

GANGRENE AFTER PENICILLIN INJECTION^{*} (A Case Report)

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SUMMARY: Özel A, Yavuz H, Erkul İ. (Department of Pediatrics, Selçuk University Faculty of Medicine, Konya, Turkey). Gangrene after penicillin injection: a case report. Turk J Pediatr 1995; 37: 67-71.

A patient with right lower limb gangrene that developed after penicillin injection is presented. Accidental intraarterial administration of penicillin may cause gangrene necessitating amputation. To avoid this severe complication, every intramuscular injection should be given with meticulous attention to proper technique, with adequate restraint of the patient, and with full knowledge of local anatomy and potential complications. *Key words: intramuscular injection, gangrene, penicillin procaine.*

Intramuscular (IM) injection is a common practice in medicine. The inadequacy of the gluteal muscle mass and the high risk of sciatic nerve injury make thigh muscles more appropriate for IM injection in infants. However, this approach is not entirely safe either. The injury of a. femoralis or its branches due to IM injection may cause tissue damage in areas of the body that are supplied by these vessels.

In this report an infant who developed limb necrosis after IM injection of penicillin into the thigh is described in order to call attention to a preventable complication.

Case Report

A seven-month-old male infant was diagnosed with acute tonsillitis in a rural health center, and therapy with IM procaine penicillin was administered. On the fifth day of therapy, immediately after the injection diffuse purple discoloration appeared around the injection site in the right thigh, extending to the abdomen and left lower limb. As the color changes became deeper and a marked feeling of coldness was noticed in the right leg, the patient was brought to our hospital. Physical examination revealed a child with an axillary temperature of 37.2 °C, weight 6700 g and height 69 cm. The systolic blood pressure was 100 mmHg, pulse rate 116/min, and both a. femoralis pulses were present. The right thigh was six cm wider than the left side. There were purpuric lesions over the periumbilical, inguinal and right hemiscrotal areas.

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Ecchymotic and gangrenous changes were present in a spotty fashion over the entire right lower extremity and the toes (Figs. 1 and 2).



Fig. 1: Discoloration, edema and bullae in the right lower extremity.



Fig. 2: Necrotic areas especially prominent at tiptoes.

Laboratory investigations yielded a normal urinalysis, hematocrit 38 percent, white cell count $3000/\text{mm}^3$, and platelet count $568,000/\text{mm}^3$. A peripheral blood smear was normal. The direct Coomb's test was negative. Both the prothrombin and the partial thromboplastin times were normal, and the level of fibrin degradation products was 10 mg/dl.

Therapy with heparin 50 U/kg and prednisolone 0.5 mg/kg, q 6 h, intravenously was started with the suggestion of vascular injury due to IM injection. Ceftriaxone was added to the therapy upon development of bullae over the ecchymotic lesions. The edema in the lower extremity disappeared gradually and the general status of the patient improved. Although distal pulses became palpable, gangrenous changes necessitating amputation developed in the toes and the sole, and the patient was referred to the Department of Plastic and Reconstructive Surgery.

Discussion

The most serious complications of intramuscular (IM) injections are muscle contracture and nerve injury. Abscess, intramuscular hemorrhage, tissue necrosis

and gangrene may also occur. The muscles of the gluteal area and the rectus muscles of the thigh are the most frequently locations for IM injections. Rectus muscles that have relatively larger mass are preferred in young infants whose gluteal muscles are not sufficiently developed. When injected in this area, vessel and nerve injury are not likely to occur because of the absence of important vessels and nerves in the anterior lateral aspect of the thigh. However it has been reported that 78 percent of quadriceps muscle contractures in children occurred postinjection¹.

Allergic reactions being the most important, penicillins have hematologic, pulmonary, cardiac, neurologic, psychiatric, and vascular side effects²⁻⁴. Vascular complications can be seen in two patterns. One is Hoigne's syndrome, which occurs as a result of the accidental intravenous injection of a drug. This syndrome expresses itself as brief transient central nervous system changes and coma developing soon after injection. Sometimes death may ensue⁵. Ischemic or gangrenous changes complicating penicillin injection are due to the intraarterial injection of the drug^{5,7}. Although no tissue reaction is seen after periarterial injection of penicillin in animal studies, ischemic changes follow the intraarterial injection⁶. In addition, failure of therapy to reverse vasospasm supports that the main mechanism responsible for tissue injury is vascular occlusion.

The signs that occur following intraarterial injection need not occur only distal to the injection site, but they may be seen in the proximal areas too. Since the distal part of the vessel is narrower, the drug may be forced retrograde⁵. The relatively lower blood pressure of children eases the retrograde filling. The drug may easily reach the aorta, as the distance is shorter in children⁸. Tissue injury follows the distribution of the lower aorta. Vascular occlusion up to the level of the aortic bifurcation leads to ipsilateral damage, whereas further retrograde filling may cause ischemic or necrotic changes on both sides. Obstruction of the upper parts of the aorta may result in transverse myelitis by interfering with the arterial supply to the spinal cord^{8,9}. If the needle is inserted horizontally to the thigh, it may reach the femoral artery. The occlusion of the femoral artery or its branches causes ischemic changes in the foot or the leg^{10,11}. The arterial injuries that may occur in the forms of transverse myelitis, sciatic neuropathy, drop foot, local necrosis, local or distant gangrenes are mostly seen in children under three years of age⁵. Amputation of the leg due to necrosis after intrarterial injection of benzathine penicillin has also been reported¹².

It is suggested that some properties of the drug could have been effective in the occurrence of the ischemic or gangrenous changes. The crystals of benzathine penicillin or procaine penicillin that are bigger than the erythrocytes may occlude the small arterioles. The embolisation of other substances in the preparations or allergic or idiosyncrathic reactions to them could also play a

role in the development of tissue damage⁵. The aggregation of the platelets on the vascular endothelium which is damaged by the caustic effect of the drug will halt the blood flow⁶.

When receiving an injection, a baby may struggle and the needle may penetrate the vessel⁶. When choosing the method of therapy, particularly in infants, the indication should be very carefully determined. Before giving the drug, the syringe should be checked for the presence of blood by first aspirating. The opacity and the high viscosity of the IM penicillin preparations may prevent the recognition of blood within the injector. The blood can only traverse in the center of the injector since the drug is highly viscous and it can only be seen at the near end of the piston, which is an atypical place to look for an aspirate^{5,11,13}. It has been reported that the insertion of the needle into a vessel might be unnoticed unless there was as much blood as the drug within the injector¹³; however we could not prove that opinion. We dissolved 800,000 units of procaine penicillin in 2 ml of distilled water and observed for color change by aspirating blood with a transparent syringe. When a minimal amount of blood was aspirated, it could be seen at the distal end of the injector, where as blood in the syringe first became visible at the proximal end of the piston with an amount of 0.2 ml.

In thigh injections, the upper lateral quadrant of the thigh should be used. The needle must be inserted at a 45° angle to both the horizontal and long axes of the leg. Meanwhile, by holding the lateral muscles of the thigh with the free hand, both the stabilization of the leg and the injection of the drug can easily be accomplished¹. The junctional parts of the needle and the injector must be transparent so as to allow for the perception of color changes. Maximum attention must be paid for the appearance of blood both at the distal end of the injector and just below the piston. If blood is seen in the injector or any discoloration occurs, the needle should be withdrawn immediately. Then the drug should be prepared with a new syringe and the injection should be tried in another area¹⁴. Local bleeding beyond what is usually expected after injection should arouse the suspicion of intraarterial injection, and the patient must be observed closely¹².

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