

Implant details

Reason for revision as listed by the surgeon: Aseptic loosening of socket and adverse soft tissue reaction to particulate debris

Explanted prosthesis: 32 mm Biolox delta ceramic head (-3 offset) and liner, and Ti alloy shell

Implantation side: Right

Implantation date: Approximately 2012

Explantation date: 25/05/2022

Implantation duration: Approximately 10 years

Acetabular shell (Ti alloy)

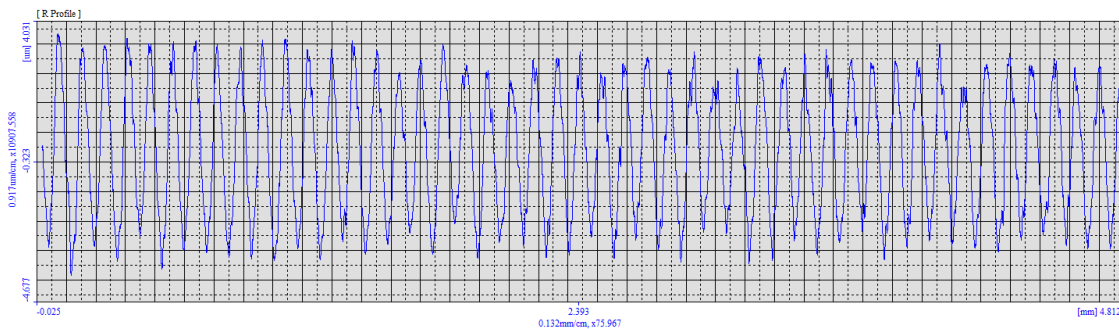
On receipt at ExplantLab, biological fluid/precipitate was present between the acetabular shell and liner. Additionally, there was surface discolouration on the inferior surface. These findings indicate fluid ingress between the shell and liner. There was limited bone growth on the posterior surface. Retrieval damage was identified on the rim.



Acetabular shell (Ti alloy)

Surface roughness analysis

Surface profilometry was performed over the area shown by the red box in the image below.



Ra = 1.737 μm

Rpk = 0.254 μm

Rvk = 0.566 μm

The CMM was also used to measure the inner taper angle of the shell and the outer taper angle of the liner.

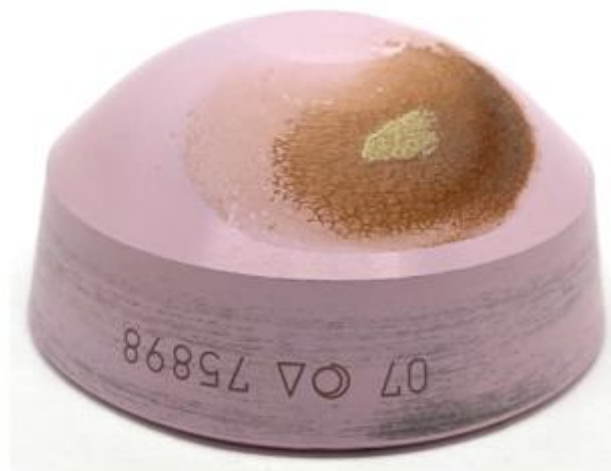
Shell taper angle: 18.9038 degrees

Liner taper angle: 18.9097 degrees

The analysis did not identify significant material loss from either surface, however the examination of the shell was limited by the rough surface. This can be further investigated using other methods if requested.

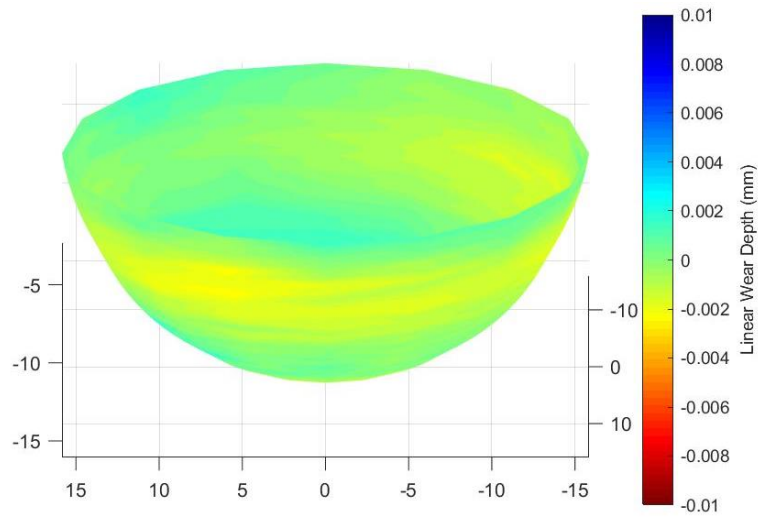
Acetabular Liner

There were isolated grey areas on the bearing surface. There was reddish-brown discolouration, indicating staining from a biological fluid, as well as grey discolouration on the posterior surface. There was asymmetric metal transfer on the outer taper, this was more pronounced than is normally found.



Acetabular Liner

Coordinate Measuring Machine (CMM) analysis



	Max Linear Wear (μm)	Volumetric Wear (mm^3)	Nominal Diameter (mm)
Acetabular Liner	4	0.75	32.0350

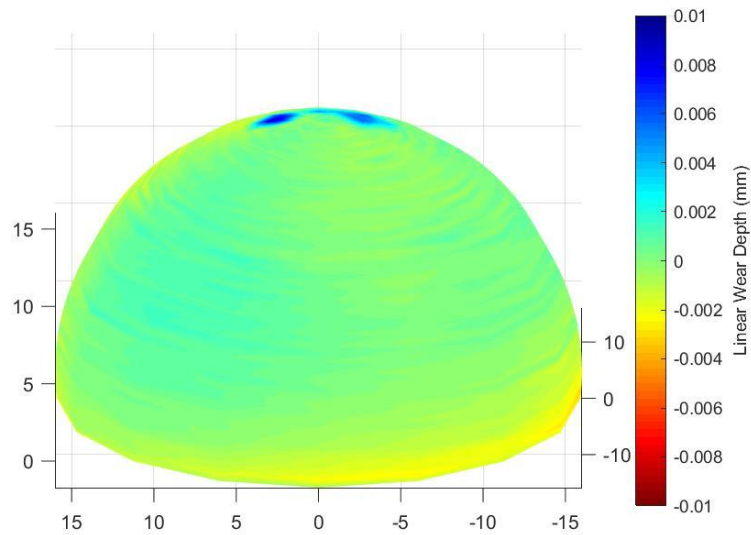
Femoral head

There were grey markings on the bearing surface – most likely due to the third body debris. Retrieval damage was identified on the bearing surface and at the base of the component.



Femoral head

Coordinate Measuring Machine (CMM) analysis



	Max Linear Wear (µm)	Volumetric Wear (mm³)	Nominal Diameter (mm)
Femoral Head	3	0.87	32.0262

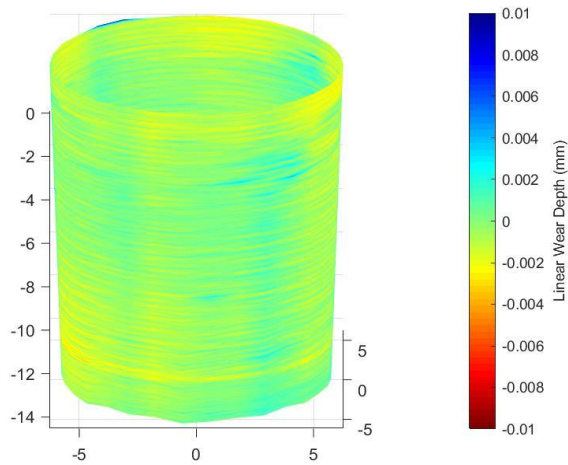
The diametrical clearance was calculated to be 8.8 microns.

Female taper

There was reddish-brown discoloration on the surface. The imprinting of the male taper onto the female taper surface was clearly visible.



Coordinate Measuring Machine (CMM) analysis



	Max Linear Wear (μm)	Volumetric Wear (mm^3)	Angle ($^\circ$)
Female Taper	4	0.22	4.080

Summary

The diametrical clearance was abnormally low – **less than 9 microns** - resulting in increased friction at the bearing surfaces, with the development of component instability.

The acetabular shell-liner interface did not appear to function optimally, with fluid ingress and an asymmetric pattern of metal transfer on the ceramic liner.

Metal release therefore from the posterior surface of the shell and potentially from the shell liner interface was the likely source of the “adverse reaction to particulate debris” described by the surgeon.

The bearing surface wear rate was approximately 0.2 mm³/year.