CASE REPORT

Salmonella sternoclavicular osteomyelitis in a patient with Crohn's diseaseKirkby Daniel Tickell,¹ Ronan Banim,² Ildiko Kustos³¹Countess of Chester, Chester, UK²Department of Orthopaedics, Countess of Chester, Chester, Cheshire, UK³Department of Microbiology, Countess of Chester Hospital, Chester, Cheshire, UKCorrespondence to
Dr Kirkby Daniel Tickell,
ktickell@nhs.net**SUMMARY**

We describe a 73-year-old man with Crohn's disease and previous sternotomies, who developed *Salmonella* sternoclavicular osteomyelitis subsequent to a *Salmonella enteritidis* sepsis and closed fracture of his clavicle. We include evidence from several cases related to sternoclavicular osteomyelitis, and *Salmonella* osteomyelitis. We continue by summarising the aetiologies of these diseases, and risk factors that predispose to them.

BACKGROUND

Salmonella is estimated to cause 0.45% of osteomyelitis,¹ and is most commonly associated with sickle cell disease. Given the extremely low incidence of the responsible pathogen and the very unusual site of infection, it is unsurprising that we found only one comparable case report of *Salmonella* osteomyelitis in the sternum or clavicle in a patient without sickle cell disease.²

Typically, sternal osteomyelitis is a complication of chest compression associated fractures or invasive procedures such as sternotomy. In our discussion we will compare these pathologies to our case, offer an overview of more conventional *Salmonella* osteomyelitis and finally examine Crohn's disease and immunosuppression as predisposing factors implicated in the dissemination of *Salmonella*.

We hope that this case may be used as a foundation for learning about *Salmonella* osteomyelitis in a non sickle cell disease patient and sternoclavicular osteomyelitis. Furthermore, it documents a successful intervention in this potentially fatal nidus of infection.

CASE PRESENTATION

A 73-year-old gentleman with Crohn's disease, treated with 17 mg of prednisolone and 150 mg of azathioprine presented to his gastroenterologist. He reported 1 month of fever, transient confusion and generalised weakness, resulting in a fall onto his right side 2 days previous to his presentation. His right shoulder and neck remained painful. His medical history included active Crohn's disease, four previous coronary artery bypass grafts; the most recent in 1995 included a stent insertion, and no previous *Salmonella* infections. On examination, he was tender over this right clavicle and supraclavicular area, but had no obvious bone abnormality. His range of movement was normal, but painful. On admission, he had no fever and systemically stable. A urine dip was overtly positive for leukocytes, nitrates and protein; CRP was

151 mg/l. After admission for presumed urosepsis, Tazocin 4.5 g thrice daily was started. Blood cultures grew *S enteritidis*, but the patient continued to improve and after 4 days was converted to amoxicillin 1 g TDS for a week. The 150 mg of azathioprine was stopped, and the steroid dose was slowly tapered from 17 to 5 mg. He was reviewed by the orthopaedic team and discharged home with a diagnosis of *Salmonella* sepsis, with muscular spasm secondary to his fall.

Two months later, he presented to an orthopaedic clinic with continued right shoulder pain. He was otherwise well, having fully recovered from his sepsis, and suffered no further trauma. A prompt CT scan revealed a fractured dislocation of the right clavicle, surrounded proximally by haematoma. Due to the duration of his symptoms, the patient was offered a closed reduction of the sternoclavicular joint, should his pain continue. However, before this was performed, the patient represented with right-sided proximal clavicular swelling that culminated in his sternotomy scar 'bursting out with a pint of pus'. On examination, a sinus was evident in the superior portion of his scar, and pus was easily milked from it. Our immediate concern was the prospect of mediastinitis, which is a dangerous and well-documented complication of chest wall infection. The local cardiothoracic surgery unit advised a CT scan to exclude mediastinal invasion.

INVESTIGATIONS

His inflammatory markers were notably not raised. He was admitted under the orthopaedic team, and tazocin was given. His blood cultures and swabs from the sinus grew *S enteritidis* with the same sensitivities. A CT scan revealed the sinus communicated with a small collection over the sternum, this tracked back to a further collection at the right sternoclavicular joint measuring approximately 3 cm×3.5 cm. Fortunately, the mediastinum appeared uninvolved, allowing the orthopaedic surgeons to take the patient to the theatre.

TREATMENT

At surgery, the sinus was explored, and the wound extended laterally to expose the proximal end of the clavicle. A large amount of pus was released, and the proximal ends of both the clavicle and first rib appeared necrotic and unstable. They were therefore excised, with care being taken not to damage the underlying pleura. The wound was thoroughly irrigated, packed with Kaltostat (ConvaTec, Uxbridge, UK), and partially closed

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with nylon. At this stage, the antibiotic regime was changed from tazocin to ciprofloxacin, 500 mg twice daily. The wound was re-explored 2 days later, and no further debridement was required. It was repacked, and postoperatively a vacuum dressing was applied. The patient was then discharged with a vacuum dressing, and an indefinite course of ciprofloxacin. The ciprofloxacin was terminated after 6 months of treatment.

OUTCOME AND FOLLOW-UP

The prospect of multifocal seeding remain concerned, particular in light of the cardiac stent and four grafts in such proximity to the infection. Fortunately, a subsequent echocardiogram and bone scan were reassuringly negative. The patient attended regularly for follow-up under orthopaedics, infectious disease and cardiothoracics. The wound healed well under the vacuum dressing. Subsequently, the cardiothoracic surgeons have removed the sternal wires to prevent reoccurrence.

DISCUSSION

Sternal osteomyelitis is a recognised and dangerous complication of both thoracic surgery and sternal bone marrow biopsy.³ However, it has only been reported in five closed traumatic chest injuries.⁴ Four of these examples relate to fractures sustained during chest compression and subsequent *Staphylococcus aureus* infection. Mallinson *et al.*,³ proposed that a haematoma complicating these fractures could act as an ideal growth medium for invading pathogens. Additionally, the vascular response to injury might facilitate an increased probability of haematogenous spread to the affected area. The mechanism of injury differs slightly in our case, but the presence of a haematoma without evidence of osteomyelitis on the original CT scan lends credence to Mallinson's hypothesis.³

Sternal osteomyelitis complicates 3–5% of sternotomies⁵ and is most commonly caused by *S aureus*.⁶ Mediastinitis often further complicates this picture leading to mortality rates of 19–29%.⁵ The treatment of these dangerous infections is controversial with a variety of primary and secondary closure used after debridement. Our patient's last cardiothoracic operation was 17 years before he presented, which makes the chance of primary infection from this operation low. However, *Salmonella* can remain asymptomatic for years to the extent that a case of *Salmonella* osteomyelitis has been reported 25 years after the initial exposure to the pathogen.⁷ Additionally, the sternal wires, four grafts and a stent were a centimetre from the infected site giving rise to the concerning possibility that the organism might have colonised these foreign bodies during his previous bacteraemia. This infection would have been able to extend directly or haematogenously into the vulnerable clavicle.

Typically, *Salmonella* osteomyelitis is found in the long bones, most commonly in the femur and humerus,^{7 8} and the vertebrae. When described in the context of Crohn's disease, osteomyelitis usually occurs in the pelvic or vertebral bones. This is thought to result from the direct spread from intra-abdominal abscesses formed due to enteric fistulas⁹. This mechanism does not explain a sternoclavicular focus of infection. *Salmonella* osteomyelitis is most commonly associated with sickle cell disease; furthermore, it has been described in the context of collagen vascular disease, diabetes, systemic lupus erythematosus, lymphoma, liver disease, vascular disease, previous surgery and trauma, extremes of age and glucocorticoid use.^{10 11} The last five associations apply to this case.^{11 12} Usually, pain and swelling dominate its presentation and, as with this case, systemic manifestations are rare.^{11 13} It commonly responds well to a wide range of antibiotics, but fluoroquinolones have recently been

favoured due to good oral bioavailability, combined with strong bone and macrophage penetration.¹⁰

Disseminated *Salmonella* can manifest in numerous ways, and many immunosuppressants have been associated with its extra gastrointestinal spread. Glucocorticoids have a proven association with *Salmonella* osteomyelitis,¹⁰ and azathioprine has been previously described in a case of *Salmonella* peritonitis.¹⁴ It is likely that both these medication were a key in the development of this patient's initial *Salmonella* sepsis. While not relevant to this case, both anti-TNF- α and IL-12 medications have also been implicated in disseminated *Salmonella* infection.^{14 15}

It is also important to note that *Salmonella* has a predilection for men and the elderly.¹⁰ We therefore conclude that his unmodifiable risk factors—age and sex combined with Crohn's disease and immunosuppression resulted in the dissemination of *Salmonella* infection. It is likely that during the resultant bacteraemia, the closed clavicular fracture or sternal wires were colonised, perhaps facilitated by the haematoma seen on CT scan. This infection then spread to involve the proximal clavicle, first rib and sternum.

Learning points

- ▶ Disseminated *Salmonella* infections are a well-described complication of Crohn's disease and immunosuppression. Where, haematogenous *Salmonella* spread has been proven, it is worth considering *Salmonella* osteomyelitis.
- ▶ Associations of *Salmonella* osteomyelitis: sickle cell disease, collagen vascular disease, diabetes, systemic lupus erythematosus, lymphoma, liver disease, vascular disease, previous surgery and trauma, Crohn's extremes of age, glucocorticoid.
- ▶ Sternal osteomyelitis is a rare, but documented complication of closed fracture, most commonly associated with chest compressions. Open trauma, such as sternotomy is most frequently associated with osteomyelitis.
- ▶ Haematological seeding of closed chest wall fractures is probably facilitated by haematomas.

Competing interests None.

Patient consent Obtained.

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