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Haematogenous vertebral osteomyelitis. Experience of a primary care hospital

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ABSTRACT

Objectives: To describe a series of patients with haematogenous vertebral osteomyelitis (HVO) in a primary care hospital. The results were compared with other Spanish and foreign series.
Patients and methods: The files of patients with HVO diagnosed in the Viladecans hospital from 1993 through 2008, were retrospectively reviewed. Only patients with microbiological demonstration of infection were included. Patients with HVO after surgical procedures were excluded.
Results: Twenty six patients had inclusion criteria, 9 females and 17 males, with a mean age of 61 years (range 36-83). The most patients had any predisposing factor, generally *diabetes mellitus*. Pyogenic microorganisms were the most frequent aetiological agents (77%). Back pain was by far the most common presenting symptom (88.4%), followed by peripheral septic arthritis in two patients (7.6%), and acute abdominal pain in one. Fever was found in 22 cases (84.6%). None of our patients died, but the sequelae were non rare.
Conclusion: We did not find difference between our series and others. It is noteworthy that the streptococcal species represents the most frequently isolated organism, followed by *Staphylococcus aureus*, more common in other series. Remarkably, none of our patients died. HVO is an infrequent disease. However, evidence suggests that the incidence is increasing. Early diagnosis can avoid potential serious sequelae.

Osteomielitis vertebral hematógena. Experiencia en un hospital comarcal

Palabras clave:
Osteomielitis vertebral
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RESUMEN

Objetivo: Describir las características generales de una serie de enfermos con osteomielitis vertebral hematógena (OVH) desde la perspectiva de un hospital comarcal y comparar nuestros resultados con los de otras series nacionales y extranjeras.
Pacientes y métodos: Análisis retrospectivo de las historias clínicas de los pacientes con OVH diagnosticados en el Hospital de Viladecans en el período comprendido entre 1993 y 2008. Se han incluido sólo los pacientes con demostración microbiológica de infección y adquiridos por vía hemática.
Resultados: Veintiséis pacientes cumplían los criterios de inclusión, nueve mujeres y diecisiete varones, con una edad media de 61 años (límites 36-83). La mayoría de éstos tenían algún factor predisponente de base, predominando la diabetes mellitus, y estaban causados por gérmenes piógenos (77%). La presentación clínica habitual fue el dolor vertebral de características inflamatorias, observado en 23 enfermos (88,4%). La artritis séptica de articulaciones periféricas fue la forma de inicio en dos pacientes (7,6%) y el abdomen agudo en un paciente. La fiebre se detectó en 22 casos (84,6%). La mortalidad fue nula, aunque las complicaciones y secuelas resultaron frecuentes y a menudo graves.
Conclusiones: Las características clínicas generales de nuestra serie no difieren esencialmente de otras, tanto nacionales como extranjeras, aunque como hecho diferencial hemos detectado una incidencia predominante de etiología estreptocócica sobre la estafilocócica habitual. Es reseñable la nula mortalidad observada. Aunque se trata de una enfermedad infrecuente, parece que está aumentando su incidencia, lo que unido a su potencial capacidad para ocasionar complicaciones y secuelas graves obliga a sensibilizar al colectivo médico a fin de conseguir un diagnóstico más precoz y mejorar con ello el pronóstico.

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Introduction

Hematogenous vertebral osteomyelitis (HVO) is a rare entity that results from colonization by pathogenic microorganisms of the spine after an isolated or continuing episode of bacteremia. Mortality, but not the disease, is rare, with complications that often occur as a result of a delayed diagnosis.[1]

Because the morbidity of the HVO is high, all published series from large hospitals.[2]

In Spain things are no different. In a review of the literature we have found six large series of patients with HVO, three of them are multicenter[3-8] and all correspond to tertiary level hospitals. We present our experience in HVO, which corresponds to a small hospital in the metropolitan area of Barcelona, considered as first level, with a reference population close to 200,000 inhabitants and 108 beds. Our aim is to extend this experience and make comparisons with the other series performed in our country and abroad.

Patients and methods

We performed a retrospective analysis of medical records of patients diagnosed with HVO. We have included only those cases with bacteriological proof of infection through the blood. In particular, the inclusion criteria were as follows:

1) Compatible clinical characteristics (inflammatory pain in any segment of the spine).
2) Compatible imaging data (decreased disc height with or without erosions on x-rays [Rx] of the adjacent vertebral platforms, computed tomography [CT] or magnetic resonance imaging [MRI], or a pathological uptake of the radiotracer on the Technetium [Tc] bone scan).
3) Isolation of the germ in (two) blood cultures and/or pathological material obtained by ultrasound or CT guided puncture. In cases of brucellosis we accepted a positive agglutination titer equal to or greater than 1/160 as valid. An etiology of tuberculosis was accepted if *Mycobacterium tuberculosis* infection was simultaneously proven in samples of infected tissue or in an active pulmonary area.

In the actual clinical data we emphasized the description of the variables contained in the osteoarticular infection protocol, which are those listed below: predisposing factors, clinical presentation and clinical manifestations, affected vertebral level, microbiological data, data laboratory, imaging data, treatment, course and consequences.

Results

We have included 26 cases of HVO in the study, 17 men and 9 women, aged 36 to 83. The first case was diagnosed in February 1993 and the last in 2008. The overall incidence from 1993 to 2008 was 9 cases per million inhabitants/year for an average population of 180,000 inhabitants. The peak incidence was observed in 2000 (5 cases). The 3 patients with brucellosis were diagnosed between 1999 and 2000, and 2 patients with tuberculosis were diagnosed in 1995 and 1996, with no more cases since then. Unfortunately, the data of time from onset of symptoms to diagnosis was not recorded systematically, so we cannot reflect on the presentation. The rest of the clinical data is discussed below:

1) *Predisposing factors: we* found a predisposing factor in 19 patients (73%), the most common being *diabetes mellitus.* All these are reflected in Table 1.
2) *Format and clinical manifestations:* the most frequent clinical presentation form was pain in any segment of the spine of inflammatory characteristics in 23 patients. In 2 patients the presentation was in the form of acute arthritis, one of the ankle, and the other of the knee. In fact, both patients were admitted with suspected septic arthritis that was later confirmed by joint fluid culture. Spinal pain appeared after both. In one patient the symptoms at onset were acute abdomen, ileus, and fever. The diagnosis was suspected when further tests ruled out intraabdominal pathology. A bone scan allowed us to perform a correct diagnosis of septic arthritis of the D11-D12 apophyseal joint.
   Fever was defined as an axillary temperature above 37.5 ºC, not being always present but detected in 22 patients (84.6%).
   Two patients had simultaneous lung disease; one, a pulmonary infiltrate with active tuberculosis, and the other pneumococcal pneumonia. We found neurological manifestations in 10 patients (38%), although only in two cases were they the first manifestation (Table 1). We performed echocardiography in 12 patients in total, among whom were the 7 patients in whom streptococci was isolated. No changes suggestive of endocarditis were found in any patient. Echocardiogram was not performed in those patients in whom there was no clinical suspicion of endocarditis, early or during the course of evolution.
3) *Vertebral level affected:* the lumbar segment was affected in 13 cases, the thoracic spine and cervical in 5 and 2, respectively. Seven patients had multiple discs affected (27%), 6 of which had several segments affected simultaneously (23%).
4) *Microbiological data:* the most common etiology was bacterial. Pyogenic bacteria were isolated in 20 patients (77%). *Brucella* spp. in 3, *M. tuberculosis* in two and *Candida albicans* in one. In the group of pyogenic bacteria, streptococci were isolated in seven patients, *Staphylococcus aureus* in 6, 5 had gram-negative bacilli, *Staphylococcus epidermidis* and *Peptostreptococcus micros* in one each. The microbiological data of all patients is summarized in Table 2. Blood cultures were positive in 16 out of 20 patients with pyogenic infections (80%). Another patient with *Brucella* infection was also positive in blood culture. In the four patients who had no fever, blood cultures were negative.
5) *Laboratory data:* erythrocyte sedimentation rate (ESR) in the first hour was accelerated in all patients except two, with a mean of 84 and ranging from 17 to 120. If we take 30 as a normal ESR value, the mean elevation was 2.8 times this value. CRP was elevated above 8 mg/dl in all patients with this data (n=14), with limits between 13 and 813, and an mean of 198, equivalent to 24 times above normal.
6) *Imaging:* simple x rays were abnormal in 16 patients and normal in early 10. Data was available from ^{99m}Tc bone scans of 7 patients and abnormal in all cases, showing increased uptake of the radiotracer in the affected area. Using CT or MRI we detected extravertebral abscesses or extensions in 16 patients (61.5%) which were located epidurally (12), paravertebral (4), psoas (5) and on the buttocks (1). Some patients had two or more collections in different locations simultaneously.
7) *Treatment:* most patients were treated with intravenous antibiotics for 4-6 weeks, depending on their clinical response and acute phase reactants, after which they received oral antibiotics for up to two months. Three patients required surgical treatment, two to debride an epidural abscess, with poor clinical outcome (paraplegia in one and progressive cognitive impairment in another). The third patient had meningitis and *C. albicans* diskitis complicated with intracranial hypertension and required surgery for placement of a ventriculo-peritoneal valve. Patients with brucellosis were treated with oral tetracycline and intramuscular streptomycin according to the classical schedule, and those who had HVO due to tuberculosis received antibiotic treatment

Table 1
Summary of the clinical characteristic

Patient	Age	Gender	Complications	Localization	Sequelae	Predisposing factor
1	58	M	No	Multiple, dorsal, and lumbar	Back pain	No
2	55	F	No	L4-5 and L5-S1	No	No
3	54	F	No	L1-L2	No	No
4	83	M	Psoas abscess	L4-L5	No	Diabetes mellitus
5	36	M	No	L4	No	HIV. No IVDU
6	37	M	Epidural and psoas abscess Meningitis	L4-L5	Endocraneal hypertension	HIV and IVDU
7	60	M	Epidural abscess	L5-S1	Back pain	No
8	55	M	Ileus. Paravertebral and intraspinal abscess	Right apophyseal D11-D12	No	Hepatitis C
9	63	F	Epidural abscess and paraplegia	D11-D12 and D12-L1	Paraparesia	Diabetes mellitus
10	82	F	No	L1-L2	No	Prior vertebral fracture
11	69	M	Epidural abscess	D4-D5	D5 flattening and back pain	Multiple myeloma
12	74	M	No	L2-L3	No	Prior vertebral fracture
13	82	M	No	D11-D12	No	Prior RTU with urinary infection
14	51	M	Gluteus abscess	L3-L4	Back pain	No
15	71	F	Epidural and psoas abscess	L4-L5, L5-S1, D2-D3	No	Diabetes mellitus
16	54	M	Epidural abscess	L4-L5	Back pain	ARU
17	59	F	Epidural, paravertebral, and prevertebral abscess RLE paresia	L3-L4	No	Leflunomide treated rheumatoid arthritis
18	76	M	Paravertebral and psoas abscess	L1-L2 and L2-L3	No	No
19	79	M	Bilateral psoas abscess Acute renal failure	L3-L4	Mild chronic renal failure	Diabetes mellitus
20	80	F	Severe anemia requiring transfusion	C4-C5, L1-L2, L4-L5, and L5-S1	No	Endometrial cancer 13 years prior treated with QT and RDT
21	45	M	Ketosis. Epidural and right paravertebral abscess	D5	Back pain	Diabetes mellitus
22	49	M	Epidural abscess, tetraparesia	C3-C4	Neck pain	Hepatic cirrhosis
23	50	M	Bilateral sciatica with nerve root disease of L5-S1 bilaterally	Right apophyseal D12-L1	Impotence	Diabetes mellitus
24	62	F	No	C3-C4	No	Diabetes mellitus
25	76	M	Epidural abscess and cognitive impairment requiring surgery	Knee. L4-L5	Back pain	No
26	48	F	Epidural abscess. Paraparesia	Ankle, C6-C7, C7-D1, L2-L3, L4-L5, and L5-S1	Pending progression	Alcoholism

ARU indicates acute retention of urine; F, Female; HVI, Human Immunodeficiency Virus; IVDU, intravenous drug use; M, Male; QT, chemotherapy; RDT, radiotherapy; RLE, right lower extremity; RTU, transurethral resection.

Table 2
Summary of the microbiological characteristics

Patient	Age	Gender	Germ	Diagnosis	Blood culture
1	58	M	*Brucella*	Blood culture and serological	Positive
2	55	F	*Brucella*	Serological	Negative
3	54	F	*Brucella*	Serological	Negative
4	83	M	*Mycobacterium tuberculosis*	Guided puncture and sputum	Negative
5	36	M	*M. tuberculosis*	Sputum	Negative
6	37	M	*Candida albicans*	Guided puncture	Negative
7	60	M	*Streptococcus pneumoniae*	Blood cultures	Positive
8	55	M	*Staphylococcus aureus*	Guided puncture	Negative
9	63	F	*S. aureus*	Blood cultures	Positive
10	82	F	*Escherichia coli*	Blood cultures	Positive
11	69	M	*Streptococcus pyogenes*	Blood cultures and guided punture	Positive
12	74	M	*Streptococcus viridans*	Blood cultures	Positive
13	82	M	*E. coli*	Blood cultures	Positive
14	51	M	*S. aureus*	Blood cultures and guided punture	Positive
15	71	F	*Streptococcus agalactiae*	Blood cultures and guided punctures	Positive
16	54	M	*Proteus mirabilis*	Blood cultures	Positive
17	59	F	*Peptostreptococcus micros*	Guided puncture	Negative
18	76	M	*S. aureus*	Guided puncture	Negative
19	79	M	*Staphylococcus epidermidis*	Blood cultures	Positive
20	80	F	*S. agalactiae*	Blood cultures	Positive
21	45	M	*S. agalactiae*	Blood cultures	Positive
22	49	M	*S. aureus*	Blood cultures	Positive
23	50	M	*Enterobacter aerogenes*	Blood cultures	Positive
24	62	F	*E. coli*	Blood and urine cultures	Positive
25	76	M	*S. agalactiae*	Blood and knee synovial fluid cultures	Positive
26	48	F	*S. aureus*	Blood and ankle synovial fluid cultures	Positive

F indicates female; M, male.

with isoniazid, rifampicin and pyrazinamide during the first two months and then isoniazid and rifampin until completing 9 months of oral treatment.

8) *Progression and sequelae:* most of the patients recovered well with medical treatment only. The complications and sequelae are reflected in Table 1. It is noteworthy that the presence of extravertebral extension of the infectious process did not result in neurological complications in most cases. Of the 16 patients in whom this complication were detected, seven had some type of neurological symptoms (43%), although only three had permanent neurological sequelae (intracranial hypertension, severe paraparesis and impotence).

Discussion

The first records of HVO in the pre-antibiotic era indicate a high rate of mortality, up to 25%,[9] with current figures showing much lower mortality.[2] However, in our experience as in others,[2] morbidity is very high, with complications and consequences that compromise the quality of life of patients. Maybe this fact is related to the delayed diagnosis of spinal infection, and partly motivated by the difficult diagnosis and a low index of suspicion.

The incidence of HVO is low. For some researchers, the reason for the increase is owed to several factors,[10] among them an aging population and immunosuppressive treatments. In 1979, Digby et al[11] calculated an incidence of 4 cases per million inhabitants per year in an area of England. In Denmark, between 1978 and 1982, an annual incidence of 5 cases per million inhabitants[12] was calculated. In Sweden and Norway, between 1995 and 1997 respectively, an annual published incidence of 2.2 cases/100,000 inhabitants was seen in the area of Goteborg[13] and 1/100.000 inhabitants in the Norwegian city of Bergen.[14] In Spain, published incidence data is difficult to interpret, because many series are multicentric and the origin of the patients is geographically heterogeneous. In 1997, Colmenero et al found an annual incidence of 7 cases per million inhabitants[3] in a retrospective study of tertiary hospitals in Seville and Malaga. In addition, they noted a higher proportion of HVO among hospital admissions to a tertiary hospital in Madrid from 1996 to 2005.[8] In our case we calculated an overall incidence, from 1993 to 2008, of 9 cases per million inhabitants per year in an average population of 180,000 inhabitants, covering the towns of Vilamoura, Barcelona, Gava, Castelldefels, Begues and Sant Climent de Llobregat. We need to note that the statistics are understated because of restrictive selection criteria that preclude those patients without microbiological proof of infection. From the data presented we show that the overall incidence has clearly increased since 1979, underscoring the importance of educating the physician to make a prompt diagnosis based on an increased diagnostic suspicion, which undoubtedly will result in a lower occurrence of complications and sequelae and, ultimately, a better prognosis.

The demographics of our patients do not depart from the general line, both in Spain and beyond. Male predominance is seen. Some demographic, clinical and microbiological characteristics are difficult to compare between studies because of the variability between them, especially in regards to the inclusion criteria. Some include[15] patients with postoperative osteomyelitis, others study only the characteristics of HVO caused by a specific germ,[16] and some other particular clinical influences[6] or age group.[4] Detection of predisposing factors is common in all studies and, in most cases, diabetes mellitus is the predominant factor.[2] However, it is noteable that in 27% of patients, we did not find any predisposing baseline factor.

The usual clinical presentation of the HVO is back pain associated with fever. However, there is a variable number of patients who manifest no fever, up to 40% in some cases,[2] though we found this only 15% of our patients. We want to highlight the curious fact that two of our patients initially manifested as infectious monoarthritis, something we could not find in other series, although one case report published in 2004 mentioned a patient with oligoarthritis with negative synovial fluid culture and positive blood cultures for group B streptococcus, who was later diagnosed with lumbar spondylodiscitis.[17]

All series presented the lumbar vertebral level affected predominantly,[2] but our experience is different. While not as frequent, multifocal disease is not rare. Some studies indicate an unusually high incidence, up 68%.[18] We have seen seven patients (27%) with multiple disc disease, highlighting a case with the simultaneous affection of the cervical, thoracic and lumbar spine.

In almost all studies of pyogenic HVO reviewed, the most common responsible agent is *S. aureus.* There is a clear discrepancy between this and the results we have found, because in our series the *Streptococcus* genus was predominant and we have failed to find a convincing explanation for it. It is true that streptococci are a quantitatively important cause in most published series but are predominant in none.

No patient had endocarditis, which contrasts with the high prevalence of this complication in some series, up to 30%,[6] while in others it is only 6%.[5] In the Spanish series the high prevalence of brucellosis is of note.[4,7] We have seen two cases of tuberculous HVO (7.69%) and 3 of brucellosis (11.5%), although since 1996 we have not detected more patients with spinal tuberculosis, and none caused by *Brucella* spp since 2000. This can be due to a trend that has been seen by others,[8] although this assertion should be confirmed by epidemiological studies designed for such a purpose. In this regard we must highlight that while this trend is valid in the specific case of HVO, we cannot say the same for septic arthritis, because in 2008 we had the opportunity to diagnose two cases of tuberculous arthritis in our hospital (unpublished data). Recently there has been retrospective data published of the incidence of osteoarticular tuberculosis in the health district of Barcelona. Most were patients with vertebral osteomyelitis and an increased frequency of cases in recent years has not been confirmed.[19]

There are no differences between our patients and others in regard to laboratory data, imaging, treatment, complications and sequelae.[2] Among the noteworthy laboratory findings, the significant increase in 100% of cases of the CRP make it preferable to ESR and diagnostic data and as an especially useful tool for control of progression.

In concurrence with Nolla,[5] we prefer to call inflammatory processes that are often seen by CT or MRI extravertebral extensions instead of abscesses, especially because in most patients there are no clinical manifestations and no clear indications for surgery, reserving the latter for when there are signs or symptoms of cord compression, nerve root neurological deficits, spinal deformity corrections or management of intractable and persistent pain.[2]

Conclusions

Although it is a small series of patients, ours is representative of the metropolitan area of Barcelona related to a local hospital and set in the first level of attention category. Our series does not differ essentially from others. The only notable difference is the prevalence of bacteria of the genus *Streptococcus* including *S. aureus.* We have no explanation for it and it is probably attributable to random differences found in a small series of patients. What is remarkable is the absence of spinal tuberculosis in the period since 1996 and brucellosis since 2000. This is presumably attributable to improvements in sanitary and socio-economic conditions of the population. However, something may be changing as we have diagnosed a few cases of tuberculosis of peripheral joints in recent years.

Although none of our patients died, the rate of complications and sequelae was high. Increasing the index of suspicion among the medical community may be the best tool to improve this in the future.

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