Management of the infected arthroplasty using antibiotic-loaded hydroxyapatite blocks combined with cement spacer

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Introduction: The treatment of the infected arthroplasty is very difficult. Although many methods have been reported to manage this intractable disease, each therapy has some limitations or disadvantages. The resection arthroplasty usually demands quite high difficulty of the daily living. Continuous irrigation needs long period of hospitalization. Although some authors reported better results using cement beads or the cement spacer, it is not fully investigated if there will be sufficient concentration of the drug. Additionally, the loss of efficacy of the antibiotics by polymerization heat is problem when heat sensitive antibiotic is used with bone cement. Hydroxy-apatite blocks filled with antibiotics seemed to be one of the better choices, but it is difficult to place the blocks to desirable location and maintain it during treatment period. In the present study, we report the clinical results of the antibiotic-loaded hydroxyl-apatite blocks (HAb) combined with cement spacer. Our method provides avoiding polymerization heat for antibiotics, to place HAb with cement spacer to desirable location, and also to fill the void space with preservation of the affected leg length.

Method: The Cement Spacer Molds® (Biomet Inc., Warsaw, IN, USA) and Boneceram P (Sumitomo Pharmaceuticals Co., Ltd., Osaka, Japan; 8mm cube) were used in combination. Multiple windows (8mm square) were made in cement spacer mold (Fig.1), and HAb was inserted through the windows with its lid toward to outside (Fig.2). The bone cement which was mixed with selected antibiotics for each patient was injected into the mold. After hardening of the cement, a mold was removed, and then the HAb were filled with powder of the antibiotics and were covered with the lid (Fig.3). In surgery, after all components were removed, vigorous débridement and washing was performed, the HAb combined with cement spacer was inserted into the joint. For the total knee arthroplasty, same procedure was performed using knee spacer molds.

Clinical results: We performed this technique for twenty-one patients (22 joints). Eight joints with infected hip and 14 joints with infected knee component were underwent insertion of the HAb combined with cement spacer. The average age at the time of surgery was 67.2 years old (39-90). Five patients were male and other 16 patients were female. The original diagnoses were rheumatoid arthritis in 9, osteoarthritis in 9, and femoral neck fracture in 3. The index surgeries were total hip arthroplasty (THA) in 4, hip hemi-arthroplasty in 3, and total knee arthroplasty (TKA) in 14. The results of cultures for micro-organisms of the joint fluid or tissue from the joints obtained during surgery showed MRSA in 8, MRSE in 2, MSSA in 2, and others in 10. Six of the infected hip cases underwent revision THA and other 2 cases are waiting for revision surgery. None of hip case showed clinical signs or laboratory data of the recurrence of infection at the time of follow-up. For cases with infected knee arthroplasty, although 6 cases underwent revision TKA with no recurrence of infection, 7 cases underwent resection arthroplasty, and a case is waiting for revision surgery.

Conclusion: The treatment and management of the infected arthroplasty is extremely difficult. In case of infection with MRSA, vancomycin often will be first choice, but the surgeons have to pay attention to handle it, since it is very delicate for heat. The choice of bone cement with low polymerization heat, or another method using HAb as a career of the powder of the drugs should be needed. We performed the two-stage reconstruction using antibiotic-loaded HAb combined with cement spacer. The advantages of our method are to avoid loss of efficacy of the antibiotic from polymerization heat of bone cement, to place HAb with cement spacer in a portion to anticipate the effect of an antibiotic, and to fill the void space. Our data showed satisfactory results For hip cases, but approximately half cases underwent resection arthroplasty in knee cases. The infected knees are more intractable, probably because the thickness of subcutaneous tissue as a barrier for micro-organisms compared to hip cases.

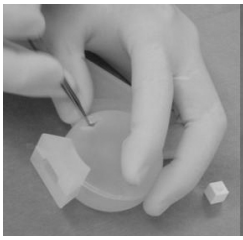

Fig.1

Fig.2

Fig.3

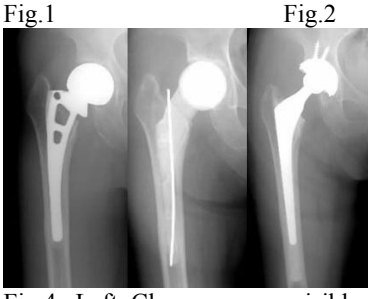

Fig.4 Left: Clear zone was visible near the calcar of the femoral neck. Center: HAb combined with cement spacer was inserted. Right: Nine months after the revision surgery, there is no evidence of infection.

References

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