Outbreak of Serial Knee Joint Sepsis after Arthroscopic Surgery: A Case Series with the Guideline for Treatment

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Abstract- Knee infection after arthroscopic surgeries is rare but devastating complication. A serial knee joint infection occurred in our hospital after the contamination of arthroscopic equipments set with an unknown microorganism. Herein we describe the natural course of these patients and suggest a treatment protocol according to the experiment gained from management of these patients.

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Introduction

Arthroscope has been an invaluable tool for the diagnosis and therapy of knee problems. Nearly 127,000 procedures were performed for anterior cruciate ligament reconstruction, and 500,000 arthroscopic procedures were performed for medial or lateral meniscal tears in 2006 in US (1).

Septic arthritis remains a serious problem with arthroscopic knee surgeries. Its rate is low and has been estimated to be between 0.05 to 0.4 % for diagnostic arthroscopy.(2) and 0.3 and 1.7% for ACL reconstruction(3-6). Despite of this low incidence, delay in diagnosis may result in devastating consequences such as loss of hyaline cartilage and arthrofibrosis. With early diagnosis and treatment the infection can be successfully eradicated.

In February 2010, an error in sterilization method of arthroscopy equipments of operating room yielded in a serial postoperative knee sepsis. The outbreak of multiple infections in a single center and a relatively homogeneity of patients give us a good opportunity to discuss the natural course and clinical presentation of patients for delineating of a treatment protocol for arthroscopic surgery infections.

Case Report

Case 1

A twenty years old soldier referred to OPD clinic for his follow-up of ACL reconstruction which had been done 2 weeks ago. He had complained of pain. In physical examination, he had no fever and a good range of motion. He was able to full weight bearing with some pain. Joint had mild swelling. After visiting by his surgeon some analgesic prescribed and isometric exercises recommended. One week later the patient referred again with complains of severe pain. Physical examination with the exception of joint swelling was in accordance with a routine ACL reconstructive surgery. Emergency lab work-ups showed normal CBC but ESR=75 and CRP=3 +. Joint aspiration was in favor of acute septic arthritis with 50000 cell and 90% PMN. Culture was negative. Patient was admitted, and IV antibiotic was promptly started. Serial arthroscopic joint washing was also done. At the end of the fourth week patients ESR was still above100, and CRP was 3+. IV antibiotic was changed by infectious ward senior attending to vancomycin and meropenem. Joint was opened through medial arthrotomy, and the loose graft along with its fixation devices (bio-absorbable screw and transfix pin) were removed. ESR and CRP were remained high, and for patients intractable pain morphine was prescribed. Serial X-rays showed cartilage destruction and MRI reported destructive arthritis. After two months, the patient discharged despite of ESR=45 AND 1+ CRP. At the end of 10 weeks due to patients swelling and high ESR and CRP, the infectious ward admitted patient again and smear for fungal infections was prepared (Figure 1). It was Alternaria from Pleosporaceae species. Despite of negative culture and because of positive smear for

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fungal infection antifungal therapy was started. Finally, after two weeks of antifungal treatment CRP and ESR became normal. At this time, patient had a stiff knee and developed DVT. One year after surgery patient had only 90 degree knee flexion, limping and flexion contracture.

Figure 1. Mycelium of fungi prepared from patients joint

Case2

This patient had also an arthroscopic ACL reconstruction and referred one week after the first case. He had his first follow up in another city and at the first presentation three weeks was past from his surgery. His clinical picture and the hospitalization scenario was exactly the same as the first case. He had also taken antifungal treatment blindly and had 100 degree knee flexion at the end of one year.

Case 3

Twenty five years old man referred 14 days after his quadruple hamstring transfixes ACL reconstruction surgery for removal of stitches. At this time, three days was past after diagnosis of the first two cases. With taking the problem of previous cases in mind, emergency lab work-ups and joint aspiration requested and the results were in favor of infection. Culture of joint fluid was negative. Patient admitted, and immediate arthroscopic joint irrigation and debridement and subtotal arthroscopic synovectomy was done. The graft was saved. After operation closed irrigation system installed and continuous irrigation of the knee joint was done for 48 hour. Patient ESR decreased to 30, and CRP became negative at the end of the sixth week but the pain was continued and patient lost his articular cartilage. Patient gradually developed valgus deformity due to loss of lateral tibial plateau cartilage (Figure 2). After one year, he had full range of motion with mild pain. His valgus deformity decreased during this period (Figure 3).

Case4

Twenty seven years old man had an ACL reconstruction using endobutton system 11 days before his presentation. He had complained of pain in the thigh and moderate knee swelling. He had no fever, and had 120 degree knee flexion and could tolerate full weight bearing. Joint aspiration showed very turbid fluid with70000 cells and more than 90% PMN. For this case, immediate open arthrotomy and synovectomy was performed (Figure 4). Graft was a little bit loose but saved (Figure 5). His symptoms improved dramatically, and he left the hospital 20 days later with negative CRP.

Figure 2. Valgus deformity of the third case due to lateral compartment cartilage loss

Figure 3. Mild valgus deformity of the third case one year later

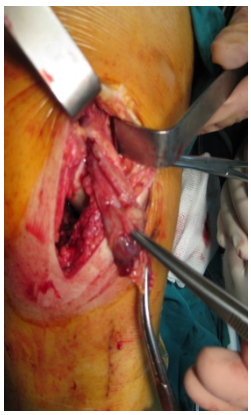

Figure 4. Open synovectomy for the fourth case

Figure 5. Hamstring graft was saved

Case 5

28 years old woman a case of renal transplantation, who had a varus femoral osteotomy one year before, had undergone a diagnostic arthroscopy because of knee pain and locking sensation. Twenty days later she complained of worsening of symptoms and admitted in nephrology department and consulted with us. Joint aspiration showed turbid fluid with 5000 cell and 70% PMN. She underwent serial arthroscopic washing. After one year she had the operation for removal of osteotomy plate and had complete recovery from infection.

Case 6

Thirty five years old man had an arthroscopic meniscectomy and referred 20days after the operation because of pain and swelling. He was afebrile and was able to full weight bearing. Lab work-ups and joint aspiration showed infective arthritis, and he recovered after serial arthroscopic irrigation and synovectomy. After one year, he had no specific complain regarding to his knee.

Case 7

Fifty three years old woman presented with swelling one week after arthroscopic meniscectomy with complain of pain and mild swelling. ESR was 60, and CRP was 3+. She took IV antibiotic treatment and one episode of arthroscopic joint irrigation. Joint fluid analysis was in favor of septic arthritis with negative culture. She completely recovered after one month's hospitalization.

Discussion

Occurrence of such a complication is frustrating for both the patient and the surgeon. The main problem after affirmation of the tragedy was the perplexity of the surgeon and medical team to estimate the dimensions of the problem. We didn't know when and how the calamity started and how the hospital should face the legal consequences. Only after proving the infection in the fourth case, the operation room closed for arthroscopic surgeries.

Our first two patients were missed in their first follow-up because their sign and symptoms were attributed to their operation. On the other hand, delay in diagnosis will end in catastrophic results. Matawa *et al.,* had previously demonstrated that the first treatment must be the surgical drainage and long-term intravenous antibiotic therapy (7). We strongly suggest the first follow-up to be done at one week after the operation, and any pain and swelling should be considered seriously. We also believe that after proving of the first infection, the arthroscopic surgeries should be postponed until the operating room warden announces that the sterilization system of operating room works correctly.

In order to understand which equipment was responsible for the infection we looked at the common equipment and the sterilization method in our patients. Apart from single use instruments that were disposable, the only common instruments were arthroscopic lenses and shaver blades. The sterilization method for these equipments was formaldehyde tablet gas sterilization technique. We found out that the first case infection occurred after a long delay (one month) between arthroscopic surgeries due to surgeon's vacation. We gave this theory that this delay had given the opportunity to microorganisms for their growth. Although we never found a definite organism in sterilization boxes and joint fluid, but we obtained a positive smear for fungi from sterilization box. We think that the formalin gas technique by itself is not sufficient for sterilization of instruments that will enter the joint. Soft tissue debris, remained from previous surgery may be putrefied despite of formalin tablets and these debris may enter the joint in the second operation. The hemarthrosis resulted from surgery will provide a suitable environment for microorganisms to growth. Meticulous washing of equipment's is mandatory before their sterilization and every instrument that will enter the joint should be sterilized using flash techniques, a few days before surgery.

Time of diagnosis is one of the most important predictive factors in the outcome of joint sepsis. It has been shown that by the seventh day of joint sepsis articular cartilage will lose fifty percent of its

glycosaminoglycan (8,9). Our first two cases lost most of their cartilage at the time of diagnosis. This cartilage loss may have no clinical or radiological manifestations at early days but as the destruction process proceeds and cartilage debris release into the joint, chemical synovitis begins and may exacerbates patients sign and symptoms. At this stage physician may be misleading that a superimposed infection has been occurred or the micro-organism is resistant to antibiotic therapy. We visualized this debris during joint washings. Furthermore as synovitis is one of joint sepsis risk factors (10,11) and we got the best result in patients with synovectomy (third and fourth cases) we suggest early synovectomy for all patients with ACL reconstruction and joint septic arthritis.

We can classify our patients into bad and good outcome groups according to their type of operation and the time of beginning of the treatment. The worst results were in patients with ACL reconstruction and delayed diagnosis. We partially attribute the poor outcome to the bone drillings of the femur and tibia in patients with ACL reconstruction. Drilling of the bone to make the bone tunnels was a negative prognostic factor both in literature and in our patients. (12,13)

Contamination through the surgical incision or the arthroscopic portals is stated to be the most probable cause of an acute infection. In none of our patients redness or tenderness was apparent over surgical incisions or portals. So we emphasize that the absence of objective signs on surgical incisions sites does not exclude infection.

Despite of using various culture media we couldn't determine the causative agent in our patients. Indolent presentation with a destructive nature suggests a moderate aggressive pathogen or a fungal infection. As the antifungal treatment started very late and perhaps at the end of the natural course of a bacterial septic arthritis, and also the fact that some of our patients didn't receive anti-fungal treatment we could not precisely attribute the sepsis to a definite fungal infection.

After changing the gas sterilization method to flash techniques, we have never seen any infection by the time of this paper.

Conclusion: Although septic arthritis after arthroscopic surgery is not common but because this surgery has become very popular more aggressive sterilization techniques should be utilized in operating rooms. Any error in sterilization method may yield to catastrophic events before the health system become aware of the danger and with the first proven case arthroscopic surgery should be abandoned until the safety is guaranteed. Any pain or swellings at the end of the first week after operation should be taken as infection unless prove otherwise. Closed joint irrigation system for 48 hour and early synovectomy should be applied for all cases with ACL reconstruction and infection.

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