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BRUCELLAR AND TUBERCULOUS SPONDYLODISCITIS: COMPARISON OF MAGNETIC RESONANCE IMAGING FINDINGS

BRUSELLÖZ VE TÜBERKÜLOZ SPONDİLODİSKİT: MANYETİK REZONAN BULGULARININ KARŞILAŞTIRILMASI

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SUMMARY:

Objective: The aim of this retrospective study was to determine the magnetic resonance imaging (MRI) findings and differences of patients with brucellar and tuberculous spondylodiscitis.

Materials and methods: 13 patients with brucellar and 6 patients with tuberculous spondylodiscitis were included in the study. Patients were diagnosed based on clinical findings, laboratory tests and MRI findings. Vertebral corpus, disc, paravertebral soft tissues and epidural distances were evaluated in cases.

Results: Lumbar involvement was present in all of the brucellar, and majority of the tuberculous cases. Multifocal involvement, paravertebral involvement and bone erosion was higher in tuberculous cases.

Conclusions: MRI can be used in differentiating the cases with tuberculous and brucellar cases by using musculoskeletal findings which are seen together with spondylodiscitis. Brucellosis and tuberculosis must be placed in differential diagnosis of patients with musculoskeletal findings in endemic regions.

Key words: Brucellosis, Tuberculousis, Spondylodiscitis, Magnetic Resonance imaging

Level of evidence: Retrospective clinical study, Level III

ÖZET:

Amaç: Bu retrospektif çalışmanın amacı bruselloz ve tüberküloz spondilodiskit hastalıklarının Manyetik rezonans Görüntüleme bulgularını karşılaştırmaktır.

Materyal ve metod: 13 bruselloz ve 6 tüberküloz spondilodiskitli hasta çalışmaya dahil edildi. Hastalar klinik bulgular, laboratuar testleri ve MRI bulguları ile değerlendirilmiştir. Tüm olgularda vertebra korpus, disk, paravertebral yumuşak dokular ve epidural mesafeler değerlendirildi.

Sonuçlar: Brusellozlu olguların tamamında, tüberküloz olgularının büyük çoğunluğunda lomber bölgede tutulum mevcuttu. Multifokal tutulum, paravertebral tutulum ve kemik erozyonu tüberküloz olgularında daha fazlaydı.

Çıkarım: MRI, spondilodiskite eşlik eden kas-iskelet tutulum bulguları sayesinde tüberküloz ve brusellozlu olguları birbirinden ayırt etmekte kullanılabilir. Endemik bölgelerde bruselloz ve tüberküloz, kas-iskelet sistem bulguları olan hastalarda ayırıcı tanıya mutlaka eklenmelidir.

Anahtar kelimeler: Bruselloz, Tüberküloz, Spondilodiskit, Manyetik Rezonans Görüntüleme

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INTRODUCTION:

Spondylodiscitis is the infection of the intervertebral disc and adjacent vertebral corpus. Spondylodiscitis may be associated with pyogenic, tuberculosis or brucellosis infections. Brucellosis and tuberculosis are still endemic infections in our country. Brucellosis is a multisystemic chronic granulomatous disease, which caused by brucella type bacteria[5]. Disease transmission to humans is by non-pasteurized milk and dairy products, and less frequently by direct contact with the infected animal[17].

Mycobacterium tuberculosis is one of the pathogens that cause most frequent and prevalent diseases in humans. Percivall Pott first defined spinal tuberculosis in 1779, and it is seen in less than 1 % of all tuberculosis cases[11,15].

Diagnosis of a brucellar and tuberculous spondylodiscitis is sometimes challenging. Delays in the diagnosis may lead progression of neurological deficits and spinal deformities. Imaging is essential both in diagnosis and guiding surgery. In this study, we have evaluated the contribution of magnetic resonance imaging (MRI) to diagnosis and differentiation of the cases with brucellar and tuberculous spndylodiscitis.

MATERIAL AND METHODS:

This retrospective study included 19 cases that diagnosed with brucellar (13 cases) and tuberculous (6 cases) spondylodiscitis according to clinical, laboratory and MRI findings, between June 2012 and July 2013 in Bitlis State Hospital. Brucellar spondylodiscitis diagnosis was based on clinical and MRI findings, and positive serologic tube agglutination test. Tuberculous spondylodiscitis diagnosis was based on clinical and laboratory (PPD test) tests. In some cases with tuberculosis, diagnosis was also supported by additional positive biopsy results.

MRI evaluations covered fat non-suppressed sagittal T1-T2 weighted, fat non-suppressed axial T2 weighted, and fat suppressed contrasted axial-sagittal T1 weighted sequences, which gathered by 1.5 Tesla MRI (Philips, Intera). Vertebral corpuses, intervertebral discs, and paraspinal structures were evaluated for signal changes and pathological contrasts. Decreased signals in T1 weighted images, increased signals in T2weighted images, and contrast enhancement in the vertebral corpuses and discs were regarded as typical findings for spondylodiscitis diagnosis. Additionally, some soft tissue fields that exhibit peripheral marginal contrast enhancement in epidural and paraspinal regions were regarded as accompanying abscess focuses.

Statistical Analyses:

SPSS 18 (IBM Inc., USA) was used for the analyses in the study. Descriptive statistics were presented with percentage, mean, and standard deviation. Quantitative data were compared with independent samples T test between two groups, when the normal distribution assumptions were met. Significance in the results was evaluated as two-sided at the level of $p<0.05$.

RESULTS:

MRI evaluated spine, paravertebral structures and spinal canal involvement in detail in all cases. Study included 13 cases with brucellar spondylodiscitis (5 female, 8 male, mean age 44.5±16.4) and 6 cases with tuberculous spondylodiscitis (3 female, 3 male, mean age 45.3±16.6).

Involvements in intervertebral disc and adjacent corpus fields were present in all cases. Moderate and/or high signal intensities on T2 weighted images were seen in vertebral corpuses intramedullary, and in discs.

Signal intensities were significantly decreased in T1 weighted images, and contrast enhancements in various doses were observed according to the clinical stage of the disease, after gadolinium contrast injection.

There was no significant difference between the ages of the two groups. All cases had local clinical symptoms. Involvements were most frequently seen in L4-5 level in lumbar regions in brucellosis cases, and in lower dorsal and lumbar regions at various levels in cases with tuberculosis.

The evaluations regarding multifocal involvement revealed that 23% of brucellar cases and 50% of tuberculous cases had multifocal disease. The difference between groups was statistically significant ($p<0.05$) and tuberculosis cases had higher levels of multifocal involvement.

Bone erosion findings were present in all cases with tuberculosis at different levels. Some patients had decreased vertebral corpus heights, and kyphosis deformity was present in one patient with dorsal involvement. Meanwhile, 5 of the cases with brucellosis had bone erosion.

Epidural extension assessments revealed that 4 brucellar (30%) and 4 tuberculous (66%) cases had epidural abscess. Paravertebral soft tissue involvement was present in 2 brucellar (15%) and 3 tuberculous (50%) cases. Epidural abscess and paravertebral involvement was significantly higher in cases with tuberculosis. Additionally, one case with brucellar spondylodiscitis had simultaneous infective arthritis findings in coxofemoral joint. This was particularly important because of its osteoarticular localization, which is a rare finding in cases with brucellosis.

Psoas abscess, which is regarded as an advanced paravertebral soft tissue involvement, was present in 3 cases (Figure-1,2).

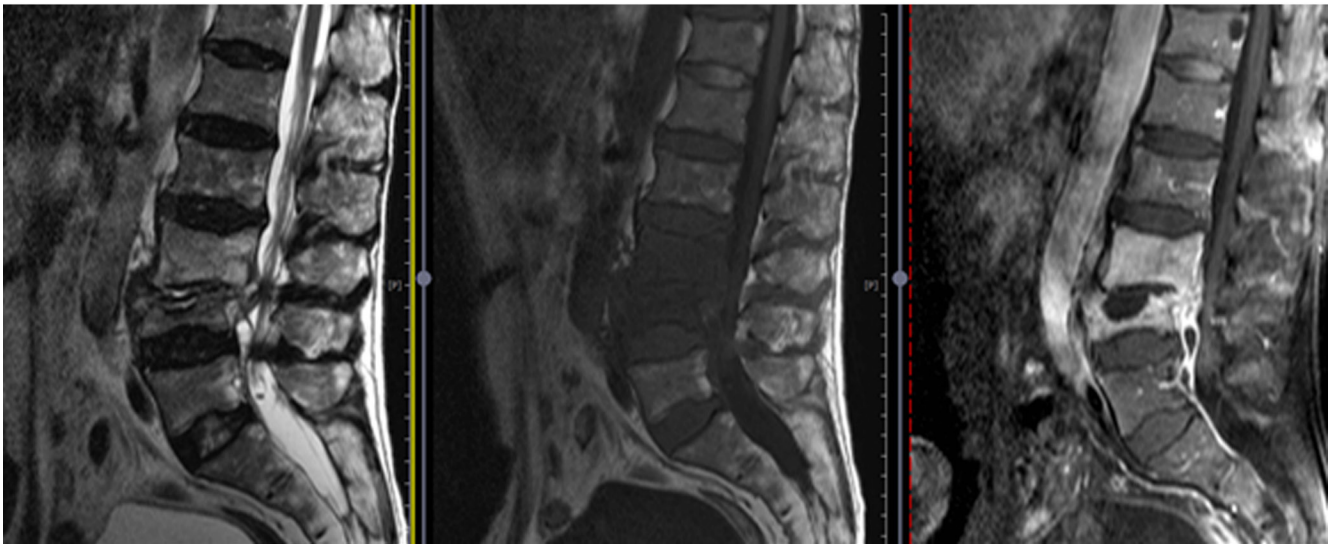

Figure-1. A 53 year-old male patient with brucellar spondylodiscitis. **a.** Hyper-intense views due to involvements on discs and end plateaus at L3-4 level in sagittal T2 weighted images, collapse in L4 vertebral corpus. **b.** Hypo-intense view at this level in sagittal T1 weighted image. **c.** Contrast enhancement accordant with spondylodiscitis, and peripherally contrasted epidural abscess formation extending to L4-5 level in sagittal contrasted T1 weighted image.

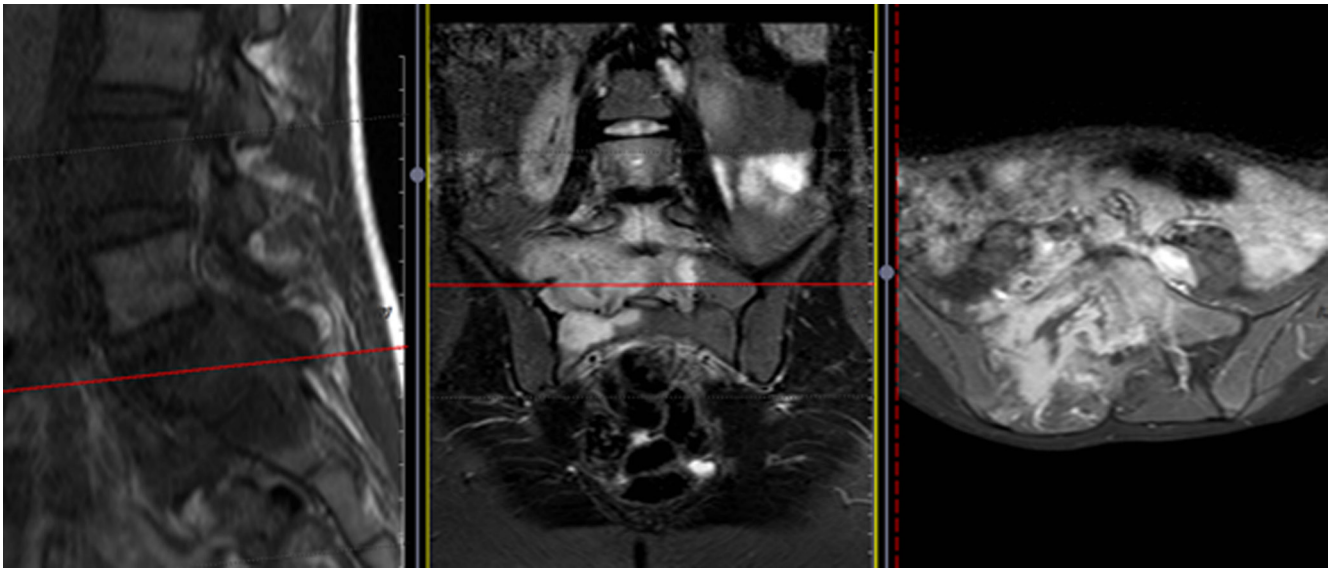

Figure-2. A year-old female patient with tuberculous spondylodiscitis. **a.** Spondylitis in L4 vertebral corpus, and hypo-intensity accordant with spondylodiscitis at S1-2 level in sagittal T1 weighted image. **b.** Abscess that extends from right half of S1 vertebral corpus to pedicle and paravertebral area in coronal T2 weighted image; infectious involvement extends to L5-S1 and S1-S2 discs and vertebral corpuses. **c.** Abscess formation that extends to paravertebral and epidural area in S1 vertebra level in axial contrasted T1 weighted image.

Table-1. MRI findings of patients with brusellar spondylodiscitis (n=13)

Age	Sex	Vertebral level	Focal involvement	Multifocal involvement	Bone erosion	Epidural abscess	Paravertebral involvement
13	M	L3-4 and L4-5		+	-	-	-
14	M	L4-5	+		-	+	-
43	M	L4-5	+		+	-	-
59	F	L3-4	+		-	-	-
44	F	D12-L1	+		+	-	-
58	M	L2-3 and L5-S1		+	+	+	-
48	M	L4-5	+		-	-	-
59	F	L4-5 and hip arthritis		+	-	-	-
30	F	L4-5	+		-	-	-
40	F	L5-S1	+		-	-	-
58	M	L1-2	+		-	-	-
60	M	L5-S1	+		+	+	+
53	M	L3-4	+		+	+	+

Table-2. MRI findings patients with tuberculous spondylodiscitis (n=6)

Age	Sex	Vertebral level	Focal involvement	Multifocal involvement	Bone erosion	Epidural abscess	Paravertebral invovement
17	F	L5-S1, S1-2 and L4 spondylitis		+	+	+	+
53	F	L4-5	+		+	-	-
38	M	D10-11	+		+	+	+
43	M	D11-12 and L1-2		+	+	+	-
63	F	L3-4	+		+	-	-
58	M	L4-5 and L5-S1		+	+	+	+

DISCUSSION:

Brucellous spondylodiscitis is a rare occasion in developed countries due to the eradication of brucellosis from animals. But, brucellosis is still one of the most frequent causes of vertebral osteomyelitis in endemic regions (e.g. Mediterranean countries[9], Central Europe[7], and Latin America)[18]. Disease in skeletal system is the most frequent type of involvement, and most frequent forms of musculoskeletal involvement are spondylitis/spondylodiskitis, arthritis, bursitis, and tenosynovitis[16].

Tuberculosis is the bacterial infection that affects millions of people globally each year. It still has importance in all populations in developing countries, and in immunosuppressed patients, homeless people, and increasing number of refugees in developed countries[20,22]. Spinal tuberculosis constitutes roughly 20% of extrapulmonary tuberculosis. Tuberculous spondylodiscitis may cause skip lesions through anterior longitudinal ligament.

Diagnosing the osteoarticular involvements of these diseases is sometimes challenging and treatment may delay due to this[10]. But, delays in diagnosis and inadequate treatment may lead to spinal deformities or severe neurological complications[4]. Paravertebral soft tissue involvement and epidural abscess may be added to clinical table in disease progression.

Tuberculous and brucellar spondylodiscitis may be seen in all age groups. But majority of the research reported that tuberculous spondylodiscitis is seen in middle-aged adults, and brucellar spondylodiscitis affects people with advanced-decade ages[19]. There was no difference between the ages of our patient groups. This may be related with the lower number of our cases when compared with the studies in the literature. This parameter may be evaluated more accurately in more crowded case groups.

Disease involvement generally affects the lumbar part of the spine in brucellous spondylodiscitis cases. Tuberculosis generally affects midthoracic-upper lumbar regions[3]. We found no difference regarding this diference, but this may also be related with our narrow sample size. But, one case with tuberculosis had kyphosis deformity in dorsal region, which is specific to this disease.

Paravertebral abscess related with brucellosis is either a less developing, or well-limited situation. Literature data about brucellosis cases generally suggest paravertebral abscess develops at low rates[6,12]. Epidural abscess formations may be together with spondylodiscitis and may cause radix pressure related clinical view[13]. But, both paravertebral and the epidural abscess formations are more frequent in tuberculous cases. Presence of epidural abscess in consecutive vertebras and presence of wide paravertebral abscess are frequently seen in tuberculosis[2,14]. These findings are also more frequent in our cases in accordance with the literature data.

Osteofits formations, namely Parrot beak, may develop in early periods of brucellosis cases, due to bone erosion and following bone healing in vertebral upper end plate[8]. Erosion is more focal. But, in tuberculosis cases, erosion is more prevalent and Gibbud deformity may develop due to vertebral collapse[3]. In our study, all of the tuberculosis cases, and 38% of the brucellous cases had bone erosion.

Spinal radiographies and computerized tomography may provide limited information for disease involvement. Nonetheless, MRI is the most useful imaging modality in the diagnosis and follow-up of the disease[1,13,23]. Contrasted T1A images are important for showing the contrast enhancement in disc and vertebra end plateaus in the early periods of disease[23]. MRI is also an outstanding method for allowing multiplan imaging. Sagittal, and coronal assessments, which can be added in a necessity, provide valuable contribution to diagnosis, particularly in the evaluation of multifocal skip lesions of tuberculous spondylodiscitis[24]. Since our study is a retrospective one, and lack of fat suppressed T2 weighted images, which are not routinely taken during spinal evaluations in our clinic, the assessments in this sequence could not be performed. But, especially in early periods of the disease, it would show the edema in bone and soft tissues better than fat non-suppressed T2 weighted images, and it should be included in the protocols for patients whom cannot take contrast agents.

As a conclusion; MRI, which is a non-invasive and highly sensitive imaging modality, should be the first choice in early diagnosis of spondylodiscitis. Multifocal involvement, wide paravertebral-epidural abscess, and significant bone destruction should be informative of tuberculous spondylodiscitis; whereas, more focal involvement, well-limited paravertebral involvements, and focal bone destruction may be indicative of brucellous spondylodisicitis. Nevertheless, exact diagnosis should be based on correlations of clinical and laboratory findings with radiological findings, and also additional histopathological verification in some patients.

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