



# Primary infectious costochondritis due to *Prevotella nigrescens* in an immunocompetent patient: clinical and imaging findings

Françoise Derouane<sup>1</sup> · Michel Lambert<sup>1</sup> · Julien De Greef<sup>1</sup> · Jacques Malghem<sup>2</sup> · Frédéric E. Lecouvet<sup>2</sup> 

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## Abstract

Infection of costal cartilage is a rare observation. We report the case of a 43-year-old male patient without relevant history who presented with a progressive painful swelling of the left chest wall since 4 months. Computed tomography (CT) and magnetic resonance imaging (MRI) demonstrated an abscess within the left ninth costal cartilage with surrounding reactive changes. A CT-guided biopsy was performed and the culture of the sample revealed the presence of *Prevotella nigrescens*. Musculoskeletal infections by *Prevotella* are rarely described in the literature, *Prevotella oralis* and *Prevotella bivia* being the most frequently observed pathogens. These infections usually originate from a hematogenous spread after thoracic surgery or dental procedure. In our patient, conservative treatment was chosen. A clinical improvement was noted after 1-month antibiotherapy, confirmed by short-term and 6-month imaging follow-up showing the complete disappearance of all previously observed abnormalities.

**Keywords** Infection · Skeleton · Chest · Cartilage · CT · MRI · *Prevotella* · Costochondritis

## Introduction

Infectious costochondritis (infection of a costal cartilage) is an uncommon condition occurring either spontaneously as a result of the hematogenous spread of bacterial (*Staphylococcus aureus*, *Salmonella*, *Actinomyces* spp.), fungal (*Candida albicans*) or mycobacterial pathogens originating from distant sites, or secondary to open trauma or thoracic wall surgery [1–5]. It may also result from the contiguous spread of infection from the adjacent pleura or lungs [3]. The most typical imaging findings are defects or erosions of the costal cartilage, and adjacent soft tissue swelling or collections that can be detected by CT and MRI examinations.

We report the observation of a primary infectious costochondritis caused by *Prevotella nigrescens* in an

immunocompetent man. The lesion was treated conservatively with antibiotics during 6 weeks, without surgical procedure, allowing clinical improvement and disappearance of all signs of disease activity on follow-up imaging studies.

## Case report

A 43-year-old male patient was admitted to the internal medicine department in March 2018 because of a painful swelling of the anterior left chest wall (Fig. 1). This swelling had progressively appeared over the previous 4 months and had been worsening for 1 month. The patient complained of intermittent low-grade fever, fatigue, and mentioned an unintended weight loss. There was no relevant medical or surgical history, particularly local trauma or dental procedure. He did not smoke, drink alcohol, or use intravenous drugs. He had not traveled during the previous 6 months. He did not take any medications.

On physical examination, there was a tender mass affecting the left thoraco-abdominal wall with a diameter of approximately 8 cm overlying the anterior segments of the lower left ribs. The overlying skin looked indurated, erythematous, and warm (Fig. 1). No lymph nodes were palpable. The cardiovascular and ear-nose-throat examinations were normal.

✉ Frédéric E. Lecouvet  
frederic.lecouvet@uclouvain.be

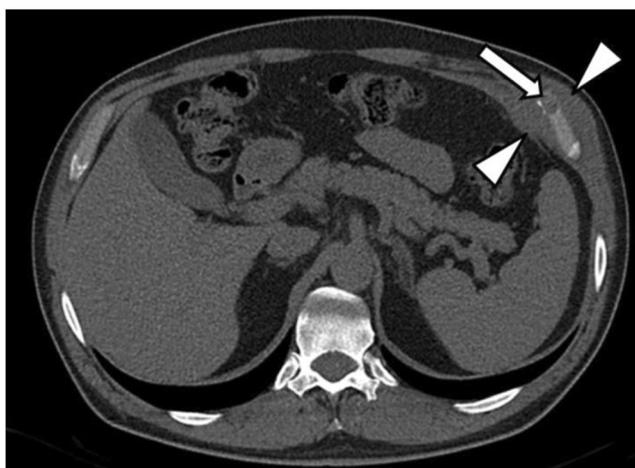
<sup>1</sup> Department of Internal Medicine, Cliniques Universitaires Saint-Luc, Institut de Recherche Expérimentale et Clinique (IREC), Université Catholique de Louvain (UCLouvain), Avenue Hippocrate 10/2942, 1200 Brussels, Belgium

<sup>2</sup> Department of Radiology and Medical Imaging, Cliniques Universitaires Saint-Luc, Institut de Recherche Expérimentale et Clinique (IREC), Université Catholique de Louvain (UCLouvain), Avenue Hippocrate 10/2942, 1200 Brussels, Belgium



**Fig. 1** Photography of the thoraco-abdominal wall shows ill-delimited swelling of the left thoraco-abdominal wall (arrowheads)

Laboratory findings revealed mildly elevated serum C-reactive protein (66 mg/l; normal range < 5 mg/l) and normal leucocyte count, without any other significant abnormalities. Blood cultures remained negative. The chest X-ray was unremarkable. Chest-CT demonstrated a swelling and infiltration of superficial subcutaneous tissues and intercostal muscles, as well as a rounded defect within the ninth left costal cartilage (Fig. 2). An MRI study demonstrated inflammatory infiltration of the left intercostal and abdominal wall muscles, and the fluid content of the costal cartilage defect, with extension on its deeper aspect, suggestive of an abscess (Fig. 3). Echo-planar single-shot fast spin-echo (SS-FSE) T2-weighted sequences acquired in apnea were most useful to detect soft tissue inflammation and the central abscess within the costal cartilage. Post-contrast gradient echo 3D Dixon T1-weighted images confirmed the inflammatory changes and showed a central avascular area within the abscess. A CT-guided biopsy and aspiration of the lesion was performed (Fig. 4).



**Fig. 2** CT examination shows evident thickening of the muscles of the left lateral abdominal wall (arrowheads). A rounded defect is present within the ninth left costal cartilage, with subtle peripheral calcifications (arrow)

The culture of the sample was positive for *Prevotella nigrescens*, sensitive to amoxicilline/clavulanate, clindamycin, metronidazole, and meropenem.

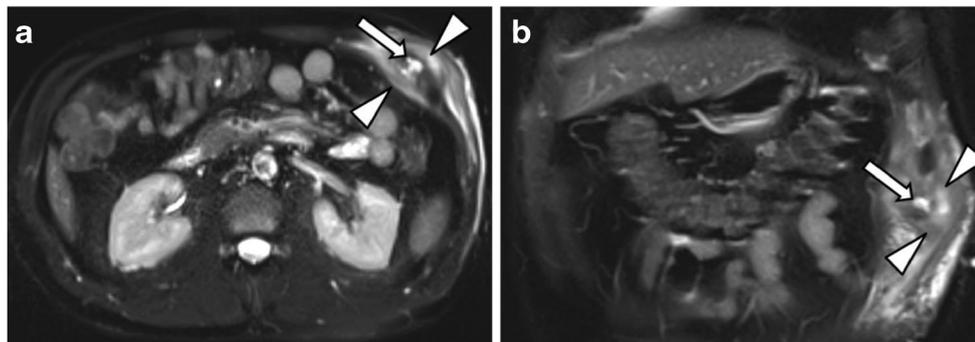
In the absence of previous history of surgery or periodontal procedure, the possibility of a hematogenous spread from a distant site was investigated. Transthoracic and transesophageal echocardiography ruled out endocarditis. Fluorodeoxyglucose positron emission tomography (18F-FDG) did not reveal any primary focus and no concurrent infectious focus. Hematogenous spread from an oral origin remains the first hypothesis in this case.

Antibiotherapy with amoxicilline/clavulanate was started, leading to a progressive improvement of the pain and a decrease of the clinical swelling. After 7 days, the patient developed a cholestatic hepatitis and treatment was switched to clindamycin for a total duration of 6 weeks.

A CT and MRI performed at 1-month follow-up showed a decrease of the swelling of the soft tissues around the cartilage. A 6-month CT and MRI follow-up showed complete disappearance of the mass effect, signs of inflammation within the soft tissues, and fluid content within the costal cartilage defect (Figs. 5 and 6).

## Discussion

*Prevotella* species are anaerobic Gram-negative rods. The *Prevotella* genus was defined to individualize a homogenous group of bacteria mainly present in the oral flora, previously identified as members of the *Bacteroides* genus [6, 7]. It comprises more than 200 species, which can also colonize the urologic, genital, and digestive tracts. Like other anaerobic Gram-negative species, *Prevotella* infections originate from endogenous spread [8]. *Prevotella* infections have been described in various anatomic locations, but the involvement of the musculoskeletal system is exceptional [9, 10]. Cases of osteomyelitis due to *Prevotella bivia* and *Prevotella oralis* have been reported [11–15]. *Prevotella nigrescens*, a black-pigmented species, which has been distinguished from *Prevotella intermedia*, is a known pathogen, but had not been described in bone or joint infections, except in some cases of chronic osteomyelitis of the jaw [7, 9, 16, 17]. In the study of Junior et al., three out of 22 cases of osteomyelitis of the jaw were caused by *Prevotella nigrescens* [17]. *Prevotella nigrescens* was responsible for 12 out of 78 cases of "head and neck" infections in the review of Matto et al. including osteomyelitis of the mandible, neck abscesses, neck ulcer, peritonsillar abscess and sinusitis, but the authors did not specify the involved areas in cases of *Prevotella nigrescens* infection [9]. Some situations are well-known predisposing factors to the development of bone and joint infections with anaerobic germs such as surgery, dental procedures, trauma, animal or



**Fig. 3** Transverse (a) and coronal (b) fat-saturated echo-planar single-shot fast spin-echo (SS-FSE) T2-weighted MR images of the thoraco-abdominal wall obtained during breath-hold show high signal intensity suggestive for edema and swelling of the left intercostal muscles and

surrounding soft tissues (arrowheads). The ninth rib cartilage shows an avascular central lesion with high signal intensity suggestive of an abscess (arrow)

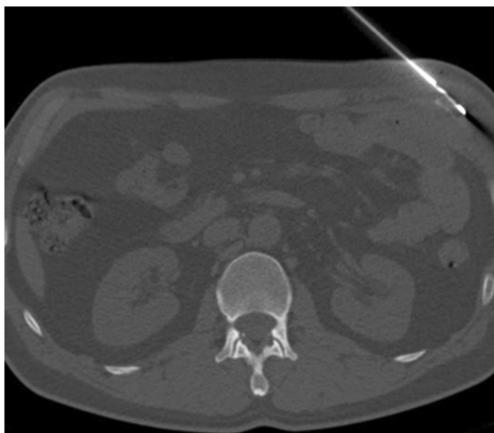
human bites, use of intravenous drugs or immunosuppression [10, 18, 19].

Some confusion does exist in the literature between costochondral infection and rib osteomyelitis, with, for example, some authors talking about costal osteomyelitis but clearly showing isolated infection of the costal cartilage on the corresponding images [20]. Some authors have also suggested that infectious costochondritis is a particular entity that may be caused by the same germs involved in costal osteomyelitis, like *Staphylococcus aureus* and *Mycobacterium tuberculosis*, or more exceptionally by *Streptococci*, Enterobacteriaceae, and *Actinomyces* [4, 5]. It is interesting to note that in bacterial osteomyelitis of the rib, only 30% of the infections are caused by hematogenous spread and 70% result from contiguous involvement. In mycobacterial infections, half of them derive from hematogenous dissemination, and the other half derive from a contiguous contamination [4]. Infectious costochondritis seems to be a much more exceptional entity, being either secondary (post-traumatic or after thoracic surgery) or primary. Intravenous drug use has been classically associated to *Candida albicans* costochondritis as described

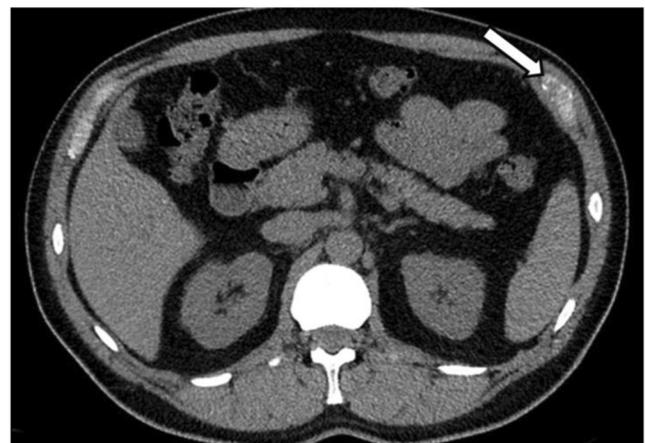
in the largest published series in brown heroin addicts [1, 21, 22]. Primary costochondritis without identification of the primary site of infection is less commonly reported, being observed with a variety of bacteria, for example with *Escherichia coli* as recently described [5, 23]. Our case suggests *Prevotella nigrescens* as a new pathogen responsible for infectious costochondritis.

As in our patient, the diagnosis of costochondritis should be evoked when facing symptoms like pain, erythematous and warm swelling on the chest wall and fever, even with a sub-acute presentation [2]. The diagnosis of costochondritis relies on a careful work-up. Plain radiographs are of limited interest, showing only chest wall swelling, unless contiguous infection of the adjacent rib is present.

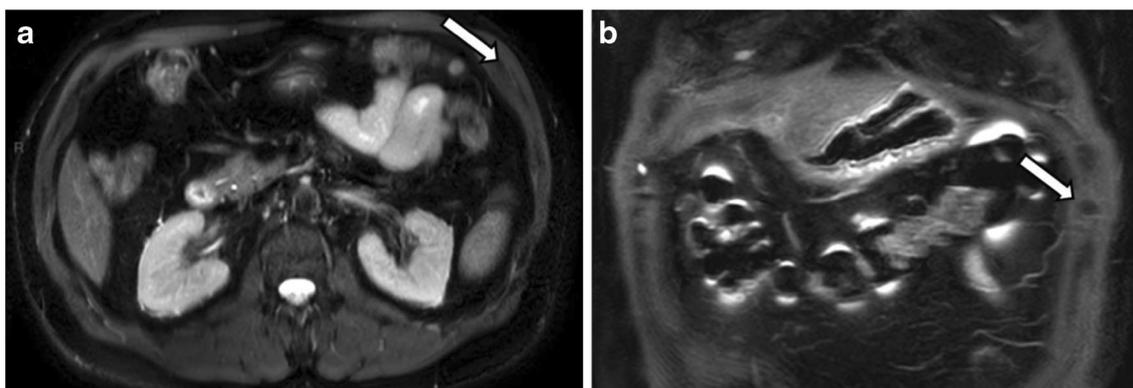
The diagnosis may be suggested by an ultrasound study, but should be confirmed by chest-CT or preferably by MRI, which is the diagnostic method of choice because of its sensitivity to soft tissue inflammation and ability to demonstrate the presence of an abscess [24]. Echo-planar single-shot fast spin-echo-type sequences (SS-FSE) were most useful, as these



**Fig. 4** CT-guided biopsy of the ninth rib cartilage: large needle is directed under CT guidance to the central avascular focus observed in the ninth rib to perform biopsy and aspiration



**Fig. 5** Six-month follow-up CT shows disappearance of the edema and infiltration and thickening of the left intercostal wall, and a residual lucency with healing changes (presence of subtle calcifications) within the 9th costal cartilage (arrow). (To compare to Fig. 2)



**Fig. 6** Six-month follow-up MRI images show complete disappearance of the soft tissues abnormalities, and disappearance of the central high-signal intensity area involving the ninth rib cartilage (*arrow*). (To compare to Fig. 3)

could be acquired in apnea thanks to their rapidity of acquisition. These heavily T2-weighted images allowed for the detection of the costal cartilage lesion and surrounding soft tissue inflammatory changes. Bone scintigraphy can be performed if osteomyelitis is suspected but lacks specificity to distinguish an infectious process from a neoplastic disease [25, 26]. Tissue sampling is required to guide antimicrobial therapy, if blood cultures remain negative. It can be performed by open biopsy or by guided fine needle aspiration.

There are no guidelines for the treatment of infectious costochondritis. Surgery is often necessary followed by a prolonged antibiotic course, especially if an abscess is present [1, 2, 4]. The present case was successfully treated by a 6-week antibiotherapy.

In conclusion, we report the original observation of a primary infectious costochondritis caused by *Prevotella nigrescens*. MRI was the key imaging modality for both the diagnosis and evaluation of the treatment response. This abscess was successfully treated with long-term antibiotherapy and did not require surgical management.

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### Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflict of interest.

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