Properties of Bone Cement:
Which Cement Should We Choose for Primary THA?

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Summary

In total hip arthroplasty (THA), the surgeon should use a well-proven antibiotic-containing cement, like Palacos or Simplex. In addition to antibiotics in the cement, systemic antibiotic prophylaxis should be administered 4 times on the operating day to prevent septic implant loosening. Studies based on data in the Norwegian Arthroplasty Register indicate that the type of cement may be a more important predictor for prosthesis outcome than commonly used prosthesis brands.

Introduction

In the early phases of hip replacement, surgery focus was on the design of the femoral stem, and on bearing surfaces. There was less focus on different types of bone cement. Later, when aseptic loosening became a recognised problem and the term «bone cement disease» was introduced, there was a shift towards more use of uncemented implants and towards new cements like the cold curing Boneoc cement and different low viscosity cements. The Swedish and Norwegian hip implant registers have shown that the type of cement is important for the performance of the hip implant and type of cement may in many ways be more important than the design of the prosthesis. The Norwegian hip implant register has published several reports concerning bone cement.

Results of Bone Cement Studies in the Norwegian Arthroplasty Register

In our first study on bone cement and prosthesis failure in Charnley prostheses, the cold curing cement Boneoc performed inferior to high viscosity cements, and low viscosity cements performed worse than high viscosity cements [5] (Fig. 3.66). CMWIII was the most widely used low viscosity cement and hence the evidence against this cement was strongest. The poor performance of low viscosity cements might in part be explained by the difficult handling characteristic of these cements. In the next study from 1997 we showed that the polished tapered Exeter stem performed better with use of Boneoc cement than did the Charnley stem [4]. This is an interesting perspective and it seems that different prosthesis designs might require different mechanical properties of the cement. A 10-year follow-up of the different cement brands used in Norway showed that the high viscosity cement CMW1 performed poorer than the other high viscosity cements Palacos and Simplex [3]. The poor performance of the CMWIII cement was further confirmed. A Charnley prosthesis implanted with CMW1 cement had a failure rate of 12% at 10 years, but only 5.9% when used with gentamicin-containing Palacos cement (Fig. 3.67). If you as a surgeon implant 100 Charnley prostheses with CMW1 cement, this will lead to 6 extra revisions after 10 years compared to using Palacos or Simplex cement. These findings represent an argument for greater awareness regarding current marketing regulations of medical devices.

Should We Add Antibiotic in the Cement?

In two publications we have addressed the question of whether to use antibiotics in the cement or not, and the influence of systemic antibiotic prophylaxis. We have shown that use of systemic antibiotic prophylaxis gave less aseptic and septic loosening of the implant, and that the addition of antibiotic in the cement gave an added protective effect [2] (Fig. 3.68). A combination of systemic antibiotic and
antibiotic in the cement gave four times less septic revisions and two times less aseptic revisions compared to use of systemic antibiotic prophylaxis only. It seems to be important to have high doses of antibiotics locally in the joint to prevent the bacteria to colonise the implant. In a recent study with over 10 years follow-up, the performance of the antibiotic loaded bone cements was still good and the protective effect of systemic antibiotic prophylaxis combined with antibiotic in the cement was maintained both for aseptic and septic loosening. The study implies that the concern of a bio-mechanically weaker bone cement due to added antibiotics does not have any clinical significance, at least not within 10 years [1]. We have further shown that giving four doses antibiotics systematically the operating day resulted in less revisions due to septic and aseptic loosening compared to one, two or three doses, and that there was no additional beneficiary effect of giving the antibiotic prophylaxis for two or three days (Fig. 3.69). Most Norwegian surgeons gave either penicillin (Oxacillin, Dikloxacinil) or first and second generation Cephalosporins in doses of 2 g × 4.
Take Home Messages

- The cement type may be a more important predictor for long term outcome than commonly used prosthesis brands.
- Palacos and Simplex cements are associated with the lowest risk for revision.
- The risk for infection following primary THA is lowest when antibiotic loaded cement is used in combination with 4 systemic antibiotic doses on the operating day.

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References