

## CASE REPORT

# Vancomycin-Loaded Bone Cement Bullet for Treatment of Chronic Septic Arthritis Post ACL Reconstruction Surgery

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### ABSTRACT

The consequence of post-operative infection can be devastating despite its rare incidence. Common organisms causing post-operative infection are normal flora of the skin: *Staphylococcus aureus* and *Staphylococcus epidermidis*. Early diagnosis followed by arthroscopic debridement and antibiotic therapy with graft retention remains the main aim of treatment. However, there are certain cases where the infection persists despite early intervention. Vancomycin-loaded bone cement bullet inserted into bone tunnel can provide a high local concentration of vancomycin with bactericidal effect and low systemic complications to treat deep-seated infection.

**Keywords:** ACL reconstruction complication; antibiotic cement; Chronic Infection post-ACL reconstruction; Post-operative infection

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### INTRODUCTION

Anterior cruciate ligament (ACL) reconstruction surgery has become very popular in the past decade to restore stability and function of the knee. Like any other surgical procedure, it is not without risks (1). Among all the risks associated with this surgery, risk of infection post-ACL reconstruction is one of which many surgeons strive to reduce. Patients with underlying diabetes mellitus have a higher risk of post-operative infection (2). Although the incidence of infection is rare (0.14% to 1.7%), the consequence can be potentially serious (3). The effort following this complication would be to eradicate the infection and try to retain the graft if possible. We are reporting a case of chronic septic arthritis post-ACL reconstruction successfully treated with vancomycin-loaded bone cement bullet.

### CASE REPORT

A 34-year-old gentleman sustained a left ACL injury and had an ACL reconstruction surgery with ipsilateral hamstring graft in January 2016. Unfortunately, the surgery was complicated with septic arthritis and infected haematoma at day 10 post-surgery. Patient underwent an arthroscopic knee washout and debridement of graft harvesting site. Methicillin-sensitive *Staphylococcus aureus* (MSSA) was isolated from the tissue and joint

fluid culture. The patient was subsequently started on cloxacillin and completed a six-week treatment.

Patient continues to have persistent left knee swelling, associated with serous discharge from proximal tibia despite having completed the antibiotic regime. Patient did not have fever or pain over the left knee. He was able to walk and to continue with his activity of daily living. On examination, patient's left knee was swollen and warm but non-tender. There was a significant knee effusion with active range of motion ranges from 0° - 150°. Anterior drawer and Lachman's test were positive with soft end point. Surgical scars on the knee and proximal tibia were well healed. Complete blood count (CBC) was normal, however erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) were raised. Left knee x-rays did not show any evidence of osteomyelitis. Eighteen months after the initial ACL reconstruction surgery, the patient underwent a left knee arthroscopic debridement and washout with removal of graft, debridement of femoral and tibial bone tunnel and insertion of vancomycin bone cement bullet into the tunnel (Fig 1). The tunnel was reamed to a larger size intra-operatively. Vancomycin (4 g) was mixed with 40 g of commercialised bone cement preloaded with 5 g gentamicin according to the supplied instruction. The mixture was hand-packed into a 5 ml syringe with the distal tip cut off. A Cerclage wire was inserted in the centre before the cement hardened. Post-operatively, patient was put on a knee brace locked in 0° extension and was allowed partial weight bearing on left lower limb to prevent dislodgement of cement bullets by movement. Post-operative left knee x-rays are shown in

Fig 2.

Patient was discharged on post-surgery day 3 with oral cloxacillin after the tissue taken from tibia bone tunnel grew MSSA. Patient's left knee was initially kept in 0° extension with knee brace for two weeks with partial weight-bearing. Patient went for physiotherapy on the third week post-operative with active knee flexion up to 100° and brace back to 0° extension after physiotherapy. On the fourth week, patient was allowed to remove the brace and full weight-bearing as tolerated.

Twelve weeks later, the patient underwent the second stage surgery to remove antibiotic bone cement and bone grafting of femoral and tibial tunnel with autologous tricortical iliac and cancellous bone graft mixed with synthetic bone putty. Post-operatively, patient was allowed partial weight-bearing on left lower limb without knee brace. Patient was able to regain full

range of motion of the left knee and ambulate with full weight-bearing on left lower limb at eight weeks post-surgery.

Clinically, the patient has mild instability over left knee with no signs and symptoms of infection. Blood inflammatory markers have normalised and latest x-rays shows full integration of bone graft at femoral and tibial tunnel. Revision ACL reconstruction surgery was however postponed by patient due to his current sedentary lifestyle.

### DISCUSSIONS

Septic arthritis post-ACL reconstruction is usually managed by early arthroscopic debridement and washout of the knee joint followed by a regime of antibiotic for four to six weeks (1). Primary aim would be to eradicate infection and retain the reconstructed



Figure 1: Vancomycin cement bullet insertion into tibia bone tunnel



Figure 2: Post-operative left knee x-rays showing the positions of vancomycin cement bullet

ACL graft. However, there are rare cases where infection persists and progress to chronic septic arthritis despite early and adequate arthroscopic debridement and washout of the knee.

In this case, symptoms suggestive of post-operative infection started on day 10 post-ACL reconstruction surgery, which tally with most of the published literature. The common clinical symptoms suggestive of such condition are swelling, pain of knee with increase local temperature and fever. Blood parameters such as white blood cell (WBC) count, ESR, CRP and joint fluid aspirate are helpful in diagnosing and monitoring the evolution of infection (1). The common isolated organisms are *Staphylococcus aureus* (31%) and *Staphylococcus epidermidis* (13%).

Patient in this case persistently has symptoms of infection despite having the standard surgical treatment and appropriate antibiotics treatment according to organism isolated during surgery. Patient only had persistent knee swelling and serous discharge from knee surgical wound site with fairly good range of motion of the affected knee. There were no fever or severe joint pain to suggest acute septic arthritis. Blood investigation revealed a normal peripheral WBC count with elevated ESR and CRP indicative of a chronic infection. This suggests an incomplete eradication of infection during the first debridement and knee washout, which lead to our decision of debridement and graft removal. This outcome is again in accordance to published literature, where chances of graft retention are much lower if the infecting organism is *Staphylococcus aureus*.

We have not encountered any published literature treating chronic septic arthritis post-ACL reconstruction with antibiotic loaded cement but there are multiple studies showing the efficacy of using this technique in treating complex spine infection post-instrumentation and surgical site infection post-joint replacement surgery (4, 5). This allows the targeted environment to achieve high concentration of vancomycin and yet low plasma concentration to reduce the complication associated with vancomycin when administered intravenously (5). Aminoglycosides present in most conventional bone cement when combined with vancomycin has a synergistic bactericidal effect even against multi resistant gram-positive organism (4). In this case we successfully treated the chronic knee septic arthritis with this technique using vancomycin loaded into gentamicin-preloaded bone cement after removal of the infected ACL graft.

## CONCLUSION

Septic arthritis post-ACL reconstruction is a rare complication but can be devastating. Early diagnosis with arthroscopic debridement and washout with graft retention remain the aim of the treatment. However, chronic septic arthritis should be suspected when patient have persistent knee swelling with raised inflammatory markers post-arthroscopic debridement and washout. Combining vancomycin with gentamicin-preloaded bone cement fashioned into cement bullet and inserted into femur and tibia tunnel can be an effective method to deliver high concentration of vancomycin locally to treat chronic joint infection and avoid complication associated with intravenous use of vancomycin.

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