

Pin site care with the Ilizarov circular fixator

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Citation

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Abstract

Objective: To determine the incidence of pin tract infections in patients who have undergone femoral and tibial lengthening with the Ilizarov fixator. **Method:** A retrospective study was undertaken of 21 patients who were treated with the Ilizarov method for limb length discrepancies in the lower limbs, between 2001 and 2009. All patients received the same protocol for pin site care. The following information was recorded for each infected pin site: location, whether the implant or the wire or half-pin, time of onset of the first pin site infection in each patient and treatment. **Results:** Of the 21 patients, 11 were males and 10 were females with an average of 19.7 years (range 2–48 years). Sixty-two wires and 95 half-pins were studied. Half-pin infection site was 6.3%; wire site infection was 18.7%. Total pin site infection was 25%. Periarticular pin site infections accounted for 13.6% and diaphyseal infections 1.36%. Of the 21 patients studied, 19 had pin tract infections. **Conclusion:** Pin tract infections are common with external fixation. The consequences of pin tract infections can range from trivial to severe. Most pin site infections respond well to local pin care and oral antibiotics.

INTRODUCTION

Pin tract infection (PTI) is the most common complication of external fixation. Its rate varies from 10% to 50% (1). Many different institutions reported many different protocols for preventing and treating pin tract infections (2–6). The protocols for the care of pin sites are often derived from the preference of the surgeon, habit, consensus or inappropriate conclusions from the basic principles of wound care (2). There is little scientific evidence to support one technique over another.

The aim of this paper is to determine the incidence of pin tract infections in patients who have undergone femoral and tibial lengthening with the Ilizarov fixator. The author also discusses the methods which were utilized to minimize and treat pin site infections.

SUBJECTS AND METHODS

This is a retrospective study of all patients who were treated at our institution with the Ilizarov circular fixator between 2001 and 2009. Only the patients who required lengthening were included in the study. Twenty-one patients were studied. Demographics were collected by reviewing the medical records of each patient. The diagnoses included post-traumatic femoral shortening in eight patients, proximal femoral focal deficiency in one, idiopathic femoral

shortening in one, congenital pseudarthrosis in one, Blount's disease in two, fibular hemimelia in one, post-traumatic tibial shortening in four, and tibial shortening secondary to infection in three patients. Three patients underwent angular corrections followed by lengthening.

During surgery, the half-pins were inserted after the holes were pre-drilled with a sharp drill bit. The wires were inserted using a power drill at a slow speed. Once the wires exited through the skin on the opposite side, the drill was removed and a mallet was used to advance the wires to the correct lengths on either side of the limbs. The wires were all tensioned using a dynamometric wire tensioner. Complete release of the skin and subcutaneous tissues was performed around each pin which showed signs of skin tension. Betadine soaked squares of gauze were placed around each pin site and a kling bandage was then used as an occlusive dressing around all the pin sites. The dressing was left undisturbed for 48 hours. Thereafter, each pin site was cleaned with normal saline for crust removal and a light gauze dressing was applied only in the presence of exudates. In the absence of exudates, the pin sites were left uncovered. Peri-operative antibiotics included a single preoperative parenteral dose of Cefuroxime, which was continued post-operatively for 72 hours. The patient was discharged with a prescription for oral antibiotics which were to be taken only if a pin site infection developed.

The signs and symptoms of a pin site infection were explained to the patient and relative (pain, erythema, tenderness, discharge). Patients were instructed to clean the pin sites daily with cotton swabs soaked in normal saline to remove all crusts. Patients were evaluated weekly by the author during the period of gradual correction of the deformity and during lengthening. During the period of consolidation, patients were followed-up every three weeks. At each visit, a record was made of the condition of the pin sites. The location of each infected pin site was noted. The tightness of each nut on the construct was assessed at each visit.

Pin releases were performed using a local anaesthetic at the pin site on an as-needed basis when skin tension was noted. In cases of prolonged or recurrent infection, the wire or half-pin was either exchanged or removed. Most cases of pin site infections were successfully treated with empirical oral antibiotics. Patients were admitted for culture directed parenteral antibiotics when the pin site infection was prolonged despite the use of oral antibiotics.

The external fixator was removed after consolidation of the regenerate bone.

RESULTS

Of the 21 patients, there were 11 males and 10 females with an average age of 19.7 years (range 2–48 years). No patient was lost to follow-up. A total of 157 wires and half-pins, which included 62 wires and 95 half-pins were studied. A transfixing wire has two pin sites and therefore tensioned wires have twice as many such sites as half-pins. The total number of pin sites were 219 (124 wire sites and 95 half pin sites). Infection rate was assessed as a percentage of the number of pin sites as well as a percentage of the number patients. The infected sites were not graded since there was no standardized classification for pin site infections. The number of pin site infections in each patient varied from zero to eight with a mean of 2.7 infections per patient. Of the total number of pin sites, half-pin infections occurred in 14 pins (6.3%). Forty-one (18.7%) wire sites became infected, each wire having two sites of possible infection. The total pin site infection rate was 25%. Of the 21 patients in this study, 19 (90.4%) had pin tract infections. The mean time of onset of the first pin site infection was 33 days (range 2–124 days). Infections were much more common in periarticular pin sites (13.6%) compared to diaphyseal pin sites (1.36%).

Two proximal half-pins and three wires were removed because of persistent infections. Two patients whose pin site

infections did not resolve with oral antibiotics were admitted for culture directed parenteral antibiotics. There was complete resolution of the infections.

DISCUSSION

Local soft-tissue irritation and low-grade pin site infection are common with external fixation (1-6). A standardized approach to minimize the development of pin tract infection is necessary since pin tract infections cause pain and interfere with rehabilitation. The consequences of pin tract infection can range from trivial to severe. Opinion differ on the most effective method to minimize pin tract infections and there is little scientific evidence to support one protocol over another (2, 3, 5-9).

Davies et al (2) compared prospectively the British consensus method with the technique used by the Russian Ilizarov Scientific Centre for Restorative Traumatology and Orthopedics.

The British protocol involved the following:

- Normal handling of wires/pins
- Continuous drilling with irrigation
- Removal of bone swarf
- Application of dry dressing around the pin site at completion of surgery
- Original dressings left undisturbed for 48 hours
- Daily cleaning of the pin sites with normal saline for crust removal and application of a non-adherent dressing only in the presence of exudates. Pin sites otherwise left uncovered.

The Russian technique consisted of the following:

- Non-touch handling of wires/pin
- Pulsed drilling (stop-start) with irrigation
- Removal of bone swarf
- Immediate pin site dressings in alcoholic solution of Chlorhexidine with pressure to reduce haematoma. Dressing change at completion of surgery if blood-stained.
- Cleaning of pin sites daily for three days with a solution of 70% alcohol and dressing moistened

with Hydrex.

- Occlusive pressure dressing after the third day; pin cleaning and dressing changes repeated every seven to ten days.

The results of the study by Davies et al showed that of the 46 patients treated by the British protocol, 41 had pin site infections compared with 48 of the 74 patients treated by the Russian method. The relative risk of a single infection was 37% greater in the British group. Sian et al (10) reported similar results to those of Davies et al. All 16 patients in the British consensus group had a pin site infection requiring oral antibiotics, compared with only 23 of 44 patients in the Russian method. Sian et al noted a dramatic reduction in infections requiring in-patient hospital care, from 63% to 7% since implementation of the Russian method.

The protocol used by the author of this paper is similar to the British consensus method. There are, however, a few differences. The author did not use irrigation with continuous drilling. The holes for the half-pins were predrilled and the wires were inserted with a power drill at a slow speed. Once the wire had penetrated the skin on the opposite side, the drill was removed and a mallet was used to advance the wire. Thermal damage was minimized by this method of insertion of half-pins and wires. Betadine soaked squares of gauze as well as dry gauze were placed around the pin sites.

Of the 21 patients in this study, 19 (90.4%) had pin tract infections. The infection rate when expressed as a percentage of the number of pin sites was 25%. Two hundred and twelve pin sites which included 136 wire sites and 76 half-pins were observed by Gordon et al (3). A total of 178 pin tract infections were noted during the course of the study. Paley (6) reported 22 pin tract infections in 13 patients.

Pin sites nearer joints are particularly prone to sepsis since they are subject to greater improvement (1, 11). Hutson et al (11) reported a high incidence of infection in periarticular wires of Ilizarov fixators inserted for femoral and tibial fractures. They noted five deep infections, three cases of septic arthritis and three cases of osteomyelitis in the fracture sites.

Sproles (12) and Respet et al (13) have noted that the possibility of pin tract infection increases with time. In this study, the mean time of onset of the first pin tract infection was 33 days.

The presence of pain or inflammation around the pin site is an indication for soft tissue release around the pin and commencement of oral antibiotics. The vast majority of pin tract infections respond well to appropriate local pin care and oral antibiotics. Admission to hospital and administration of culture directed parenteral antibiotics with or without removal of the pin/wire are indicated in cases of persistent pin tract infection.

Pin care can be difficult, time-consuming and costly for patients and families. Several courses of oral antibiotics and on occasion hospitalization for parenteral antibiotics are required for the treatment of pin tract infections. An effective, relatively simple and standardized method of minimizing pin tract infections is needed.

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