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Research Article

Study Of Infectious Spondylodiscitis in Moba Territory, Democratic Republic of the Congo

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Abstract

Background: Usually not more than 5% of all forms of tuberculosis (TB) present as TB spondylodiscitis. To investigate whether brucellosis contributed to the high proportion of TB spondylodiscitis among patients diagnosed with TB in Moba Territory, Democratic Republic of the Congo, blood samples from patients with presumptive spondylodiscitis were tested with the Rose Bengal test (RBT). We describe RBT results, and characteristics and outcomes of spondylodiscitis patients.

Methods: Cross-sectional descriptive study of patients who presented with clinical signs of spondylodiscitis between 2018-2019. The Rose Bengal test (RBT) was done in Moba and at the Sciensano laboratory in Brussels. Awaiting RBT results, patients were treated for TB.

Results: Among 138 patients, RBT showed brucellosis in two (1.4%) patients. The remaining 136 were clinically diagnosed with EPTB. Of 138 patients, 81 (58.7%) presented with a spinal deformity, 18 showed neurological signs, such as paraesthesia, paresis or paralysis, and five had urinary retention. One of two patients diagnosed with brucellosis was successfully treated with TB treatment. Among EPTB patients, one was lost to follow-up, and therapeutic success was 91% (121/135) among the remaining.

Conclusion: In Moba Territory the main cause of spondylodiscitis was Mycobacterium tuberculosis. In two (1.4%) patients' brucellosis was diagnosed.

Keywords: BRUCELLOSIS, INFECTIOUS SPONDYLODISCITIS, ROSE BENGAL TEST, TUBERCULOSIS.

Abbreviations: BC PTB: Bacteriologically Confirmed Pulmonary TB; BCG: Bacilles de Calmette et Guérin; DRC: Democratic Republic of Congo; EPTB: Extrapulmonary Tuberculosis; NSAID: Non-Steroidal Anti-Inflammatory Drugs; RBT: Rose Bengal Test; TB: Tuberculosis; UN: United Nations; WHO: World Health Organization.

Background

Extrapulmonary tuberculosis is the most common cause of infectious spondylodiscitis in low- and middle-income countries. Up to 5% of all TB diagnosed may present as spondylodiscitis [1]. Previous studies show concurrent pulmonary involvement in 1%-67% of patients with TB spondylodiscitis [1]. TB spondylodiscitis usually occurs in thoracic or upper lumbar vertebrae. It can be a result of haematogenous spread or follow contiguous or lymphatic spread from pleural disease. Without treatment, granulomas become caseous and then necrotic, eventually leading to the collapse of vertebral bodies. Clinical findings include a painful spine, which can evolve to gibbus (structural kyphosis), with the classic X-ray finding showing anterior wedging of two adjacent vertebral bodies and destruction of the intervertebral disk. Nerve roots may be compressed and result in radiculopathy (with pain, weakness, and/or numbness). The spinal cord may be compressed and result in paralysis of the upper or lower limbs. Compressions may occur early during active TB disease, but also years after cure due to the structural kyphosis. Diagnosis of TB spondylodiscitis is usually made based on clinical and X-ray findings. Treatment of TB spondylodiscitis is similar to the treatment of pulmonary TB. First-line TB drugs show a good bone penetration [2]. To prevent relapse some authors recommend a longer duration than the 6 months treatment duration used for patients with pulmonary TB [3]. Unless pulmonary samples can be obtained, the diagnosis of any initial drug resistance is extremely challenging, particularly in low- and middle-income countries.

Brucellosis is the second most frequent cause of infectious spondylodiscitis after tuberculosis.4 Brucellosis is an endemic zoonosis in certain regions of the world, notably in sub-Saharan Africa. In humans, skeletal involvement occurs in 10-85% of patients with brucellosis. Spondylodiscitis is the most severe form, and occurs in 6-85% of patients with skeletal involvement [4]. Lumbar vertebra are most often affected, but also thoracic and cervical vertebrae can be involved. Lesions can show a destructive appearance of vertebrae and can be accompanied by osteosclerosis. Diagnosis is made using serological tests, such as the Rose Bengal test (RBT) [5]. Several combinations of antibiotic drugs have been used. One of such regimens is prescribed for six months and includes two anti-TB drugs, rifampicin and streptomycin, plus doxycycline [6].

In Moba Territory, routine reporting showed that about half of notified TB cases had EPTB, of whom more than half had spondylodiscitis. Considering that globally about 15% of TB manifest extrapulmonary, [7] and that up to 5% of TB present as spondylodiscitis,1 the reported high frequency of EPTB, mainly due to spondylodiscitis, led to the present study. Considering extensive pastoral activities, [4] we speculated that brucellosis could be one of the underlying causes of spondylodiscitis. We describe the proportion of notified cases that were reported to have TB spondylodiscitis between 2011-2020. For patients diagnosed with spondylodiscitis and treated for TB between 2018-2019 we describe the characteristics and outcomes. Moreover, RBT on blood samples was done in the DRC and at the Sciensano laboratory in Brussels to identify brucellosis.

Methods and Ethic

Methods

Using aggregate data from routine reporting, we show the proportion of notified TB cases that were reported to have TB spondylodiscitis between 2011-2020.

We also present the results of a prospective study conducted among patients who presented with presumed spondylodiscitis in Moba Territory in Tanganyika between 2018 to 2019. Of a total of 42 Health Areas in Moba Territory, 10 participated. The study was conducted in 6 and 4 Health Areas from the Health Zones of Moba and Kansimba, respectively. These two Health Zones were selected purposely, based on routine reports showing high numbers of patients with spondylodiscitis TB. The Health Areas were selected based on proximity to the general hospital of Moba, in order to facilitate the referral of patients for paraclinical examinations.

Patients were considered to have presumed spondylodiscitis when they presented with spinal pain, with or without spinal deformity (loss of lumbar lordosis, scoliosis, kyphosis). Patients with presumed spondylodiscitis who provided written consent were referred to the referral hospital for a thorough physical examination, an X-ray of the spine, and blood sample collection for RBT in the Moba General Hospital and at Sciensano in Brussels. In patients without vertebral lesions or spinal deformity on physical examination and X-ray, treatment with NSAID was prescribed. Patients who improved on NSAID and without antibiotic therapy were excluded from the analysis.

Sputum samples from patients with presumptive spondylodiscitis were tested using sputum smear microscopy using Ziehl-Neelsen staining. The diagnosis of spondylodiscitis was made based on clinical signs in patients with spinal pain who presented any of the following signs: a) spinal deformity, visible on inspection or X-ray, or b) neurological involvement shown in the form of paraesthesia, paresis, or paralysis of the upper or lower limbs, or c) neurological involvement shown in the form of urinary retention/incontinence, or d) lesions of the vertebrae (geode, erosion, compression) and intervertebral discs (pinching) on X-ray.

All patients with spondylodiscitis were treated for TB, while RBT results were awaited. TB treatment consisted of the four first-line drugs for a duration of 12 months. After a two-month intensive phase with rifampicin, isoniazid, ethambutol and pyrazinamide, rifampicin and isoniazid were continued for another 10 months.

In patients with TB spondylodiscitis bacteriological confirmation for the extrapulmonary localization of infection was not possible. Hence, treatment success could not be bacteriologically confirmed, but was determined by the clinical evolution. Patients were considered to be treated successfully when constitutional symptoms (e.g. fever, weight loss) regressed, spinal pain had reduced before the end of treatment, without further progression of neurological signs.

The diagnosis of brucellosis was based on RBT done in Moba

and in Brussels. The RBT is an agglutination test based on an antigen-antibody reaction that is performed on blood serum. If positive, between one and 4 crosses are shown. In the General Hospital of Moba blood was collected in Falcon tubes. One tube was transported from Moba to Kalemie by boat, then to Kinshasa and Brussels by plane, conserved between 0° and 8°C, in triple packaging, according to WHO rules, as an infectious sample of category B, UN number 3374.

Brucellosis treatment had to be started in case of a positive RBT. Brucellosis treatment consisted of 8 weeks of doxycycline and rifampicin, unless patients were already treated successfully with TB treatment. Treatment success was determined by the clinical evolution, in the same way as for TB spondylodiscitis. A corset was used as an adjuvant treatment to minimize excessive spinal pain, or to support the spine in patients with extensive lesions.

A data collection form was developed before the start of the study. The variables collected included gender, age, BCG status, contact with patients with bacteriologically confirmed pulmonary TB (BC PTB), clinical presentation, X-ray findings, RBT results from Moba and Brussels, and treatment outcomes. Data were prospectively encoded in an Excel database. We used descriptive statistics to summarize the findings.

Ethics

The study was approved by the National Ethics Review Board (74/CNES/BN/PMMF/2018) Each patient provided written consent before study enrolment. Study procedures and treatments were free of charge.

Results, Discussion, Strength and Limitation

Results

Between 2011-2020, 4639 patients were diagnosed with TB in the 42 Health Areas of Moba Territory, including 1595 (34%) with EP TB. Of 4639, 1140 (25%) patients had spondylodiscitis. In this period, the yearly proportion of patients with spondylodiscitis ranged between 12% (in 2016) and 39% (in 2019).

Between 2018-2019, 324 cases of spondylodiscitis were notified in the 42 Health Areas of the Territory of Moba. In the same period, in 10 out of 42 Health Areas of the Territory of Moba, 160 patients with presumptive spondylodiscitis were enrolled in this study (Figures 1). After a referral consultation, spondylodiscitis was not confirmed in 22 patients. Nineteen patients did not have clinical signs of spondylodiscitis. Another 3 patients without spinal deformity were excluded from the analysis as their clinical signs had improved after treatment with NSAID. The remaining 138 patients were diagnosed with spondylodiscitis. Most (57%; 78/138) were female (Table 2). The majority was older than 45 years. No patient reported contact with another patient with BC PTB.

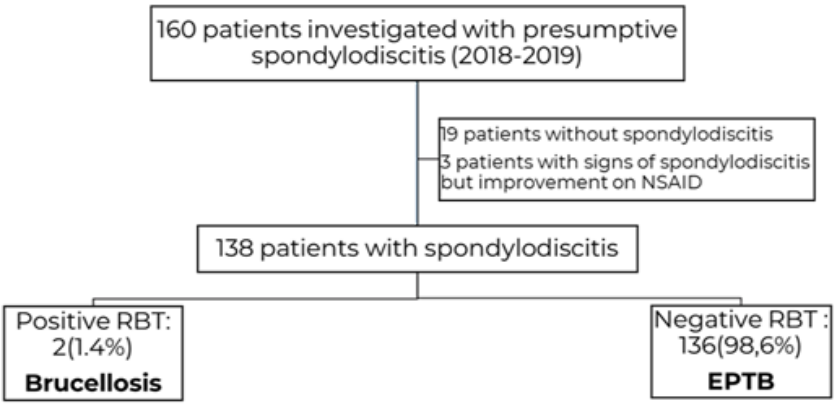

Figure 1: Diagnosis of infectious spondylodiscitis between 2018-2019, in the Health Zones of Moba and Kansimba, Moba Territory (10 Health Areas), Democratic Republic of the Congo.

All patients with spondylodiscitis presented with spinal pain, and 81 (58.7%) with a spinal deformity. More than one in 10 (13.0%; 18/138) showed neurological signs (paresthesia, paresis, or paralysis). Five patients had urinary retention. The vast majority (68.9%; 95/138) had vertebral lesions on X-ray.

Of 138 patients, 138 and 120 had a RBT result from Moba and Brussels, respectively. RBT done in Moba was negative for all. RBT performed in Brussels identified brucellosis in 2 patients (3+ for both). Both patients with brucellosis had spinal deformity and vertebral lesions on X-ray. The Brussels RBT results that showed brucellosis arrived after about 2 months in Moba. One patient had already concluded the first 2 months of TB treatment, had improved clinically and treatment success was declared without starting the specific treatment for brucellosis. The other patient had died while on TB treatment (Table 1).

Table 1: Notification of extra-pulmonary TB and spondylodiscitis among notified TB cases in Moba Territory (42 Health Areas), Democratic Republic of the Congo.

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
TB, all forms	342	364	345	344	375	500	528	545	565	731	4639
BC PTB	226	220	216	217	274	379	342	352	302	339	2867
EPTB	110	127	121	97	96	110	162	157	254	361	1595
Spondylodiscitis TB	49	91	114	97	67	59	70	103	221	269	1140
Among all forms:											
% EPTB	32%	35%	35%	28%	26%	22%	31%	29%	45%	49%	34%
% Spondylodiscitis	14%	25%	33%	28%	18%	12%	13%	19%	39%	37%	25%

Note*: BC PTB : bacteriologically confirmed pulmonary tuberculosis; EPTB: extra-pulmonary tuberculosis; TB= tuberculosis.

Of 136 patients diagnosed with TB spondylodiscitis, 5 (3.7%) had BC PTB. One of 136 patients was lost to follow-up before starting TB treatment. Among the remaining 135, therapeutic success was 91.1% (123). Seven patients died, 3 were lost to follow-up, and 2 were not evaluated.

As complementary treatment a corset was used for 13 (9.6% of 138) patients.

Discussion

During our study period, extra-pulmonary TB cases accounted for 37% (411/1110) of TB cases in the 2 health zones. This is higher than the norm of 20% set by the DR Congo National Tuberculosis Control Program (PNLT) [8]. Cases of spondylodiscitis accounted for 29% (324/1110) of all TB cases. This is higher than that found in Gabon by P.M. Loembe, where spondylodiscitis cases represent 3% of all TB cases [10]. Raising community awareness and actively seeking out cases of spondylodiscitis in selected health facilities may explain this high proportion. The high proportion of missing all forms of TB (59%) compared with the WHO estimate may also be a reason. Indeed, the reported incidence in 2020 for the 2 health zones represents only 131 per 100,000 inhabitants [11], compared with a WHO estimate of 319 [9].

We selected 138 of the 160 suspected cases of spondylodiscitis (86%), based on clinical and radiographic criteria. Radiography revealed lesions in 112 patients (81%). This is in line with the study by L. Badaoui in Morocco, where radiography was pathological in 17/21 (81%) cases [12].

As in studies elsewhere [12,14,19], spondylodiscitis is common in adults over 30 (83%). But 7.2% are children under 15. This is lower than the findings of P. M. Loembe in Gabon, where 55% of patients were under 20 [10].

Females predominated at 56.5%, as in Fatma Hammami's series [19], but in contrast to N. Belhaj's study, where the sex ratio was 1.22 in favor of males [16], and L. Badaoui's study, where males predominated [12].

Clinically, all patients presented with a spinal syndrome, as in other studies [12,15,16,19]. In 58.7% of cases, patients had spinal deformities, demonstrating that screening is carried out at a late stage.

Neurological abnormalities were observed in 13% of patients, slightly less than in the studies by Ben Tekaya in Tunisia [14], L.M. Loembe in Gabon [10], N. Belhaj Salah in Tunisia [16] and L. Badaoui in Morocco [12].

Brucellosis is the most common bacterial zoonosis, with over 500,000 cases per year worldwide [15]. Some East African countries have reported an incidence of human brucellosis ranging from 0-35.8% [13]. Spondylodiscitis is the most frequent complication of brucellosis [15,17]. The Rose Bengal test (RBT) has been used to diagnose cases of brucellosis [5]. In our study, brucellosis spondylodiscitis accounted for 1.4% of cases. According to James M Rizkalla, the prevalence of brucellian spondylodiscitis is 2-60% [15]. Our result is lower than that of Ben Tekaya in Tunisia, who found that 23/85 (27%) cases of spondylodiscitis were positive for brucellosis serology [14]. This spondylodiscitis is observed in people over 50 years of age [16,18].

Tuberculous spondylodiscitis was confirmed in 98.6% of cases on the basis of clinical and radiological findings, after exclusion of brucellosis. It should be noted that further etiological investigations were difficult in the context of our study. A good response to anti-tuberculosis treatment supported our hypothesis. Globally, tuberculosis is the main cause of spondylodiscitis in endemic countries [19]. Sputum examination for pulmonary TB was positive in 5 patients (3.6%), similar to the series by Ben Thekaya in Tunisia, where Koch's bacillus was found in 5% of cases [14].

The clinical and radiological features were identical to those described elsewhere: spinal syndrome, spinal deformity and neurological abnormalities [10,14,16,20].

Patients were treated with antituberculosis drugs as a severe form of TB (8): Rifampicin, Isoniazid, Pyrazinamide and Ethambutol for 2 months, then Rifampicin and Isoniazid for 10 months. Spinal immobilization in a plaster cast combined with physiotherapy was performed in cases with spinal deformity and/or neurological lesions.

The therapeutic outcome was that 91.1% completed with therapeutic success and regression of clinical signs, 5.2% died and 3.7% were lost to follow-up or not assessed.

According to studies, other causes of spondylodiscitis besides TB and brucellosis are possible [12,16,18,20]. Further study is needed to identify the contribution of each germ to this pathology in the Moba area.

Strengths and Limitations

This study shows the profile of spondylodiscitis cases in this endemic region.

Its limitation is that it does not allow us to accurately identify the share of each potential germ in this high proportion of spondylodiscitis clinically diagnosed as of tuberculosis origin. This calls for a more thorough and structured etiological study.

Conclusion

In Moba Territory the main cause of spondylodiscitis was Mycobacterium tuberculosis.

In two (1.4%) patients, brucellosis was diagnosed.

The clinical and radiological characteristics of the patients are identical to those described in the literature.

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Conflict of Interest

There are no conflicts of interest to report.

Annexes

(Figure 1, Tables 1,2 & Figures 2,3)

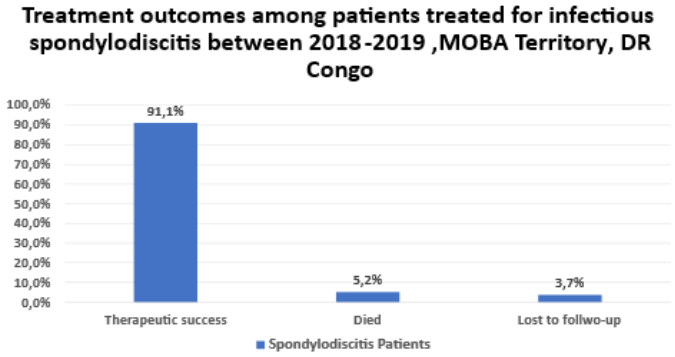

Figure 2: Treatment outcomes among patients treated for infectious spondylodiscitis between 2018-2019, in 10 Health Areas of the Health Zones of Moba and Kansimba, Moba Territory, Democratic Republic of the Congo.

Figure 3: A few photos of patients, including a woman with paraplegia complicated by decubitus ulcers and a photo of children with spondylodiscitis undergoing physical rehabilitation thanks to the walking platforms at the Thalita Qoum Center in MOBA.

Table 2: Characteristics of patients diagnosed with infectious spondylodiscitis between 2018-2019, in 10 Health Areas of the Health Zones of Moba and Kansimba, Moba Territory, Democratic Republic of the Congo.

	Total		TB		Brucellosis	
	No	%	No.	%	No.	%
Total	138		136		2	
Gender						
Female	78	56.5	77	56.6	1	50
Male	60	43.5	59	43.4	1	50
Age group						
<=15	10	7.2	10	7.4	0	0
>15-30	13	9.4	13	9.6	0	0
>30-45	25	18.1	25	18.4	0	0
>45-50	17	12.3	17	12.5	0	0
>50-65	60	43.5	58	42.6	2	100
>65	13	9.4	13	9.6	0	0
BCG						
Yes	63	45.7	62	45.6	1	50
No	46	33.3	46	33.8	0	0
Missing data	29	21	28	20.6	1	50
Contact with BC PTB						
Yes	0	0	0	0	0	0
No	138	100	136	100	2	100

Spinal pain						
Yes	138	100	136	100	2	100
No	0	0	0	0	0	0
BC PTB						
Yes	5	3.6	5	3.7	0	0
No	133	96.4	131	96.3	2	100
Severe sign: spinal deformity						
Yes	81	58.70%	79	58.10%	2	100.00%
No	57	41.30%	57	41.90%	0	0.00%
Severe sign: Paresthesia/paresis/paralysis						
Yes	18	13.00%	18	13.20%	0	0.00%
No	120	87.00%	118	86.80%	2	100.00%
Severe sign: Urinary retention / incontinence						
Yes	5	3.60%	5	3.70%	0	0.00%
No	133	96.40%	131	96.30%	2	100.00%
Clinical presentation						
One or more of the above severe signs	138	66.7	136	66.2	2	100
None of the above severe signs	46	33.3	46	33.8	0	0
X-ray interpretation						
Normal	26	18.8	26	19.1	0	0
>=1 lytic lesions	1	0.7	1	0.7	0	0
Erosion >=1 vertebrae	28	20.3	28	20.6	0	0
Anterior wedging >=1 vertebrae	35	25.4	35	25.7	0	0
Collapse >= 1 vertebrae	31	22.5	29	21.3	2	100
Missing data	17	12.3	17	12.5	0	0

Note*: BC PTB : bacteriologically confirmed pulmonary tuberculosis; EPTB: extra-pulmonary tuberculosis; TB= tuberculosis.

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