

# Use of an ultrasound-guided periosteal catheter to manage severe pain following a sternal fracture

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## BACKGROUND

Sternal fractures occasionally cause significant pain requiring admission to hospital for pain control. In this context, they may significantly impair respiratory function, leading to atelectasis, hypoxia and pneumonia risk. Options for analgesia include traditional approaches using the WHO pain ladder, escalating to a PCA. High PCA requirements cause a dilemma; respiratory depression from high dose opioids may paradoxically worsen the predicament.

## ANATOMY

The sternum is formed by fusion of two cartilaginous sternal plates flanking the median plane. Incomplete fusion leaves a sternal foramen. The innervation of the sternum comes primarily from the anterior branches of the intercostal nerves as they emerge from their neurovascular bundles at the very distal end of the costochondral parasternal area. The anterior branch of the phrenic nerve supplies the lower portion of the sternum with its contralateral counterpart. The sternum has a segmental innervation, such that the manubrium is innervated primarily from T1/2, with contribution from the anterior branch of the supraclavicular nerve and possibly the medial pectoral nerve the sternal body innervated from T3-T6 with the Xiphisternum from T5 and 6.

## CASE REPORT

A 72 year old lady sustained a fracture through the sternal body following a car accident. (See figure 1) She had significant comorbidity in the form of hypertension, widespread degenerative osteoarthritis involving multiple levels in the back, and had been under the chronic pain team receiving multiple injection strategies in attempts to alleviate her longstanding lumbar and cervical pain. Analgesic regime prior to admission included gabapentin 600mg tds, amitryptiline 50mg nocte, paracetamol 1g qds and codeine 60mg qds. She was intolerant to NSAIDs.

Initially analgesia with bolus morphine was not successful. A morphine PCA was commenced which delivered 95mg morphine in 24hrs; subjectively there was no improvement in pain control, but significant nausea and respiratory depression had developed. Objectively, she had become oxygen dependant, and was non-compliant with chest physiotherapy and non-productive of secretions.

Following consideration of the alternatives, a decision was made to place a periosteal catheter across the fracture site and use an intermittent bolus regime to improve the analgesia.

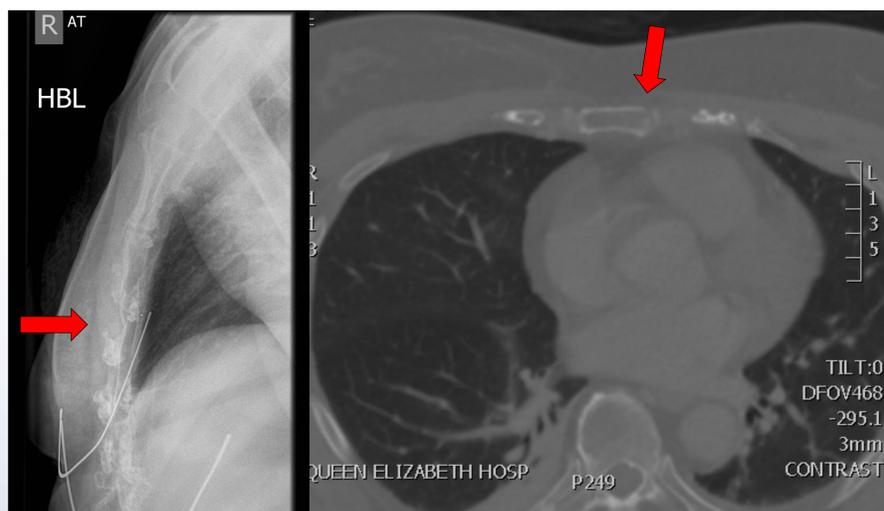


Figure 1. Lateral Sternal X-ray (LEFT) and CT thorax (RIGHT) demonstrating a sternal fracture (red arrows)

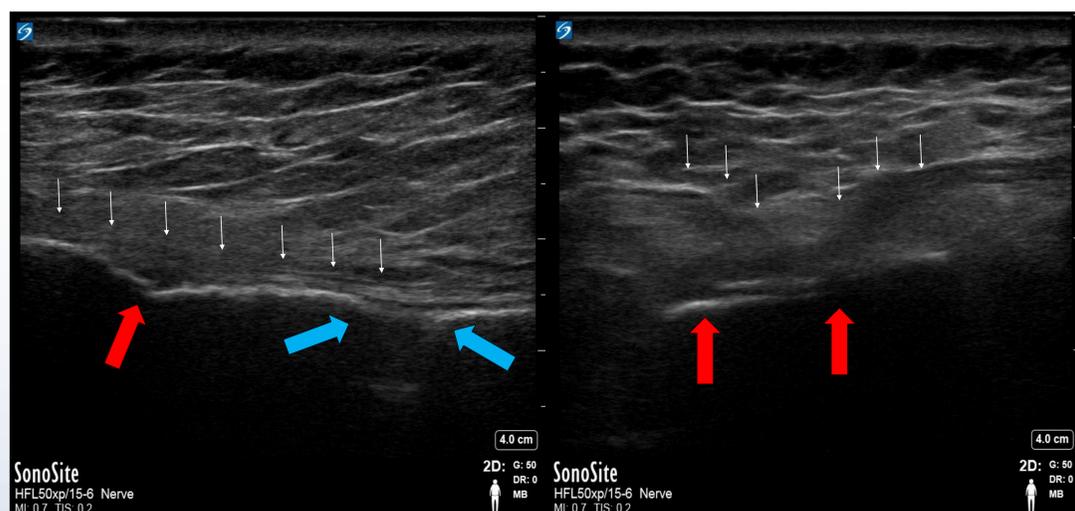


Figure 2. Longitudinal ultrasound of the sternum demonstrating the fracture (red arrows), an incidental finding of a sternal foramen (blue arrows) and the catheter location (white arrows).

Figure 3. Transverse ultrasound demonstrating the sternal fracture (red arrows), and the lateral 'seagull' effect from the spread of local anaesthetic injectate. (white arrows)

## PERIOSTEAL CATHETER PLACEMENT AND MANAGEMENT

A periosteal catheter was inserted under ultrasound in-plane guidance. A full aseptic technique was used; after local infiltration to the skin and subcutaneous tissues a 16G Tuohy needle (Portex) was inserted at 3-4cm cranial to the fracture site at an angle of approx. 60 degrees to the vertical. Once the tip was adjacent to the periosteum, 10mls normal saline were inserted to establish injectate spread and expand a potential space. An epidural catheter was then inserted using the ultrasound to establish location of the epidural catheter over the fracture site. The catheter was then bolused using 15mls 0.25% Levobupivacaine. Figure 2 demonstrates a longitudinal ultrasound of the sternum, showing the fracture site, the sternal foramen and the catheter location. Figure 3 demonstrates the expansion of the peristernal tissues, particularly marked towards the lateral edges.

## CONCLUSION

Periosteal catheters placed across the fracture site may be a useful adjunct for the management of severe pain with sternal fractures.

**REFERENCES:** Wilson SR, Price DD, Penner E. Pain Control for Sternal Fracture Using an Ultrasound-Guided Hematoma Block. *J Emerg Med* 2010; 38(3): 359-361

Appelboom A, McLauchlan CAJ, Murdoch J, MacIntyre PA. Delivery of local anaesthetic via a sternal catheter to reduce the pain caused by sternal fractures: first case series using the new technique. *Emerg Med J* 2006; 23: 791-793.