Contribution of computed tomography in chronic septic arthritis and osteomyelitis management in a dog

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SUMMARY

A 3 year-old Shepherd Malinois was referred for chronic septic arthritis of the right hook after a dog bite injury. A computed tomography scanner (CT) was planned to get exhaustive images of the lesions and to look for the possible arthritis origin. The different CT sections brought to light osteomyelitis lesions with a geode in the malleolus of the distal fibula in addition to arthritis. Therefore, instead of a medical management, a surgical curettage of the lesions was performed and multiple osseous sequestra were found. A new antibiotic treatment was started requiring cephalosporins. Functional outcome after surgery was found to be satisfactory despite a severe osteoarthrits which could be managed medically. As far as osteomyelitis don't require the same treatment as septic arthritis, accurate diagnostic imaging could dramatically change a case management, especially during chronic evolution.

Keywords: Septic arthritis, osteomyelitis, geode, tarsal joint, computed tomography, dog.

RESUME

Contribution de l’examen tomodensitométrique dans la prise en charge d’une arthrite septique et d’une ostéomyélite chez un chien.

Un chien berger Malinois de trois ans a été référé pour arthrite septique chronique du tarse droit après une morsure par morsure. Un examen tomodensitométrique a été effectué afin d’obtenir des images exhaustives des lésions et de déterminer l’origine de l’arthrite. Les différentes coupes sérées ont mis en évidence des lésions d’ostéomyélite dont une géode dans la malléole fibulaire. Un curetage chirurgical des lésions a alors remplacé une prise en charge médicale et de multiples séquestres osseux ont pu être retirés. Un nouveau traitement antibiotique par des céphalosporines a été instauré. La récupération fonctionnelle a été considérée comme satisfaisante malgré des signes sévères d’ostéarthrose dont la gestion a été médicalement effectuée. Dans la mesure où une ostéomyélite ne requiert pas le même traitement qu’une arthrite septique, un examen diagnostic performant peut changer radicalement la prise en charge d’un patient souffrant d’arthrite septique, surtout dans le cas d’une évolution chronique.

Mots-clés : Arthrite septique, ostéomyélite, géode, articulation du tarse, tomodensitométrie, chien.

Introduction

Septic arthritis is a bacterial infection which is potentially disastrous for joint integrity and develops after exogenous extension from surrounding soft tissue infection (such as from a foreign object or an open wound) or haematogenous spread contamination. Staphylococcus intermedius is known to be the most common bacteria in both septic arthritis and osteomyelitis [8]. Diagnosis can be difficult if based solely on historical observations, clinical findings and/or radiographic data. Nevertheless, the confirmation of a septic arthritis or an osteomyelitis changes the treatment plan and prognosis. Early and accurate diagnosis is therefore critical. Surgical treatment is often necessary after a wound bite injury to stop bacterial infection [8]. On the other hand, surgery’s usefulness was recently questioned in a case of septic arthritis [5], and invasiveness of a surgical procedure must be considered. This case report describes how computed tomography (CT) scans rather than conventional radiography led to modifications to medical care, involving surgical and medical treatments, to manage an original case of septic arthritis of the tarsus.

Case report

A three-year-old Shepherd Malinois bitch, meant to become a working dog, was referred for treatment of chronic septic arthritis of the right hook. The condition had been evolving for 3 months and began after the patient suffered from a dog bite. Multiple antibiotherapy (amoxicillin/clavulanate, cefalexin, clindamycin), non steroidal anti-inflammatory drugs (NSAIDs) followed by steroidal anti-inflammatory drugs and local treatments (polyvidone iodine), were all initiated without success. Successive radiographic investigations and cytology confirmed the persistence of arthritis and bacteria in the area. Despite a good general trim during the first examination in clinics of the National Veterinary School of Lyon (France), the dog did not bear weight on the right hind limb. Orthopaedic examination revealed a swollen, painful andankylosed hook. The ipsilateral popliteal lymph node was hypertrophic.

Radiographs from the referring veterinarian showed a fracture of the tip of the lateral malleolus of the right hook (figure 1), but abnormal feature explaining infection persistence was absent. Therefore a CT was performed. CT...
sections revealed a severe subchondral osteolysis on the lateral malleolus with geodes and on the medial part of the tibial coxclea (osteomyelitis). Periarticular osteoproliferation confirmed the chronic septic phenomenon in this joint. Based on the CT images, osseous fragments could be seen on the suspected fractured distal part of the lateral malleolus (figures 2A and 2B). Some synovial fluid was sampled via a fine needle aspiration for bacteriological analysis.

Based on the CT images, osseous fragments could be seen on the suspected fractured distal part of the lateral malleolus (figures 2A and 2B). Some synovial fluid was sampled via a fine needle aspiration for bacteriological analysis. A cranio-lateral approach of the right tarsus allowed preservation of the lateral collateral ligament of the tarsus. The surgical exploration revealed a generalized chondromalacia with severe subchondral bone osteolysis of the tibia, the lateral rim of the talus and the lateral malleolus. The latter was freed from the tibia in a cranial approach and was rotated externally. Curettage of the geode was accomplished on the medial part of the lateral malleolus with a curette (figure 3). A tiny fistula extending from the distal fracture of the fibula to the geode was opened with a burr to permit distal drainage (figure 4). Multiple osseous sequestra were found between the tibial epiphyseal and the medio-distal part of the lateral malleolus and were sent for histopathology. Biopsy of the synovium was performed for bacteriological analysis. The joint was flushed with warm saline (1L). Then, the geode was packed with autologous cancellous bone graft from the tibial tuberosity to promote bone healing. The joint was closed routinely and postoperative radiographs showed no evidence of fracture in the lateral malleolus.

**Figure 1:** A. Radiography from the referring veterinarian, cranio-caudal view. Note the fracture of the tip of the lateral malleolus of the right hook (white arrow). B. One month postoperative radiography, cranio-caudal view. Note the absence of osteolysis and further osteoproliferation.

**Figure 2:** A. CT (computed tomography) frontal plan. A geode is seen within the lateral malleolus (1). A discrete subchondral osteolysis (2) is suspected on the medial rim of the tibial coxclea. There is periarticular osteoproliferation (3). A bony fragment is seen at the tip of the lateral malleolus (4). B. CT (computed tomography) transverse plan. The geode of the lateral malleolus is open and communicates with the joint (1).

**Figure 3:** Surgical access to the medial part of the lateral malleolus where the geode was found. The curette is placed between the medial side of the lateral malleolus and the lateral part of the tibia.

**Figure 4:** Three dimensional reconstruction with the software Osirix® of the right hook only with the fibula (F) and the talus (T) before surgery (A. and C.) and modelisation of the post-surgical images (B. and D.). On these views, the osseous geode into the lateral malleolus (1), the bony fragment at the tip of the lateral malleolus (2) and periarticular osteoproliferation on the lateral part of the talus (3) can be seen. The geode is opened distally to make drainage possible (4).
A modified Robert-Jones bandage with a splint was dressed postoperatively on the right pelvic limb. In addition, courses of per os antibiotic therapy with 20 mg/kg cefalexin (Rilexine, Virbac) twice daily as well as anti-inflammatory treatment with meloxicam (0.1 mg/kg, per os) (Metacam, Boehringer) once daily were initiated while awaiting culture results. Strict rest for 6 to 8 weeks with short leash walks was recommended.

Twelve days after surgery at stitches removal control, the dog was still limping but was bearing weight on the right pelvic limb. The Robert-Jones bandage was replaced with a cast to be worn for 1 month. Bandage renewal was done weekly by the referring veterinarian during this period with no associated problems reported. Histopathology results showed no evidence of bone tumour. Bacterial analysis was negative. Therefore, medical treatment remained unchanged. At the one month recheck, NSAIDs treatment had concluded and lameness was considerably reduced. Palpation proved a significant decrease in swelling of the hook. In addition, no clinical instability of the hook was noticed at this time. On radiography, osteolysis was still absent with no further osteoproliferation evolution (figure 1B). The cast was replaced with a Robert-Jones bandage with a splint for ten days. Antibiotherapy was continued for two weeks more.

At two month follow-up appointment, the dog was still slightly lame on its right pelvic limb during walk and moderately during trot. Right hook swelling was absent and flexion was a little bit uncomfortable with a decreased range of motion (of 10° in extension and 15° in flexion). On radiographs, no modification was seen. The resolution of the septic arthritis and the osteomyelitis seemed to be favourable. Clinic symptoms still present at this stage could be related to osteoarthrosis. Medical treatment was then modified to manage osteoarthrosis with restriction of excessive sportive activities, hydrotherapy and NSAIDs as needed. At four month follow-up, the dog was able to run and to jump a height of 1.5 metres without any problem.

Discussion

The diagnosis of a septic arthritis is usually obtained through clinical observation of symptoms, bacterial culture with antibiogram, radiographs and treatment response. The chronic lameness that we have observed is often seen in case of septic arthritis [8]. Bacteria usually isolated in septic arthritis are Staphylococcus, Streptococcus, and Pasteurella species, whose common contamination origins are skin, oral cavity or environment [1, 8, 13]. Synovial fluid incubation in breeding grounds enriched with blood for 24 hours increases result’s reliability [9], and synovium biopsy is known to improve culture sensibility [1]. Surgical exploration allowed retrieval of all samples needed in a single procedure and led to a better evaluation of the lesions. As a result, osseous sequestra were found and curetted appropriately. Samples of synovial fluid and synovium biopsy were sent to optimize bacterial detection as specified previously. Although bacterial results were negative, joint infection could not, at this point, be ruled out completely. Previous long term antibiotic therapy must be considered for interpreting the results in the present case. Therefore, cefalexin was selected for antibiotic therapy as most bacteria isolated from septic arthritis are susceptible to cephalosporins [8].

Radiographic interpretation could be challenging as its sensitivity and specificity are only 62% and 57% respectively, in case of septic arthritis [3]. However, in some chronic septic arthritis of the type seen here, it is possible to observe destruction of the joint, a subchondral sclerosis and significant fibrosis which can lead to joint ankylosis [11]. Persistence of important clinical signs associated with weak radiographic signs led us to perform a CT. This examination permitted a more accurate localization and description of the lesions than radiography because the CT scan avoids superimposition of anatomical structures. Nevertheless, radiographic examinations were performed for the postoperative follow-up, as generalized anaesthesia requirements and the costs of the CT were issues for the dog’s owners. Osteomyelitis is usually associated with bony necrosis, modifications of the joint and osseous sequestra in CT [14], as observed in this dog.

Histopathology is known in veterinary field to be highly specific but poorly sensitive in osteomyelitis [4]. In the present case, osteomyelitis was not brought to light, but a bone tumour was able to be ruled out. Bone is less resistant to bacterial infection due to soft tissue devitalisation, bony necrosis, osseous sequestra, foreign matter and instability of bony fragments, chronic open wound or decrease in the immune system efficiency attributable to corticoids [4, 7]. Most of these conditions were met in this case. Nevertheless, it is still impossible to know retrospectively whether osteomyelitis or arthritis was present first, and direct contamination and infection by extension from surrounding soft tissue makes the likelihood of one condition or the other occurring first roughly equal [8]. In this case, the dog bite likely induced a fracture of the distal part of the lateral malleolus. Our hypothesis is that the local soft tissue infection extended to the fractured bone and finally created a geode and some other bony lesions more proximally. Osseous sequestra could explain the recurrence of both arthritis and osteomyelitis in this dog. Association of osteomyelitis and arthritis is well documented, but their most common order of appearance is not well described in the literature.

Despite the case history of trauma and the highly suspicious septic phenomenon, we must be also forewarned that bone tumours could mask osteomyelitis and vice versa in clinical features as well as in radiographic appearance [2, 12]. In human medicine, the gold standard to make the differential diagnostic is the magnetic resonance imaging (MRI) coupled to the determination of plasma C-reactive protein concentration. Abscess cavities are lined by a Penumbra sign in MRI, and concentrations of the C-reactive protein should be elevated in the case of osteomyelitis [12]. These
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Examinations were not performed in the present case. CT results, surgical exploration and histopathology, combined with osteomyelitis diagnosis concomitant to the arthritis, had already been diagnosed by the referring veterinarian.

The actual need for surgery for isolated septic arthritis is discussed in literature [5]. In the case of osteomyelitis, an aggressive surgical debridement of bony resorption and sclerosis is advised to free the medullar cavity and to increase the vascular supply [10]. Associated antibiotic therapy is also necessary [6] and was continued in this case.

As a conclusion, diagnosing septic arthritis can be challenging, and its resolution can take a long time. The CT allowed here to diagnose an osteomyelitis impossible to detect with radiography and thereby permitted to modify the classic medical plan for treatment. It is unlikely that medical treatment alone would have resulted in a pain-free gait like the surgery we ultimately performed did. Complete debridement of the tarsus lesions permitted a satisfactory aetiological treatment and a favourable clinical outcome free from recurrence.

References