



Precoated femoral stem with no subsidence

~ A 5 year RSA follow-up ~

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Conclusion

As far as we know this is the first hip femoral stem implant showing no subsidence at all on RSA examinations. The stems seem to be totally fixed to the cement mantle showing no detectable migration or debonding.

Introduction

One approach to enhance the interface between stem and bone in cemented hip arthroplasty is the concept of pre-coating. The stem is manufactured with a PMMA coating. This pre-coating is much stronger bonded to the implant compared to what is achieved at the time of surgery.

Theoretically this would lead to a stronger cement-implant interface as the pre-coating binds very strongly to the cement. However, results with pre-coated stems have so far mostly been very poor with frequent problems such as debonding of the pre-coating, cement fracture and early loosening¹⁻⁵.

Aim of study

To evaluate the magnitude and pattern of migration of a comparatively newly designed pre-coated femoral stem. As a surrogate outcome measure for long-term performance radiostereometric analysis (RSA) was used, which is known to have a high prognostic precision in early detection of potentially late occurring aseptic loosening.

Materials and methods

The stem studied was the Definition PM[®] (Stryker). This is a collared chromium-cobalt stem with a straight rectangular geometry and a distal circular cross-section with rounded corners. It has rough gritblasted proximal and distal surfaces and a proximal PMMA mantle which, according to the manufacturer, is 86 times stronger than hand-mixed cement. The stem also has a distal centralizer. The stem was inserted with vacuum mixed Palacos-gentamicin bone-cement using 3rd generation cementing technique.

Twenty patients were operated with total hip arthroplasty using this stem and followed with RSA examinations at two months, one year, two years and five years.



The Definition pre-coated stem



X ray showing a Definition stem. The white dots are tantalum spheres in the femur and the cement used for RSA

Results

Up to five years postop. there was no detectable migration between the implant and femur (Table 1). The measured migration was in almost all cases lower than the precision of the RSA method.

Moreover, there was also no significant migration between the femoral implants and the cement mantle (Table 2).

	Valgus migr. (n=20 SD 0.4)	Subsidence (n=17 SD 0.1)	Posterior migr. (n=20 SD 1.2)
Mean	0.29	0.04	0.56
Median	0.28	0.01	0.61
Precision (of RSA)	0.13	0.06	0.65

Table 1. Migration of the femoral implant relative femur up to 5 years

	Valgus migr. (n=19 SD 0.3)	Subsidence (n=16 SD 0.1)	Posterior migr. (n=19 SD 1.0)
Mean	0.07	0.01	0.57
Median	0.07	0.01	0.33
Precision (of RSA)	0.37	0.06	0.82

Table 2. Migration of the femoral implant relative the cement mantle up to 5 years.

Discussion

One reason for this extraordinary stability of the Definition stem may be the combination of stem pre-coating and a distal centralizer. It is previously demonstrated that the quality of the cement mantle is of importance for aseptic loosening^{5,6}. The proximal pre-coating can be said to act as a proximal centralizer and theoretically this in combination with the distal centralizer would give a perfect cement mantle. Other studies have demonstrated debonding of the pre-coating, which so far, has not been found in this material. The reason for this different behavior is still not fully understood, but there are some aspects of the stem design that may be part of the explanation. Maybe the design of the pre-coating, with a proximal mantle and longitudinal parts on the sides overlapping the rough gritblasted proximal surface is of importance. Or it may be an effect of how the pre-coating of this design is manufactured. Also, other factors such as overall stem design, material, and offset may well add to the explanation.

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