CASE REPORT

Septic arthritis of the elbow with *Streptococcus pneumoniae* in a 9-month-old girl

Tabea Haas,¹ Mark S Gaston,² Erich Rutz,³ Carlo Camathias³

¹BG Unfallklinik, Tübingen, Germany

²Department of Orthopedics, Royal Hospital for Sick Children, Edinburgh, UK

³Department of Orthopedics, University Children's Hospital Basel, Basel, Switzerland

Correspondence to

Dr Carlo Camathias, camathias.carlo@gmail.com

Accepted 6 June 2014

SUMMARY

A 9-month-old girl presented with a swollen, erythematous and hot left elbow, which was tender on palpation. Physical examination was unremarkable except temperature of 38.4°C and restriction of elbow movement. Blood tests showed an elevated C reactive protein of 116 mg/L. Plain radiograph and ultrasound of the elbow showed no pathological findings. MRI revealed an intra-articular effusion and associated myositis, but did not demonstrate intra-articular synovitis. Arthroscopic lavage of the joint yielded purulent fluid and gross synovitis involving the entire joint. *Streptococcus pneumoniae* was isolated from the synovial fluid, although the patient had been immunised with Prevenar (pneumococcal vaccine). Postoperative empiric treatment with antibiotics for 6 weeks was started. Follow-up of 2 years revealed a healthy girl with a full range of motion of her elbow and no signs of complications. This case of septic arthritis emphasises the importance of the clinical presentation to determine the correct diagnosis and treatment modalities.

BACKGROUND

Septic arthritis in children is a relatively common diagnosis representing an orthopaedic emergency with hip and knee being the most common anatomical sites.^{1–3} *Staphylococcus aureus* is the usual offending microorganism, present in 50% of cases.^{1 2 4 5} We present an unusual case affecting the elbow in a child where *Streptococcus pneumoniae* was isolated. To the best of our knowledge this has not been previously described in the literature.^{1 2 6} Early diagnosis and accurate treatment is key in avoiding complications such as joint destruction, ankylosis, growth arrest or spread of infection leading to osteomyelitis or nerve lesions.^{7 8} With regard to elbow sepsis in children there is no clear consensus about the most effective and safe diagnostic and treatment methods. Options for treatment include arthrocentesis, arthrotomy or arthroscopy accompanied by empiric antibiotic treatment. The fast relief of pain and regaining a functional range of motion are the primary aims in avoiding untoward sequelae.

CASE PRESENTATION

A 9-month-old girl, without systemic pathologies, presented with rhinorrhoea, fever (38.4°C) and cough of 4 days duration. The parents also reported a swollen elbow with restriction of movement beginning 2 days prior to her presentation. Medical history revealed birth by caesarian section at 38 weeks gestation due to placenta praevia and a

Marcus-Gunn syndrome (trigemino-oculomotor synkineses) on the left side. She has been immunised according to standard local protocols with Prevenar (pneumococcal vaccine). Except for the recent respiratory symptoms there were no other predisposing conditions such as immunosuppression or recent vaccination. There was no history of trauma.

This girl, weighing 8.6 kg, presented to the emergency room in reasonable general condition. The physical examination revealed a swollen, erythematous, hot left elbow, which was tender on palpation. All other joints had a free range of motion and no other remarkable findings. The remainder of the physical examination including eyes, lymph nodes, cardiac, pulmonary and abdominal systems was unremarkable except temperature of 38.4°C.

INVESTIGATIONS

Blood tests showed an elevated C reactive protein (CRP) of 116 mg/L. Erythrocytes sedimentation rate was 150 mm/1 h. Blood cell count showed 16.8×10^9 leucocytes/L with a differential of 49.9% neutrophils and 24.9% lymphocytes. Haemoglobin was 99 g/L and mean cell volume was 72 fL, revealing a microcytic anaemia. Blood cultures were also sent.

Plain radiograph of the elbow showed no pathological findings (figure 1). The ultrasound of the elbow showed no intra-articular effusion (figure 2) compared with the contralateral joint. MRI (figure 3) clearly showed the intra-articular effusion and associated myositis. However, MRI did not demonstrate intra-articular synovitis, which was later found during arthroscopy.

DIFFERENTIAL DIAGNOSIS

The differential diagnosis of osteomyelitis was excluded due to the lack of any bone involvement.

TREATMENT

Owing to functional limitation, pain, swelling, articular effusion, and elevated CRP and leucocytes the decision was taken for emergency lavage of the elbow. Initial arthrocentesis yielded 5 mL of purulent fluid, which was sent for microbiological analysis. An arthroscopic lavage of the joint was performed using two portals: one antrolateral and one proximal lateral using the paediatric arthroscope 3.5 mm. Gross synovitis involving the entire joint was demonstrated (figure 4). Thorough irrigation with 1 L of saline solution was performed and the fluid was running clear.

CrossMark

To cite: Haas T, Gaston MS, Rutz E, et al. *BMJ Case Rep* Published online: [please include Day Month Year] doi:10.1136/bcr-2014-205204

Figure 1 No pathological findings in the X-ray of the affected elbow. To exclude bony lesions X-rays in anteroposterior and lateral view were performed.

Postoperatively empiric treatment with intravenous Augmentin 220 mg/kg/day was started.

Penicillin sensitive *S. pneumoniae* was isolated from the synovial fluid. Blood cultures resulted in Gram-negative bacteria interpreted as destroyed *S. pneumoniae*.

OUTCOME AND FOLLOW-UP

The patient's condition remained stable after surgery. The CRP and white cell count (WCC) dropped on sequential post-operative testing. After 10 days the girl started to mobilise her elbow spontaneously and the swelling resolved. No further surgical intervention was required and intravenous antibiotic treatment was continued for 14 days. At 2 weeks the patient was discharged following normal clinical and laboratory findings.

The parents were instructed to continue the infant on oral antibiotic treatment for 4 weeks. Follow-up examination of 2 years revealed a healthy girl with a full range of motion of her elbow and no sign of complications.

DISCUSSION

Septic arthritis in children is one of the few true orthopaedic emergencies. It is very important to make the diagnosis as early as possible to avoid sequelae such as cartilage destruction, osteomyelitis, ankylosis, growth aberration due to physical damage, joint instability and restriction of movement.^{7 9}

Figure 2 No articular effusion found in ultrasound (OLE, olecranon; HUM, humerus).

Figure 3 MRI (sagittal reconstruction) shows articular effusion clearly (*), myositis and soft tissue reaction (arrow) but no bone involvement and no synovitis.

Early diagnosis in young children can be particularly challenging. The elbow in infants is at a location that is not easy to fully assess. Infantile fat makes it especially difficult to distinguish joint effusion from soft tissue swelling.

In addition, clinical symptoms in these young patients can range from subtle signs such as restlessness and poor feeding without fever to the more common diagnostic criteria of inflammation such as swelling, erythema, warmth, functional limitation and location specific pain.^{2 7} The medical history is, as always, crucial to diagnosis, in particular other foci of infection such as the respiratory tract.⁸

This case emphasises that clinical assessment is the most important factor in making diagnostic and treatment decisions. Swelling, functional limitation, fever and elevated inflammatory parameters (CRP, WCC) should lead to a high index of suspicion for septic arthritis in any joint.

As CRP is an acute phase protein it increases quickly with the onset of symptoms, peaks after 48 h and decreases within 1 week if therapy is successful.¹⁰ Therefore we recommend using the CRP as a parameter in the diagnosis and for monitoring response to treatment.

Differential diagnosis such as the common 'pulled elbow' should not distract the assessor from considering septic arthritis and the range of investigative procedures as detailed should be followed.⁶ Delay in diagnosis in cases like these can have severe consequences.

The most important findings in this case are the lack of positive indicators on the radiological investigations. X-ray findings are often unremarkable, as was the situation here, except in cases that have proceeded to chronic infection. However, contrary to other studies, no abnormalities were noted on ultrasound scan.⁶ MRI has been shown to be more sensitive for detecting joint effusion as discussed in the studies of Muslim *et al.* The presence of

Figure 4 Arthroscopy of the elbow using an antrolateral and a proximal lateral. Intra-arthroscopic finding: synovitis with clear inflammation and minimal fibrous tissue, no destruction of cartilage or bone.

effusion on MRI, even in the absence of synovitis, along with clinical and laboratory findings should lead to arthrocentesis and arthroscopic lavage as an emergency procedure.¹ The evidence shows that, in cases where the clinical findings are such as was noted here, there is no time for a 'wait and see policy' and surgery should be undertaken on an emergent basis.⁷ It is our opinion that arthroscopy is the superior surgical treatment modality as it allows for full visualisation of the joint and avoids the morbidity from scarring following an arthrotomy. It can also be easily repeated if the clinical and laboratory signs do not resolve, allowing a further full assessment of the joint. Our case uniquely demonstrates that a minimally invasive arthroscopic irrigation of the elbow was adequate, and resulted in an excellent clinical outcome. The synovitis could be visualised easily during arthroscopy, confirming the suspected diagnosis and samples for culture were positive for an organism. Arthroscopy permitted full visualisation of the joint and confirmed that there was no destruction of cartilage or bone. This allowed for a better prognostic forecast to be made.

Learning points

- ▶ Septic arthritis in children is an orthopaedic emergency, which is especially difficult to diagnose in infants younger than 2 years.
- ▶ In case of missing typical symptoms such as pain, swelling, functional limitation or a sonographic joint effusion, MRI might be useful to assist in the diagnosis.
- ▶ However, the clinical history, examination and laboratory inflammatory parameters (C reactive protein, leucocytes) are the key features in making the diagnosis and guiding treatment.
- ▶ The prompt and adequate combination of empiric and—after pathogen isolation—targeted antibiotic treatment and surgical intervention can preserve these infants from life impacting sequelae.

S. pneumoniae which was isolated in this case reveals the problem of incomplete protection of the heptavalent vaccine. Since the 9-month-old girl had been immunised with the standard vaccine the infection was most likely due to a non-vaccine serotype.⁵ This bacteria is not frequently involved in arthritis. However, it is known that pneumococcal joint infections have decreased since the introduction of the heptavalent vaccine.¹¹

Postoperative therapy should involve targeted antibiotic therapy, clinical and laboratory re-examination and arthroscopic reirrigation if symptoms do not resolve. Early mobilisation assisted by physiotherapists should start as pain resolves.

Contributors TH wrote the paper; MSG was involved in the revision and final draft; ER was involved in the acquisition of data; CC was involved in the conception, revision and final approval.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

- 1 Hefti F, Freuler F, Hinchcliffe R, *et al.* *Pediatric orthopedics in practice*. Springer, 2007.
- 2 Al Saadi MM, Al Zamil FA, Bokhary NA, *et al.* Acute septic arthritis in children. *Pediatr Int* 2009;51:377–80.
- 3 Rutz E, Brunner R. Septic arthritis of the hip—current concepts. *Hip Int* 2009;19 (Suppl 6):S9–12.
- 4 Akinyoola AL, Obiajunwa PO, Oginni LM. Septic arthritis in children. *West Afr J Med* 2006;25:119–23.
- 5 Young TP, Maas L, Thorp AW, *et al.* Etiology of septic arthritis in children: an update for the new millennium. *Am J Emerg Med* 2011;29:899–902.
- 6 Bowakim J, Marti R, Curto A. Elbow septic arthritis in children: clinical presentation and management. *J Pediatr Orthop B* 2010;19:281–4.
- 7 Kariminasab MH, Shayesteh Azar M, Sajjadi Saravi M. Surgical intervention for treatment of septic arthritis in infancy and childhood; a retrospective study. *Arch Iran Med* 2009;12:409–11.
- 8 Michelotti F, Camathias C, Gaston M, *et al.* Severe septic arthritis of the shoulder with an axillary nerve lesion in a 4-year-old child. *J Orthop Sci* 2011;16:821–4.
- 9 Lejman T, Strong M, Michno P. [Septic arthritis in newborns and infants. Treatment of hip arthritis]. *Chir Narzadow Ruchu Ortop Pol* 1996;61:567–77.
- 10 Kallio MJ, Unkila-Kallio L, Aalto K, *et al.* Serum C-reactive protein, erythrocyte sedimentation rate and white blood cell count in septic arthritis of children. *Pediatr Infect Dis J* 1997;16:411–13.
- 11 Lane JE, Moore CC, Beckish ML, *et al.* Isolated septic arthritis caused by penicillin-resistant *Streptococcus pneumoniae*. *South Med J* 2001;94:429–31.

Copyright 2014 BMJ Publishing Group. All rights reserved. For permission to reuse any of this content visit <http://group.bmj.com/group/rights-licensing/permissions>.
BMJ Case Report Fellows may re-use this article for personal use and teaching without any further permission.

Become a Fellow of BMJ Case Reports today and you can:

- ▶ Submit as many cases as you like
- ▶ Enjoy fast sympathetic peer review and rapid publication of accepted articles
- ▶ Access all the published articles
- ▶ Re-use any of the published material for personal use and teaching without further permission

For information on Institutional Fellowships contact consortiasales@bmjgroup.com

Visit casereports.bmj.com for more articles like this and to become a Fellow