Fracture

We have to separate acute fracture or fracture that did evolve slowly with a initial crack that will progress; some histories we have recorded to fall in this category; For example in our series, the only fracture of an alumina linner occured in a 59 years old woman who was operated in 1992. Results was excellent; In 1994 she sustained a car accident and was again operated in our department for a patella fracture on the side of the total hip. At this time, clinical and radiological evaluation of the hip were considered as perfect. During the year 1997 she was revised on the same hip for groin pain, images of osteolysis on the X rays; The surgeon documented the revision, the liner was

fractured and displaced leaving some ceramic on metal friction to occur; this explains the osteolysis and the pain; Then we can suspect the fracture of the patella to be concomitant with a ceramic liner crack initiation that slowly did evolve to a complete fracture.

When a fracture of ceramics occurred we can suspect many debris of different size to be generated in the articulation; Then when we have to revise, the surgeon must be aware of taking out all the debris but also to take into consideration that as it is never possible to clear totally the operating field, he will have to use special material to replace the hip .Metallic head must be avoided because the remaining ceramic debris could be trapped into the polyethylene of the socket and give rise to very severe damaged of the metallic head as reported by Kempf and others (). Then it is absolutely necessary to use another ceramic head either in a ceramic on ceramic couple either in a ceramic on polyethylene.

If the Morse taper has been damaged because of the long term fracture, it has to be replaced. If it is a case of acute fracture quickly revised, the cone is usually not damaged and another ceramic head could be fixed on the old taper; This will avoid femoral stem revision which is by far a difficult procedure.

Mechanical loosening

In this circumstances there can be many different situation:

The first one is when the mechanical loosening occurred acutely or even slowly. In the first condition, there are very few debris; many papers demonstrated that wear in regular situation is very low, then we can expect very few debris, and also very limited wear of the component's surface; then it can be possible to retain the same head and even the same socket; for example in some of bulky alumina loosening, we retained the same

socket that was cemented. If the socket has been loosed for a long time and had tilted, we have to replace the acetabular sliding surface; If the head has not been damaged, we can retain the same head, and replace the acetabular by another ceramic material with a metal backed or if the patient is older than 65 or 70 by a plain polyethylene socket cemented.

If the cone had been badly damaged, or if, due to impingement, the femoral stem presents some rubbing marks, it is better to exchange the stem for another one. And then still use at least one sliding component (the head) made of alumina ceramics.

How to deal with a cone that had already received a ceramic head.

Due to cone technology, the cone is theoretically damaged and the engineers will advise to replace the cone as well if a new ceramic head has to be implanted; The other solution could be to use a metallic head. But, as we know from different report, the risk of putting a metallic head after retrieval of ceramic component is very high of getting a severe metallic wear with massive abrasion and need to revision in short term period.

Practically there are three situations:

- there is a mechanical loosening of the socket, which did not tilt, we exchange the socket sometimes without exchanging the head or sometimes, for technical reasons, we take out the head during the revision and put it back at the end. We check that the fixation is secure.
- there is a mechanical loosening of the socket with some impingement or tilting of the socket; Usually the head in this situation could have been worn out; Then it is better to exchange the socket and the head; If the cone looks good, we check the fixation of the new head on the cone; If this seems secure, we retain this solution; If not, we exchange the stem as well, putting another ceramic head on the taper.
- there is a mechanical loosening of both components, reconstruction is conducted in a regular way, but always a ceramic head has to be uti-

lized sliding either on a ceramic acetabulum if the patient is young or very active, or a polyethylene socket if not.

In case we put another ceramic head on the same Morse taper, we have to explain to the patient that there is an increased risk of alumina ceramic fracture. We did that in 29 cases over 61 revisions performed in a series of 401 hips. These patients were followed very accurately and none of them sustained a ceramic head fracture in the following period up to 15 years.

Conclusion

Revision strategy when we have to retrieve alumina ceramics material must be precise. Surgeon must be aware of the specificity of this material: very limited wear and no osteolysis in regular situation which allow sometimes to implant the same components, risk of ceramics debris in the surrounding tissues that could eventually badly damage a metallic head if implanted instead of the ceramic one, risk of fracture of the ceramic head if implanted on a Morse taper that already had a ceramic head.

We tried in this short paper to explain the way to overcome these situations and how we can deal with. Surgeons and engineers could have some different strategies, the answer are always, as in every surgery, in the calculated risk of each situation.

References

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