Pin Site Care Innovations: The Royal Stoke University Hospital Experience

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Introduction

When a patient is treated with an external fixator the main body of the fixator has to be physically connected to the bone. This is achieved using two methods: the first is the fine k-wire (or Kirschner wire); the second is the half-pin. The k-wire is most commonly used with Illizarov frame fixation systems[1] and their recent embodiments[2,3]. Made from 316LVM stainless steel and usually less that 2mm in diameter (1.8 mm and 1.5 mm being common place) it passes through the bone and communicates with opposite sides of the frame creating a bilateral fixation. Under tension (often about 1kN) the wire is fixed in place on the fixator body with locking clamps. The wires are commonly inserted in pairs creating a cross formation; this produces a mechanical fixing that does not rely on internal friction between the bone and the wire. A single cross-wire combination will, therefore, create 4 skin piercings. Half-pins are most commonly used with mono-lateral external fixators[4,5]. A threaded portion creates an anchor with the bone; a smooth shank enables location with the fixator. Normally, the pins are made from 316L or 316LVM stainless steel and can be 3mm, 5mm or 6mm in diameter. More complex embodiments have evolved such as the Taylor Spatial Frame[2] and Hexapod[3]. A common frame configuration can have 32 wounds created by 8 k-wire pairs. Hybrid systems can have a combination of k-wires and half-pins. This means they could have a combination of 4 wires and 3 half-pins (or 11 skin piercings). Mono-lateral fixators tend to use half-pins in groups of 3 at each end [4,5] creating 6 individual skin piercings. The fixation device has to remain in place during the whole treatment period. For tibial fractures this could be up to 24 weeks, and for some reconstruction surgery it could be much longer. The pin-sites, therefore, are open to: the atmosphere, the environment, and to bacteria for the whole duration. Pin-site infection incidence is reported to be about 12%[6]. Out of these some 4% can increase in severity to osteomyelitis[6]. Hence pin-site care designed to avoid irritation, inflammation or infection is of paramount importance.

Materials and Methods

Patients/carers are educated from the outset on pin-site care and on the three state of the pin site: calm, irritated and infected. Further work was undertaken investigating the effects of retainers on polymeric membrane pin-site dressings for compression and pressure[7]. The RCN guidelines[8] recommend that an element of compression is required in order to prevent skin movement around the pin or wire, thus helping to reduce the risk of irritation of the skin or cause pin site infection. We compared the effects of a new design of clip retainer and bung retainer for ease of use and pressure forces on a frame fixator model. We also conducted a review of infection rates prior to introduction of the protocol compared to those post introduction. We examined 60 concurrent patient records prior to 31st December 2013 against an equal number prior to 31st December 2017.

Discussion

Our study demonstrated bung retainers had higher retention pressures but clip retainers provided ease of use, visibility and compression over dressings. Pressure exerted by bung retainers could exceed thresholds that could cause pressure necrosis. The new clip retainer in combination with the polymeric membrane dressing has proved an effective combination. The polymeric membrane dressing contains active ingredients that reduce pain and inflammation. This technique, coupled with good patient education, has dramatically reduced associated complications with pin-site care such as irritated pin sites, PSI, hospital re-admissions and osteomyelitis.

References

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