

Table 1
Treatments received based on age group.

Treatment	Under 2 years old n = 149; n (%)	Over 2 years old n = 43; n (%)	p-value
Bronchodilators	125 (83.9)	27 (62.8)	0.003
Corticosteroids	84 (56.8)	18 (41.9)	0.045
Oxygen therapy	95 (63.8)	20 (46.5)	0.042
Antibiotics	70 (47.3)	34 (79.1)	<0.001

(D3 Duet® DFA RSV/Respiratory Virus Screening Kit, Diagnostic Hybrids).

Patients under the age of 2 accounted for 77.6% of the cases. Of the patients in our series, 10.4% presented an underlying condition (neurological, heart, oncological, prematurity), with no statistically significant differences between the two groups (<2 years 7%; >2 years 11.6%; $p=0.542$). Eight point nine percent (8.9%) of the patients required admission to the intensive care unit, again with no differences between the two groups (<2 years 10.1%; >2 years 4.7%; $p=0.370$). One patient died with a congenital cytomegalovirus infection and respiratory exacerbation in the context of the infection.

The under-2 patients more frequently presented cough, rhinitis, apnoea and difficulty breathing, with statistically significant differences found ($p<0.001$); meanwhile those over 2 more frequently presented seizures and fever ($p=0.005$). There were 20 patients in whom other germs were simultaneously isolated in the nasopharyngeal aspirate. The isolated germs were *H. influenzae* ($n=10$), *M. catarrhalis* ($n=4$), *S. aureus* ($n=2$), *P. aeruginosa* ($n=2$), *Candida* ($n=1$) and *Parainfluenza 3* ($n=1$). No statistically significant differences were found between the two groups.

Regarding supplementary tests, more laboratory tests were performed in the over 2 group (82.1% vs. 58.2%; $p=0.006$), as well as more chest X-rays (81.4% vs. 59.1%; $p=0.007$). There were no differences in the infection marker levels (C-reactive protein and procalcitonin) or white blood cells. Differences were found in the presence of parenchymal consolidations on X-rays, which were more common in the older group (65.7% vs. 40.9%; $p=0.013$).

The differences in treatment are shown in Table 1.

This study provides data based on a broad patient sample that exclusively corresponds to children under 14. With the hypothesis that there is greater obstructive symptomatology and severity from hMPV infection in infants,^{7,8} it was decided to divide the sample into patients over and under 2 years of age. It was found that the latter had greater lower tract involvement and, therefore, a higher need for corticosteroid bronchodilator treatment and oxygen therapy.⁹

Contrary to what was expected, it was observed that more supplementary tests were used in the older patients, which may be explained by more underlying conditions and fever symptoms.⁹ Moreover, by presenting more parenchymal condensations, we

assume a higher use of antibiotic therapy, despite there being no differences in the infection parameters, supporting the viral origin.

Performing direct immunofluorescence enables a definitive diagnosis to be reached in under 24 h, however, there is no rapid diagnostic test as used in other infections, such as those caused by the flu virus or group A streptococcus, that enable decisions to be made in the emergency department or at the time of admission to the hospital. If such tests existed, they could decrease the use of diagnostic techniques and unnecessary treatments, as we have seen happen.

Admission to the intensive care unit was required for a significant number of patients in both groups, therefore hMPV should be considered in the aetiological diagnosis of respiratory infections in patients requiring admission to the hospital.

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Alicia Montaner Ramón*, Cristina Martínez Faci,
José Miguel Martínez de Zabarte Fernández, Ignacio Ros Arnal

Servicio de Pediatría, Hospital Infantil Miguel Servet, Zaragoza, Spain

* Corresponding author.

E-mail address: alicia87mr@hotmail.com (A. Montaner Ramón).

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Primary sternal osteomyelitis caused by *Salmonella enteritidis*



Osteomielitis esternal primaria causada por *Salmonella enteritidis*

Salmonella osteomyelitis is a rare infection manifested mostly in patients with sickle cell disease. Of all locations, sternal osteomyelitis comprises only 0.3% of the cases,¹ the majority being a complication secondary to sternotomy. Primary sternal osteomyelitis is a rare syndrome, with *Staphylococcus aureus* being

the most frequent cause.² We report the case of a primary sternal osteomyelitis caused by *Salmonella*.

A 45 year-old male presented with a long-standing history of an osteo-cutaneous fistula over the sternal area. His previous medical history included poorly controlled Diabetes Mellitus and hypertriglyceridemia. His present illness started 16 months before his visit to our hospital, when he developed a left pectoral muscle tear after lifting a heavy object. He initially received conservative care with little improvement, later presenting with fever, pain and edema over retrosternal area. An MRI demonstrated an isolated left major-pectoralis abscess near the left sternum border at the level

of third intercostal space, with no chondrocostal involvement. A surgical drainage was performed, obtaining purulent material that grew positive for *Salmonella enteritidis* with intermediate sensitivity for quinolones (MIC = 1 ng/mL). Oral ciprofloxacin was prescribed for three months, with clinical improvement. Eight months later, a lump formed over the sternal area, fistulizing days later. Culture grew positive for *S. enteritidis* and antibiotic was restarted. Patient remained with continuous discharge through sternal fistula.

After several months of unsatisfactory evolution, he attended to our hospital for further investigation. Physical examination was remarkable for an osteo-cutaneous fistula over the sternal area. Culture of the sternal discharge grew positive for *S. enteritidis*. Full laboratory analysis showed a markedly elnacyevated glycosylated hemoglobin (HbA1C = 13.02%). We performed a mediastinum-focused Tc 99m bone gammagram that showed early and late radiotracer uptake at left edge of sternal handle. A low dose PET/CT scan confirmed the results and also showed a component of adjacent soft tissue activity in the posterior aspect of costal cartilage (Fig. 1). A full body contrast enhanced CT scan showed no other areas of inflammation or infection. An abdominal ultrasound showed no involvement of the biliary tract. A transthoracic echocardiogram ruled out infective endocarditis. Blood and stool cultures were negative. Open surgical drainage was performed via partial sternotomy, showing fibrous tissue, bad quality bone and the presence of a granuloma fistulizing to fourth and fifth intercostals space. Granuloma resection and curettage were performed and a negative pressure wound therapy system was used during 7 days. Antibiotic therapy with intravenous ceftriaxone 1 g b.i.d. was administered for 14 days; Trimethoprim 800 mg/sulfamethoxazole 160 mg q.d. was then continued for six weeks. C-reactive protein, erythrocyte sedimentation rate and control cultures were negative after cessation of antibiotic therapy, and the patient remained symptom free during his follow up.

Salmonella is estimated to cause 0.45% of osteomyelitis, and is most commonly associated with sickle cell disease.³ The three most common strains of *Salmonella* causing osteomyelitis are *Salmonella typhimurium*, *Salmonella typhi*, and *S. enteritidis*, with *S. typhi* being the only strain to be transmitted from human to human. Typhoid osteomyelitis has a predilection for patients with comorbidities such as diabetes, systemic lupus erythematosus, lymphoma, liver disease, previous surgery and those at extremes of age. The incidence of typhoid osteomyelitis in otherwise healthy individuals is much lower. Given the extremely low incidence of the pathogen and the very unusual site of infection, it is unsurprising that only two comparable case reports of *S. osteomyelitis* in the sternum were found. The first case reported a 71 year-old man with primary sternal osteomyelitis caused by *Salmonella hirschfeldii*,⁴ treated successfully with surgical debridement and 6 weeks of high dose ampicillin. The second case reported the case of 73-year-old man with Crohn's disease and a history of a sternotomy 15 years before, who developed *Salmonella* sternoclavicular osteomyelitis subsequent to a *S. enteritidis* sepsis.⁵

In regard to our case, we found no clinical risk factors for osteomyelitis other than diabetes mellitus. The history of a left pectoral muscle tear may contribute to tissue friability and local factors predisposing to infection. The isolated *Salmonella* strain showed intermediate resistance to quinolones: this could explain the persistence of the infection after the first course of ciprofloxacin. The patient denied recent history of gastroenteritis, abdominal pain, thoracic trauma; he also denied high risk sexual practices. Nasal exudate, stool culture and a liver and bladder ultrasound demonstrated no evidence of chronic colonization. Therefore, we diagnosed the case of a true primary osteomyelitis in the absence of secondary foci. To our knowledge, this is the third reported case of a primary osteomyelitis of the sternum. A high clinical suspicion is needed to diagnose the disease.

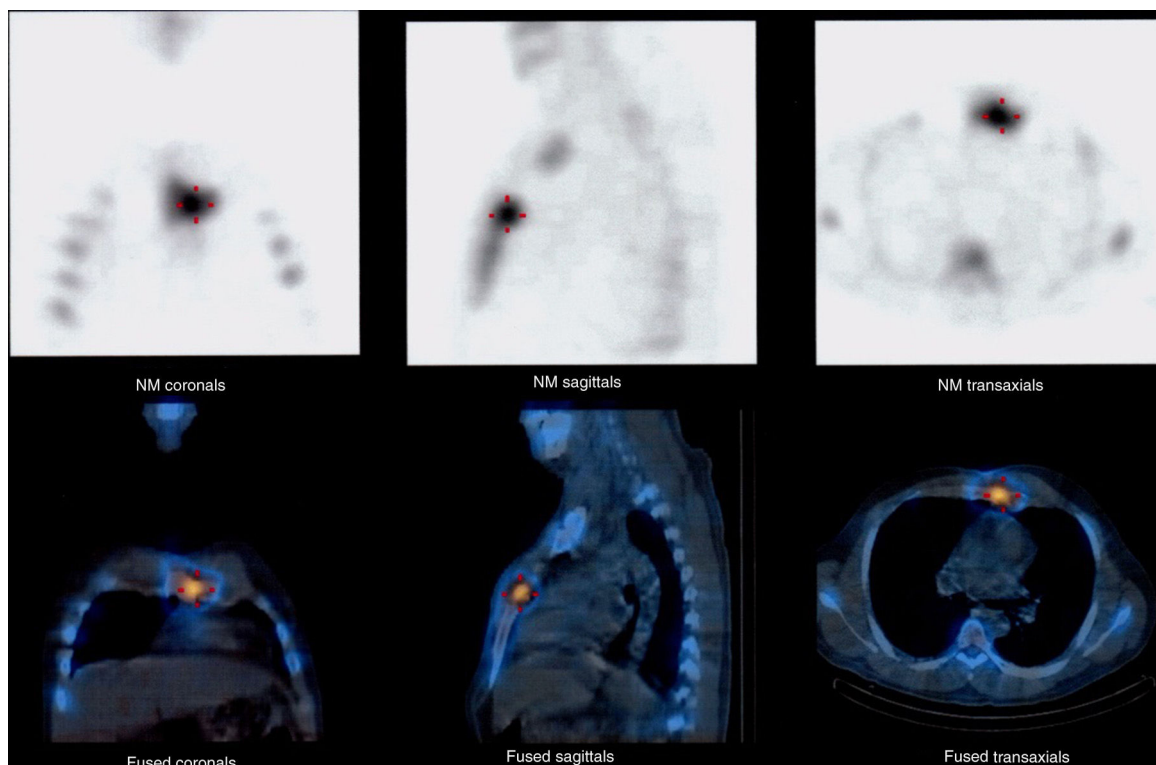


Fig. 1. Thoracic-focused Tc-99 bone gammagram and low dose PET/CT showing tracer uptake compatible with sternal osteomyelitis.

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Diego Araiza-Garaygordobil^{a,*}, Gabriel Israel Soto-Nieto^b,
Luis Antonio Aguilar-Rojas^a, Jorge Catrip^c

^a Departamento de enseñanza, Instituto Nacional de Cardiología Ignacio Chávez, Ciudad de México, Mexico

^b Departamento de Infectología, Instituto Nacional de Cardiología Ignacio Chávez, Ciudad de México, Mexico

^c Departamento de Cirugía, Instituto Nacional de Cardiología Ignacio Chávez, Ciudad de México, Mexico

* Corresponding author.

E-mail address: dargaray@gmail.com (D. Araiza-Garaygordobil).

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Bacteremia due to *Cellulosimicrobium cellulans* associated with central catheter for hemodialysis



Bacteriemia asociada a catéter central para hemodiálisis debida a *Cellulosimicrobium cellulans*

We report a case of an 80 year-old female patient with history of hypertension and chronic renal failure secondary to nephrosclerosis on hemodialysis through permanent central venous catheter.

In June 2013, during a hemodialysis session, the patient presented general discomfort, tremor and discrete acrocyanosis; neither fever nor other abnormalities on physical examination were found.

Catheter blood cultures were obtained, for aerobic and anaerobic microorganisms, and antibiotic treatment was initiated with vancomycin and ceftazidime. After five days of incubation, blood cultures were reported as negative and therefore antibiotic treatment was discontinued.

However, a week later, symptoms reappeared with no apparent origin, so blood cultures were extracted through the central venous catheter (for aerobic and anaerobic microbes). They were incubated into the BACTEC (Becton Dickinson) system and after 18 h of incubation, they resulted positive. Gram staining was performed and branched gram positive bacilli were observed. The recovered bacteria from blood cultures were subcultured in blood agar, chocolate agar and Mac Conkey plates, and incubated at 37 °C in a 5% CO₂ atmosphere. Twenty-four hours later, 2 mm diameter, bright yellow, irregular edges and convex surface colonies were observed. They were identified as *Cellulosimicrobium cellulans* by matrix-assisted laser desorption ionization-time of flight mass spectrometry (MALDI-TOF) (Bruker Daltonics). An API *Coryne* gallery was conducted to compare the results, identifying *C. cellulans* with a reliability of 99.9%. The identification of the genus was confirmed by sequencing the 16S rRNA, showing a 100% similarity with *C. cellulans* and a 99.8% for *C. funkei* (Colección Española de Cultivos Tipo, CECT).

Antimicrobial susceptibility tests were performed using MicroScan microdilution panels, which were interpreted according to CLSI criteria for *Nocardia* and others aerobic Actinomycetes breakpoints. The inoculum suspension was made adjusting the turbidity to 0.5 McFarland standard and incubated at 37 °C for 24 h. The results of antimicrobial susceptibility testing for the following antimicrobial drugs were: susceptible to amoxicillin/clavulanate (MIC ≤ 4/2 mg/L), imipenem (MIC ≤ 2 mg/L), moxifloxacin (MIC = 1 mg/L), cotrimoxazole (MIC ≤ 2/38 mg/L) and linezolid (MIC ≤ 1 mg/L); and

resistant to tobramycin (MIC > 8 mg/L), amikacin (MIC = 16 mg/L), ciprofloxacin (MIC > 2 mg/L). The CMI for vancomycin was ≤ 0.5 mg/L (there are no criteria for interpretation).

A 4-week course of vancomycin, adjusted according to our patient renal function (1 g initially followed by 0.5 g at each dialysis session) was started. During the treatment, the patient presented several episodes of tremor. Control blood cultures were taken from the central venous catheter and from peripheral veins one week after finishing each treatment cycle, persisting positive after two -4 week cycles-. After three positive controls, it was decided to remove the catheter and blood cultures became negative.

Cellulosimicrobium cellulans, formerly known as *Oerskovia xanthineolytica*, belongs to the order Actinomycetales, suborder Micrococineae, family Promicromonosporaceae.¹ It has a worldwide distribution and it is found in the environment mainly in the soil, water, plant residues, cut grass and in decomposed organic matter.² It infects primarily immunocompromised patients but it has also been implicated in foreign body infections in immunocompetent patients with central venous catheters, peritoneal catheters, ventriculo-peritoneal shunts and prostheses. Moreover, it has been related to neonatal infections, bacteremia, peritonitis, meningitis, endocarditis, keratitis, pyonephrosis, soft tissue infection and tenosynovitis.³

They are branched gram-positive bacilli with irregular contours, growing in regular culture media at room temperature but faster at 37 °C, differentiating it from the genera *Corynebacterium* and *Nocardia*. These bacteria are aerobic and facultative anaerobic, non-motile, catalase positive, oxidase negative, reduces nitrate to nitrite, and hydrolyzes gelatin, urea and DNA. They have a fermentative metabolism using sugars such as glucose, ribose, sucrose, lactose and maltose. However, they do not ferment mannitol or sorbitol.⁴ *Cellulosimicrobium cellulans* is phenotypically identified by API-Coryne®, and it can also be identified by 16S rRNA sequencing,⁵ or mass spectrometry.³

The treatment of choice in patients with normal renal function is vancomycin 1 g every 12 h or linezolid 600 mg every 12 h. Carbapenems and associations with rifampicin can also be used for antibiotic therapy.⁶ In our case, dosage had to be adjusted due to our patient renal impairment. Unfortunately, despite receiving a 4-week course treatment, the microorganism was still isolated in cultures. Complete healing was not achieved until catheter removal.

The catheter-related bacteremia case reports published in the literature were treated with antibiotics associations such as vancomycin and rifampicin, and complete cure was achieved.⁷ However, the optimal treatment is the withdrawal of the foreign