Volume: 29, Issue: 4, October 2018 pp: 213-218 ORIGINAL ARTICLE

SPINAL INFECTIONS

Okan TÜRK[1]

[1]İstanbul Training and Research Hospital, Department of Neurosurgery, İstanbul, Turkey.

ORCID Number:
https://orcid.org/0000-0002-0074-2835

Address: Okan TÜRK,
İstanbul Eğitim ve Araştırma Hastanesi, Fatih, İstanbul, Turkey.
E-mail: drokanturk@gmail.com
Phone:
Received: 5th June, 2018.
Accepted: 6th September, 2018.

ABSTRACT

Objective: The aim of the study is to reveal the etiological and epidemiological characteristics of frequently observed spinal infections.

Material and Method: The patients who applied and diagnosed with spinal infection to Neurosurgery Polyclinics between 2013 and 2018 were investigated. The age, sex, radiological examinations, neurological consultations, medical treatments and comorbidities of the patients were evaluated. The cases were divided into 3 groups as tuberculosis, brucella and other pyogenic factors. The vertebra segment involved and the surrounding bone, neural and soft tissue dispersion of infection were analyzed.

Results: The study was made with 75 cases, in total, and consisted of 26 (34.7 %) females and 49 (65.3 %) males. The ages of the cases varied between 19 and 85 and the average was 59.32 ± 16.14 years. The abscess rate of the cases was observed to be 70.7 % (n=53), and was found in paraspinal, epidural and psoas areas of 52.8 % (n=28), 32.1 % (n=17) and 15.1 % (n=8) of the patients, respectively. In consequence of the analysis, we observed the factor to be 57.3 % (n=43) pyogenic, 28.0 % (n=21) tuberculosis, and 14.7 % (n=11) brucella.

Conclusion: Spinal infections are highly morbid, prevalent and destructive infections. Early diagnosis and treatment are necessary in order to preserve spinal stability and neurological function. Spinal infections are generally medically treated with antibiotics. However, debridement and intervertebral fusion are generally practiced in order to support healing, restrict neurological deterioration and ensure spinal stability in case surgical intervention is indicated.

Key words: Spinal infections, brucella, vertebra abscess

Level of evidence: Retrospective clinical study, Level III.

INTRODUCTION

Spinal infections can involve one or more than one of vertebra, neural tissues and the surrounding soft tissues. It is hard to diagnose this group early due to its insidious onset and asymptomatic clinic course [4]. 10-50 % of the patients develop neurological deficit. Though rarely, severe neurological deficits can also be seen such as paraplegia [4,11,15]. This is a disease group that is expensive to treat and which takes a morbid course as a consequence. Therefore, early diagnosis and treatment are necessary.

Spinal infections demand great effort to diagnose due to their insidious onset. These infections are encountered in males more frequently compared to females. They are generally adult diseases and appear after 50 [12,15]. This research attempts to reveal the etiological and epidemiological characteristics of frequently observed spinal infections.

MATERIAL AND METHOD

In this study, the files were retrospectively analyzed for the patients who applied to Neurosurgery Polyclinics between 2013 and 2018 and who were diagnosed with spinal infection. The age, sex, radiological examinations, neurological consultations, medical treatments and comorbidities of the patients were evaluated.

The cases were divided into 3 groups as tuberculosis, brucella and other pyogenic factors. The vertebra segment involved and the surrounding bone, neural and soft tissue dispersion of infection were analyzed.

Statistical Analyse

NCSS (Number Cruncher Statistical System) 2007 (Kaysville, Utah, USA) program was used for the statistical analyses. Descriptive statistical methods (average, standard deviation, median, and frequency, rate, minimum and maximum) were used while evaluating the data of the study. Kruskal Wallis test was availed of for the comparison of three or more groups that did not show normal distribution. Fisher-Freeman-Halton test and Fisher's Exact Test were used for the comparison of qualitative data. The significance level was determined to be p<0,05 (Table-1).

RESULTS

The study was carried out in Neurosurgery Clinics of Istanbul Training and Research Hospital with 75 cases, in total, and consisted of 26 (34.7 %) females and 49 (65.3 %) males. The ages of the cases varied between 19 and 85 and the average was 59.32 ± 16.14 years.

The incidence rate of diabetes was found out to be 20.0 % (n=15). The analysis on the involved areas produced the following rates: lumbar 52.0 % (n=39), thoracic 20.0 % (n=15), thoracolumbar 9.3 % (n=7), lumbosacral 14.7 % (n=11) and cervical 4.0 % (n=3) (Figure-1).

The abscess rate of the cases was observed to be 70.7 % (n=53), and was found in paraspinal, epidural and psoas areas of 52.8 % (n=28), 32.1 % (n=17) and 15.1 % (n=8) of the patients, respectively (Figure-1).

In consequence of the analysis, we observed the factor to be 57.3 % (n=43) pyogenic, 28.0 % (n=21) tuberculosis, and 14.7 % (n=11) brucella (figure-3, Table-1).

The type of development of the cases is 68.0 % (n=51) spontaneous and 32.0 % (n=24) postop. The follow-up periods varied from 2 to 45 months and the average follow-up period was 10.09 ± 6.85 years (Figure-4).

The factor showed statistically significant difference according to the presence of diabetes (p=0,005; p<0,01). The pyogenic rate of the diabetes group was found to be significantly higher than the non-diabetes group. The tuberculosis and brucella rates of the non-diabetes group were found to be significantly higher than the diabetes group (Table-2, Figure-5).

Type of development does not indicate statistically significant difference according to diabetes presence (p>0,05) (Table-3).

No statistically significant difference was obtained between the age distributions according to the involved area (p>0,05).

The abscess condition demonstrates statistically significant difference according to the involved area (p=0,014; p<0,05). The abscess incidence rate of lumbosacral group was found to be significantly lower compared to the lumbar, thoracolumbar and cervical groups. The abscess incidence rate of thoracic group was found to be significantly lower compared to the thoracolumbar and cervical groups. The rate of paraspinal abscess in thoracolumbar group was determined to be significantly higher than thoracic group.

The epidural abscess rate of cervical group was found to be significantly higher compared to the lumbar, thoracic and lumbosacral groups.

The factor does not demonstrate statistically significant difference according to the involved area (p>0,05).

Table-1. The Distribution of Descriptive Characteristics

		n (%)
Age (years)	*Min-Max (Median)*	19-85 (62)
	Ave±Sd	59.32±16.14
Sex:	**Female**	26 (34,7)
	Male	49 (65,3)
Diabetes	**N/A**	60 (80,0)
	Yes	15 (20,0)
Involved area	**Lumbar**	39 (52,0)
	Thoracic	15 (20,0)
	Thoracolumbar	7 (9,3)
	Lumbosacral	11 (14,7)
	Cervical	3 (4,0)
Abscess	**N/A**	22 (29,3)
	Yes	53 (70,7)
	Paraspinal	28 (52,8)
	Epidural	17 (32,1)
	Psoas	8 (15,1)
Factor	**Pyogenic**	43 (57,3)
	Tuberculosis	21 (28,0)
	Brucella	11 (14,7)
Type of development	**Spontaneous**	51 (68,0)
	Postop	24 (32,0)
Follow-up period (months)	*Min-Max (Median)*	2-45 (9)
	Ave±Sd	10.09±6.85

The factor showed statistically significant difference according to the presence of abscess (p=0,042; p<0,05). The pyogenic factor rate of epidural abscess cases was higher compared to the psoas abscess cases. The rate of tuberculosis in psoas abscess cases was higher than the cases without abscess but with paraspinal and epidural abscesses (Figure-6).

The type of development showed statistically significant difference according to the presence of abscess (p=0,032; p<0,05). The rate of spontaneous development in psoas abscess cases was higher compared to the paraspinal abscess cases. The rate of postop development in paraspinal abscess cases was higher compared to the psoas abscess cases (Table-4).

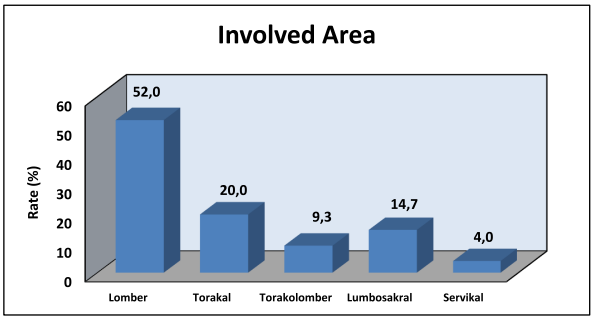

Figure-1. Involved area distributions

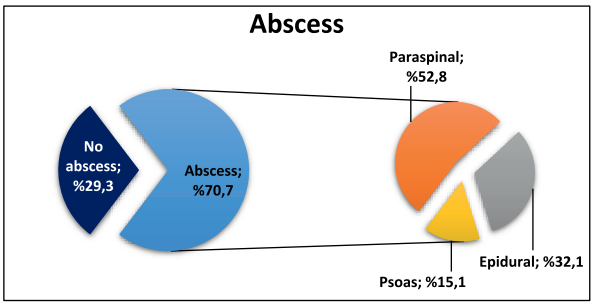

Figure-2. The distribution for abscess cases

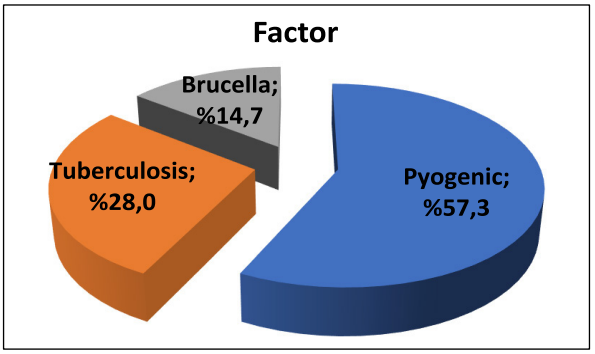

Figure-3. Factor distributions

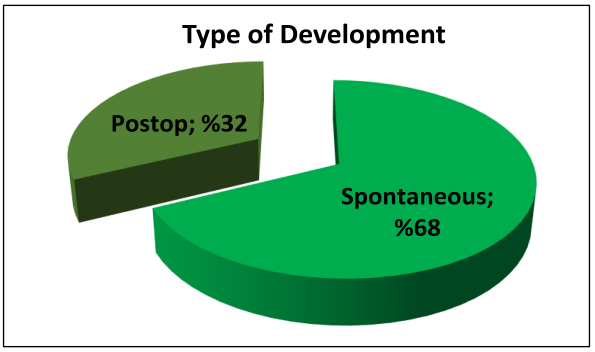

Figure-4. Type of development distributions

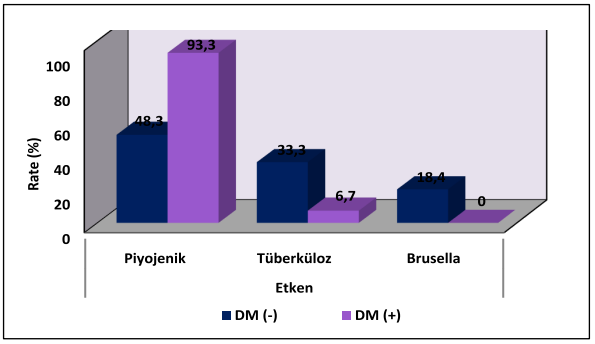

Figure-5. Factor distributions according to diabetes presence

Table-2. Evaluations for the Presence of Diabetes

		DM (-) (n=60)	DM (+) (n=15)	*p*
Factor; *n (%)*	**Pyogenic**	29 (48,3)	14 (93,3)	*[a]0,005***
	Tuberculosis	20 (33,3)	1 (6,7)	
	Brucella	11 (18,4)	0 (0)	
Type of development; *n (%)*	**Spontaneous**	42 (70,0)	9 (60,0)	*[b]0,540*
	Postop	18 (30,0)	6 (40,0)	

[a]Fisher Freeman Halton Test *[b]Fisher's Exact Test* ***p<0,01*

Table-3. Evaluations for the Involved Area

		Involved area					
		Lumbar (n=39)	**Thoracic (n=15)**	**Thoracolumbar (n=7)**	**Lumbosacral (n=11)**	**Cervical (n=3)**	***p***
Age (years)	*Min-Max (Median)*	26-85 (66)	19-81 (60)	23-69 (62)	44-80 (60)	26-70 (62)	***[c]0,860***
	Ave±Sd	60.56±16.64	58.40±17.99	55.57±16.34	60.36±11.02	52.67±23.44	
Abscess; *n (%)*	**N/A**	9 (23,1)	7 (46,6)	0 (0)	6 (54,5)	0 (0)	***[a]0,014****
	Paraspinal	16 (41,0)	4 (26,7)	5 (71,4)	3 (27,3)	0 (0)	
	Epidural	6 (15,4)	4 (26,7)	2 (28,6)	2 (18,2)	3 (100)	
	Psoas	8 (20,5)	0 (0)	0 (0)	0 (0)	0 (0)	
Factor; *n (%)*	**Pyogenic**	24 (61,5)	5 (33,3)	3 (42,8)	9 (81,8)	2 (66,7)	***[a]0,127***
	Tuberculosis	12 (30,8)	6 (40,0)	2 (28,6)	1 (9,1)	0 (0)	
	Brucella	3 (7,7)	4 (26,7)	2 (28,6)	1 (9,1)	1 (33,3)	

*[a]Fisher Freeman Halton Test [c]Kruskall Wallis Test *p<0,05*

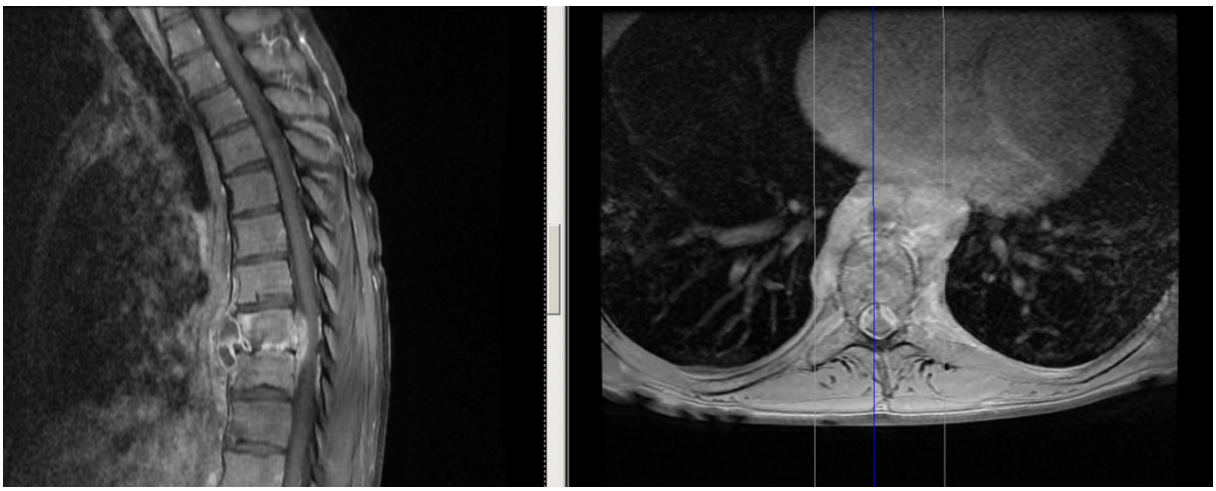

Figure 6. Axial and sagittal MR imaging of the patient with tuberculosis spondylitis.

Table-4. The Evaluations for Abscess Cases

		Abscess				
		N/A (n=22)	**Paraspinal (n=28)**	**Epidural (n=17)**	**Psoas (n=8)**	***[a]p***
Factor; *n (%)*	**Pyogenic**	14 (63,6)	15 (53,6)	12 (70,6)	2 (25,0)	***0,042****
	Tuberculosis	6 (27,3)	7 (25,0)	2 (11,8)	6 (75,0)	
	Brucella	2 (9,1)	6 (21,4)	3 (17,6)	0 (0)	
Type of development; *n (%)*	**Spontaneous**	16 (72,7)	14 (50,0)	13 (76,5)	8 (100)	***0,032****
	Postop	6 (27,3)	14 (50,0)	4 (23,5)	0 (0)	

*[a]Fisher Freeman Halton Test *p<0,05*

DISCUSSION

The clinical characteristics of cases are determined by the virulence of an active microorganism and the resistance of host. Cases generally apply for medical consultancy due to backache, fever, night sweat and extremity distress [15]. In this study, the most frequent complaint for application was backache. Many studies pointed out diabetes mellitus (DM), immune suppression, kidney failure, liver failure, malignity and alcoholism as significant risk factors [5,10,12-13,20,24]. In this study, diabetes mellitus was the most frequent accompanying disease by 20 %. In particular, pyogenic infection risk is statistically significant higher for the patients with DM (p<001).

There are three forms of spinal infections that vary according to etiological characteristics: tuberculosis, brucella and other pyogenic infections [2]. It is reported that mostly thoracic vertebra is affected in tuberculosis cases [1,4-5,9-10,15,17,22-23]. This study observed that lumbar vertebra involvement was more prevalent. Cervical area demonstrated the least prevalent involvement. Brucella generally indicates lumbar area involvement [2,23,27]. This study accomplished the same results with the literature. Soft tissue changes in tuberculosis form are encountered more frequently compared to the other infection cases [4-5,7,21]. In contrast with the literature, this study revealed that soft tissue changes were observed more frequently in brucella. This is followed by tuberculosis and pyogenic factors, respectively. The study conducted by Hamidi et al. revealed that thoracic area involvement was more frequent in tuberculosis cases while lumbar area involvement was higher for brucella cases [15]. On the contrary, this study encountered brucella in thoracic area and pyogenic and tuberculosis in lumbar area more frequently. The prevalence of abscess in thoracolumbar area is higher than the other areas (p<0,05).

Vertebral osteomyelitis is a morbid disease which is expensive to treat. The infection at upper spinal area increases morbidity. Infection at upper spinal area is associated with neurological deficit [8,14]. The serious deficit rate obtained in this study supports such data.

MRI is the gold standard imaging modality while biopsy and culture accompanied by CT is the gold standard for diagnosis. If a patient is hemodynamically and neurologically stable, biopsy should always be performed previous to treatment [26]. It may not be possible to reproduce factor for every patient. Treatment should commence according to clinical and other lab characteristics [15,18-19]. Regardless whether it is a defined organism, patients generally are obliged to be subject to intravenous antibiotics for more than 1 month [3]. Aggressive antibiotic treatment, early immobilization, close observance of inflammatory markers and clinical condition constitute the basis for the first conservative treatment of discitis. Furthermore, all the attempts must focus on the determination of causative pathogen before initiating any treatment in case the patient is hemodynamically and neurologically stable [25]. Surgical treatment should be considered in cases of neurological deterioration, wide vertebral destruction with instability and big epidural abscess [6,26]. Debridement should be the main purpose; however, decompression and fusion are also required if neural compression or spinal cord instability are present [16]. Instrumentation and combined debridement for stabilization are associated with faster postoperative mobilization, decreased postoperative morbidity and decreased risk for pseudoarthrosis and kyphosis [28].

CONCLUSION

Spinal infections are highly morbid, prevalent and destructive infections. Early diagnosis and treatment are necessary in order to preserve spinal stability and neurological function. Spinal infections are generally medically treated with antibiotics. However, debridement and intervertebral fusion are generally practiced in order to support healing, restrict neurological deterioration and ensure spinal stability in case surgical intervention is indicated.

REFERENCES

1. Akman S, Sirvanci M, Talu U, Gogus A, Hamzaoglu A. Magnetic resonance imaging of tuberculous spondylitis. *Orthopedics* 2003; 26: 69-73.
2. Bodur H, Erbay A, Çolpan A, Akıncı E. Brucellar spondylitis. *Rheumatol Int* 2004; 24(4): 221-226.
3. Chong BSW, Brereton CJ, Gordon A, Davis JS. Epidemiology, Microbiological Diagnosis, and Clinical Outcomes in Pyogenic Vertebral Osteomyelitis: A 10-year Retrospective Cohort Study. *Open Forum Infect Dis* 2018; 5(3): ofy037.
4. Colmenero JD, Jiménez-Mejías ME, Sánchez-Lora FJ, Reguera JM, Palomino-Nicás J, Martos F, García de las Heras J, Pachón J. Pyogenic, tuberculous, and brucellar vertebral osteomyelitis: a descriptive and comparative study of 219 cases. Ann Rheum Dis 1997; 56(12): 709-715.
5. Currier BL, Kim CW, Eismont FJ. Infections of the spine. *Rothman-Simeone The Spine*. 2006; pp: 1265-1309.
6. Di Martino A, Papapietro N, Lanotte A, Russo F, Vadalà G, Denaro V. Spondylodiscitis: standards of current treatment. *Curr Med Res Opin* 2012; 28(5): 689-699.
7. Doğan H. Vertebranın granülomatöz infeksiyonları. *J Turk Spinal Surg* 2006; 17(2): 33-51.
8. Eismont FJ, Bohlman HH, Soni PL, Goldberg VM, Freehafer AA. Pyogenic and fungal vertebral osteomyelitis with paralysis. *J Bone Joint Surg* 1983; 65-A: 19–29.
9. Farah K, Graillon T, Dufour H, Fuentes S. Adjacent level spondylodiscitis in a patient with thoracic spondylodiscitis: A case report and review of the literature. *Neurochirurgie*. 2018; 64(1): 53-56.

10. Gasbarrini AL, Bertoldi E, Mazzetti M, Fini L, Terzi S, Gonella F, Mirabile L, Barbanti Bròdano G, Furno A, Gasbarrini A, Boriani S. Clinical features, diagnostic and therapeutic approaches to haematogenous vertebral osteomyelitis. *Eur Rev Med Pharmacol Sci* 2005; 9(1): 53-66.
11. Govender S. Spinal infections. *J Bone Joint Surg* 2005; 87-B(11): 1454-1458.
12. Gupta A, Kowalski TJ, Osmon DR, Enzler M, Steckelberg JM, Huddleston PM, Nassr A, Mandrekar JM, Berbari EF. Long-term outcome of pyogenic vertebral osteomyelitis: a cohort study of 260 patients. *Open Forum Infect Dis* 2014; 1: 107.
13. Güven O, Bezer M, Aydın N, Ketenci İE. Tüberküloz spondilitinde tedavi stratejisi: 55 hastanın uzun dönem takip sonuçları. *Acta Orthop Traumatol Turc.* 2008; 42(5): 334-343.
14. Hadjipavlou AG, Mader JT, Necessary JT, Muffoletto AJ. Hematogenous pyogenic spinal infections and their surgical management. *Spine* 2000; 25: 1668–1677.
15. Hamidi AA, Ozsut H, Basaran S, Cagatay A, Eraksoy H. Tuberculous, pyogenic and brucellar spondylodiscitis: clinical and laboratory features of 103 cases. *Clin J* 2015; *28*(2): 80-86.
16. Hsieh PC, Wienecke RJ, O'Shaughnessy BA, Koski TR, Ondra SL. Surgical strategies for vertebral osteomyelitis and epidural abscess. *Neurosurg Focus* 2004; 17(6): E4.
17. Kandemir Ö, Milcan A, Uğuz M. Spinal infeksiyonlu olguların etyolojik, klinik ve laboratuvar olarak karşılaştırılması: ön çalışma. *J Turk Spinal Surg* 2008; 19(4): 427-434.
18. Kim J, Kim YS, Peck KR, Kim ES, Cho SY, Ha YE, Kang CI, Chung DR, Song JH. Outcome of culture-negative pyogenic vertebral osteomyelitis: comparison with microbiologically confirmed pyogenic vertebral osteomyelitis. *Semin Arthritis Rheum* 2014; 44: 246–252.
19. Lora-Tamayo J, Euba G, Narváez JA, Murillo O, Verdaguer R, Sobrino B, Narváez J, Nolla JM, Ariza J. Changing trends in the epidemiology of pyogenic vertebral osteomyelitis: the impact of cases with no microbiologic diagnosis. *Semin Arthritis Rheum* 2011; 41: 247–255.
20. Luzzati R, Giacomazzi D, Danzi MC, Tacconi L, Concia E, Vento S. Diagnosis, management and outcome of clinically-suspected spinal infection. *J Infect* 2009; 58(4): 259-265.
21. Panta OB, Pathak YR, Karki DB. Magnetic resonance imaging findings in spondylodiscitis. *J Nepal Health Res Counc* 2018; 15(3): 217-221.
22. Talı ET, Gültekin S. Spinal infeksiyonların tanı ve tedavisinde görüntüleme yöntemlerinin algoritmik kullanımı. *Ankem Derg* 2005; 19(2): 174-177.
23. Turgut M, Turgut AT, Koşar U. Spinal brucellosis: Turkish experience based on 452 cases published during the last century. *Acta Neurochir (Wien)* 2006; 148(10): 1033-1044.
24. Turunç T, Demiroğlu YZ, Uncu H, Çolakoğlu S, Arslan H. A comparative analysis of tuberculous, brucellar and pyogenic spontaneous spondylodiscitis patients. *J Infect* 2007; 55(2): 158-163.
25. Sharan AD, Tang SY, Vaccaro AR. *Basic Science of Spinal Diseases*. Jaypee Brothers Medical Publishers, Philadelphia 2013.
26. Shenoy K, Singla A, Krystal JD, Razi AE, Kim YH, Sharan AD. Discitis in adults. *JBJS Rev* 2018; 6(6): e6.
27. Solera J, Lozano E, Martínez-Alfaro E, Espinosa A, Castillejos ML, Abad L. Brucellar spondylitis: review of 35 cases and literature survey. *Clin Infect Dis* 1999; 29(6): 1440-1449.
28. Zarghooni K, Rollinghoff M, Sobottke R, Eysel P. Treatment of spondylodiscitis. *Int Orthop* 2012; 36(2): 405-411.