Pseudomonas aeruginosa septic arthritis of knee after intra-articular ozone injection

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SUMMARY

We describe a case of septic arthritis caused by *Pseudomonas aeruginosa* in an immunocompetent patient following intra-articular ozone injection into the knee. To the best of our knowledge, and after considering the current literature, we believe this case is unique as no other reports of septic arthritis caused by *P. aeruginosa* following intra-articular ozone injection has been made.

Key words: Ozone theraphy, Pseudomonas aeruginosa, Septic arthritis.

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INTRODUCTION

Septic arthritis (SA) is serious disease affecting joint spaces, synovial fluid, and articular cartilage, and carries a high potential for permanent joint damage and considerable loss of the joint function (Gallucci *et al*., 2007; Geirsson *et al*., 2008).

The main risk factors for SA are age older than 60 years, recent bacteremia, rheumatoid arthritis, osteoarthritis, immunosupressive therapies and diabetes mellitus (Matteson *et al*., 1990). The most common etiologic agent of SA is *Staphylococcus aureus* and gram negative bacilli account for approximately 10 to 20% of cases. Among the gram negative bacilli, coliform bacteria, particularly *Escherichia coli*, are the most commonly isolated microorganisms.

Pseudomonas aeruginosa an important pathogen in intravenous drug users and has a particular affinity for fibrocartiloginous articular structures.

There are several possible routes of joint invasion by microorganisms, including hematogenous spread, direct inoculation with a penetrating injury or iatrogenic causes like theraupetic joint aspirations or injections.

Therapeutic joint injections such as intraforaminal or intraarticular applications of ozone, steroids or joint viscous supplements may increase the risk of joint infections.

Ozone therapy is a common procedure that is cost-effective and simple and it is widely used in outpatient clinics for acute and chronic painful diseases of joints. It has been shown to have satisfactory clinical results with minimal complication rates.

Ozone theraphy is preferred method as it provides a rapid decrease in pain with reduced inflammation and early mobilization (Bocci *et al.*, 2004; Gallucci *et al*., 2007).

Despite these beneficial effects, it should be kept in mind that local complications such as septic arthritis can occur.

This report is of a unique case of *P. aeruginosa*-septic arthritis following intra-articular ozone injection that occurred in an immunocompetent patient with no risk factors.

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CASE REPORT

A 83-year-old man was admitted to the Department of Infectious Disease and Clinical Microbiology of Bucak State Hospital due to the chief complaint of pain and increased warmth at his left knee with moderate swelling. His medical reports revealed no serious condition other than increase in blood pressure under irbesartan plus hydrochlorothiazide and metoprolol treatment. However, he had been treated with intra-articular ozone for grade 3 gonarthrosis three weeks ago at a private doctor's office.The procedure was performed through intra-articular injections into four regions of the each knee. Four days after intra-articular ozone injections, the patient suffered from pain on the superior aspect of his left knee. In order to decrease pain, his doctor prescribed a non-steroidal anti-inflammatory drug and recommended cold compress treatment over his left knee. However his clinical symptoms were not resolved by this symptomatic management.

On admission, his physical examination showed normal vital signs with no fever. Examination of the respiratory, cardiovascular and abdomen systems were also unremarkable. His skeletal examination revealed pain associated with decreased range of motion, marked increase in joint temperature besides redness and swelling of his left knee.

Laboratory evaluation showed the white blood cell count (WBC) (7600/ mm^3) and hemoglobin levels (12.6 g/dl) in normal range, however the sedimentation rate (86 mm/h) and C-reactive protein levels were high (11.3 mg/dl). Radiological evaluation demonstrated a mild effusion in his left knee in X-ray roentgenogram. Joint aspiration was performed for the differential diagnosis of septic arthritis on the same day and the aspirate was cloudy in apperance. The WBC count was 74.280/mm^3 with neutrophilic predominance (92%). The gram stain showed 7-8 polymorphonuclear leukocytes per field of magnification, but no microorganisms. The aspirate was also inoculated on blood agar, eosin-methylene-blue agar and chocolate agar and into blood culture bottle. At the same time blood and urine cultures were obtained. Next day, arthroscopic drainage and irrigation of the knee were performed with normal saline solution in the operating room. Ampicillin/sulbactam therapy (2 g every 6 h) was also administered empirically.

The culture of the aspirates yielded *P. aeruginosa*. The isolate was also sent to the Akdeniz University Hospital, where similar results were reached diagnosing *P. aeruginosa* by both conventional methods and BD Phoenix automated system (Becton Dickinson, USA). In accordance to Clinical Standarts of Laboratory Institute (CLSI) recommendations, susceptibility tests were performed by using BD Phoenix automated system (Becton Dickinson, USA). MIC results of the microorganism indicated susceptibility to amikacin (≤8 mg/L), aztreonam (8 mg/L), cefepime (4 mg/L), cefaperazone-sulbactam (8/8 mg/L), ceftazidime (2 mg/L), ciprofloxacin (≤0.5 mg/L), gentamicin (≤2 mg/L), imipenem(2 mg/L), levofloxacin (≤1 mg/L), meropenem (≤1 mg/L), piperacilin (≤4 mg/L) but resistance to trimethoprim-sulfamethoxazole (>2/38 mg/L). The blood and urine cultures did not yield any proliferation for microorganisms, moreover *P. aeruginosa* could not be isolated from any other site.

According to the culture results, the current antibiotic treatment was modified to intravenous piperacillin-tazobactam. After the completion of one week's antibiotic treatment, the patient's clinical findings and laboratory results led to a reoperation providing irrigation of the intrarticular region and yielding samples for further microsopic and culture evaluation. Both gram stains and culture findings were negative for isolating any other microorganisms. The range of motion in the knee was rapidly improved in three days after second arthroscopic irrigation as well as CRP levels decreased to normal levels at 12th day of antibiotic therapy.

The patient was discharged home after three weeks of intravenous antibiotic therapy and maintained on 750 mg oral ciprofloxacin twice daily for one week. One month after the therapy, follow-up examination showed no signs of active disease and medical condition was good.

DISCUSSION

Nowadays, the growing the number of arthroscopies, use of intra-articular steroids and joint-

viscous supplements increase the risk of joint infections and the incidence of SA. Organisms can be introduced into the joint space during these invasive procedures. Clinical signs of SA can appear within two weeks after arthrocentesis/arthroscopy or within 6 months after open joint surgery (Geirsson *et al.*, 2008; Marmor *et al.*, 2009).

The most common causative organism for SA is *Staphylococcus aureus*. Following *S. aureus, Streptococcus spp* are the next most commonly isolated bacteria in adult patients with SA. Other rare microorganisms are as follows; *Neisseria gonorrhoeae* (frequent in young, sexually active adults), gram negative bacteria (e.g. *E. coli*) and *P. aeruginosa* which are commonly seen in patients with underlying medical conditions. *P. aeruginosa* rarely causes SA, is generally found in the commensal of the skin, mucous membranes and intestinal tract of humans (Gifford *et al.*, 1975; Bishara *et al.*, 2000; Calza *et al.*, 2002). SA caused by *P. aeruginosa* usually occurs in immunocompromised patients, intravenous drug abusers, patients who have suffered traumatic events or in those undergoing invasive procedures. To best of our knowledge, this case report is the first report of SA due to *P. aeruginosa* after intra-articular ozone injections.

Ozone therapy is widely used for management of lumbar disk herniations since the late 1990s. Ozone therapy has also been reported as more effective than steroids in many published articles (Bocci *et al.,* 2004; Muto *et al.,* 2004) by chemonucleolytic effects of oxygen-ozone mixture. Ozone is an unstable form of oxygen, which has antiseptic, disinfectant and antiviral effects. It reduces inflammation, improves microcirculation, inhibits the synthesis and release of prostaglandins, bradykinin and various algogenic molecules (Bocci *et al.,* 2004; Muto *et al.,* 2004; Gallucci *et al.*, 2007).

Despite the beneficial effects of ozone, intra-articular injection is still an invasive procedure contacting sterile joint space with outer milieu. Once the synovium is infected, the injuries begin to worsen particularly with rapid destruction of the articular cartilages (Gallucci *et al.*, 2007).

To prevent irreversible the damage in the joint space, early diagnosis of the infection and management with appropriate treatment is crucial.

The presented case is the first report of septic arthritis caused by *P. aeruginosa* after intraarticular ozone injection in an immunocompetent patient with no medical history of intravenous drug abuse, recent hospitalization or chronic diseases like rheumatoid arthritis. There are only a few published cases of SA caused by *P. aeruginosa*. Most of these cases, as expected, occured in high-risk patients with underlying medical conditions such as diabetes mellitus, chronic cardiac diseases, blood stream or urinary tract infections and malignancies (Gifford *et al.*, 1975; Walton *et al.*, 1985; Matteson *et al.*, 1990; Bishara *et al.*, 2000; Mohan *et al.*, 2005; Keynes *et al.*, 2009). SA of knee joint is rare but the complication of arthroscopy or therapeutic joint injections are dreaded (Gallucci *et al.*, 2007).

In conclusion, the incidence of SA will increase in the future as the number of intra-articular injections increases. Being aware of the risk regarding joint damage, prior prevention efforts with special emphasis on preoperative sterilization tecniques during invasive procedures to the joints is extremely important. Physcians must be alerted to the possibility of infections due to unusual microorganisms after open trauma, surgery or intra-articular invasive procedures.

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