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Case Report

Atypical staphylococcus aureus infection and screws loosening mimicking recurrence of spinal tuberculosis after surgery of debridement, interbody fusion and internal fixation

Yi Yang[1], Haifeng Huang[1], Xia Wu[2], Litai Ma[1], Junfeng Zeng[1], Lingli Li[1], Ying Hong[3], Beiyu Wang[1], Hao Liu[1]

Departments of [1]Orthopedics, [2]Pathology, [3]Operation Room, West China Hospital, Sichuan University, Chengdu 610041, Sichuan Province, P. R. China

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Abstract: Spinal tuberculosis, also named as Pott's disease, was first described by Percival Pott in 1779. Early diagnosis and anti-tuberculosis treatment is important for spinal tuberculosis but it is really not easy to make a diagnosis of spinal tuberculosis in some atypical patients. A 14-year-old male patient presented to our hospital in July 2013 and was diagnosed as spinal tuberculosis. He received a standard anti-tuberculosis treatment after an anterior-posterior union approach surgery with instrument. However, 24 months after surgery the patient presented to our hospital again for the "recurrent" symptoms. Radiological examinations showed the screws loosening. The blood biochemical results were as follows: ESR 27.0 mm/h, C-RP 9.86 mg/L, WBC 7.42×10^9/L, NEUT% 60.9%. We considered this as the recurrent tuberculosis and a surgery of removal of instruments was performed. To our surprise, pathological tissue around the screws HE staining supported a pyogenic infection and the acid fast staining returned a negative result. Microbial cultivation repeatedly supported a staphylococcus aureus infection. Dressing change and intravenous levofloxacin was performed every day. After a two-week intensive therapy, the patient' symptoms were relived and the ESR, C-RP and WBC returned to normal level. After a follow-up of 12 months, the patient was free of any discomfort, the the ESR, C-RP and WBC were all in normal level. Spinal surgeons should make a careful differential diagnosis from pyogenic spondylitis, brucellar spondylitis, sarcoidosis, metastasis, multiple myeloma, lymphoma, and other diseases before they make a diagnosis of spinal tuberculosis even in a patient with a history of spinal tuberculosis and the "recurrent" symptoms.

Keywords: Spinal tuberculosis, Pott's disease, spinal surgery, staphylococcus aureus infection, differential diagnosis

Introduction

Spinal tuberculosis, a most common type of osteoarticular tuberculosis, also named as Pott's disease, was first described by Percival Pott in 1779 [1, 2]. The clinical characteristics of spinal tuberculosis includes local pain, local tenderness, stiffness and spasm of the muscles, a cold abscess and kyphosis deformity. Plain radiographs can give a good overview, computed tomography (CT) especially the three-dimensional CT scan can demonstrate abnormalities earlier than plain radiography such as bone destruction, osteolytic, localized and sclerotic while magnetic resonance imaging (MRI) can readily demonstrate involvement of the vertebral bodies, disk destruction, cold abscess, vertebral collapse, and spinal deformities. Cytological and microbiological detection, erythrocyte sedimentation rate (ESR), polymerase chain reaction and other immunological tests and tumor marker detection can help to make a differential diagnosis from pyogenic spondylitis, brucellar spondylitis, sarcoidosis, metastasis, multiple myeloma, and lymphoma [3-6].

However, it is really not easy to make a diagnosis of spinal tuberculosis in some atypical patients. Antituberculous treatment should be started as early as possible, much before an etiological diagnosis is established. The treat-

Figure 1. The lumbar anterior-posterior, lateral and flexion-extension X-rays showed pedicel screws loosening but the stability of lumbar spine is not damaged.

ment response includes pain relief, decrease in neurological deficit, and even correction of spinal deformity [7]. In some patients such as severe kyphosis, an evolving neurological deficit, and clinical deterioration, surgeries like debridement of the infected material with or without bone grafts and instrumentations are recommended. Even individuals with a previous history of spinal tuberculosis who might have been cured or successfully completed their antituberculous treatment might develop spinal tuberculosis again. The "recurrent" spinal tuberculosis infection might be due to 1) a newly acquired infection, or activation of latent M. tuberculosis from a previous exposure which did not result in active TB disease, or activation of latent M. tuberculosis which remained following treatment completion for a prior episode of active TB disease [8]. Considering the "recurrent" symptoms and signs along with the imaging manifestations at the same segments, doctors often tend to the diagnosis of "recurrence of tuberculosis". However, in some cases, the patients may suffered from a new type of infection or metastasis. Considering the little knowledge of this area, we present a special case of atypical staphylococcus aureus infection and screws loosening mimicking recurrence of tuberculosis after debridement, interbody fusion and internal fixation in a child with Pott's disease to share our experience with our spinal surgeons.

Case description

The patient provided informed consent for the publication of his clinical and radiological data. This case report was approved by Medical Ethical Committee of West China Hospital, Sichuan University.

A 14-year-old male patient presented to our hospital in July 2013 with a history of serious low back pain, night sweat for 50 days. The physical examinations showed tenderness and percussion pain at spinous process of L4. The lumbar CT scan showed bone destruction at vertebral bodies L3-L4, and cold abscess around the vertebral bodies. The blood biochemical results were as follows: ESR 94.0 mm/h, C reactive protein (C-RP) 19.40 mg/L,

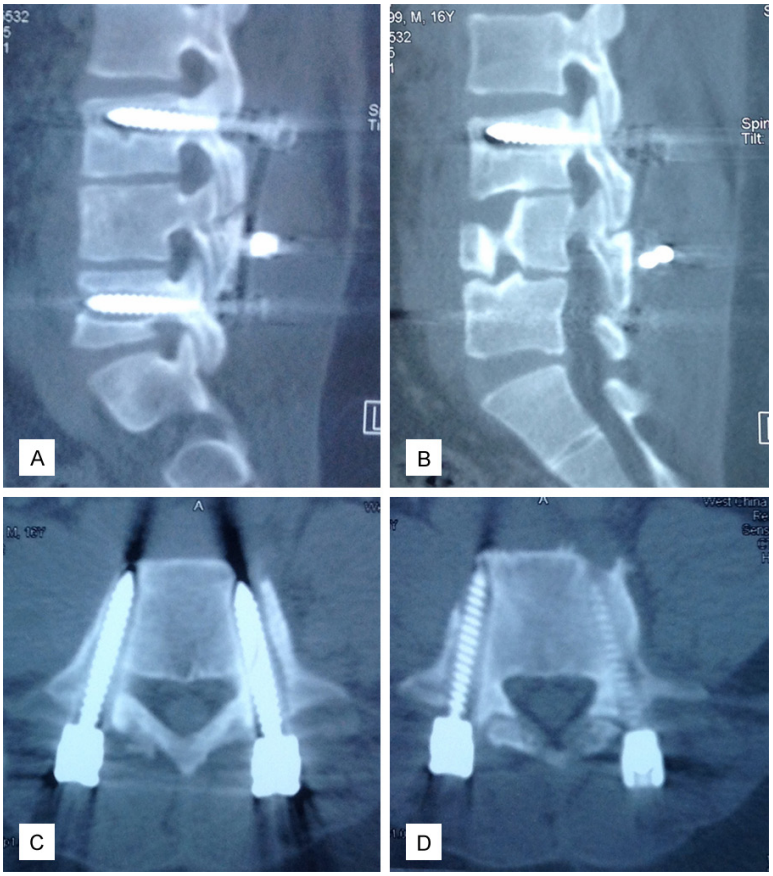

Figure 2. The three dimensional reconstruction of CT scan images confirmed the pedicel screws loosening.

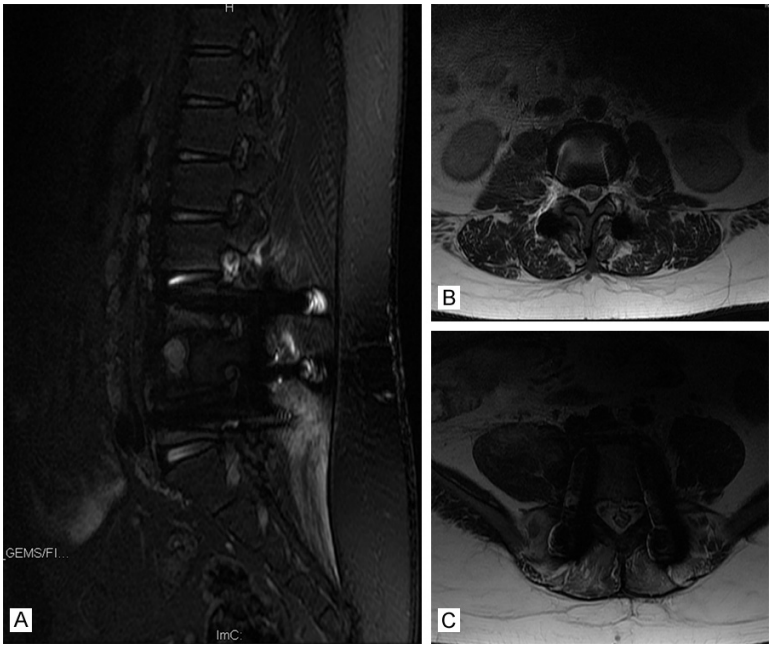

Figure 3. The lumbar MRI showed an abnormal signal in the vertebral body of L4.

hemoglobin 121 g/L, white blood cell (WBC) 5.84×10^9/L, neutrophile granulocyte percentage (NEUT%) 61.1%. After careful and comprehensive physical, biochemical and radiological examinations, he was diagnosed as spinal tuberculosis. An anterior-posterior union approach surgery was performed: anterior debridement, iliac bone graft, and abscess drainage was conducted; posterior lateral bone graft and posterior pedicle screw rod system was applied. After surgery the patient received an eighteen-month-time antituberculous treatment: rifampicin, isoniazid and pyrazinamide. General supportive measures, together with rest and nutritional support, were also recommended. The symptom such as low back pain, night sweat was relived.

However, 24 months after surgery the patient presented to our hospital again for the "recurrent" symptoms such as low back pain, night sweat. The physical examinations showed tenderness and percussion pain at his back. The lumbar anterior-posterior, lateral and flexion-extension X-rays showed pedicel screws loosening but the stability of lumbar spine is not damaged (**Figure 1**). The three dimensional reconstruction of CT scan images confirmed the pedicel screws loosening in this patient (**Figure 2**). The lumbar MRI showed an abnormal signal in the vertebral body of L4 (**Figure 3**). The blood biochemical results were as follows: ESR 27.0 mm/h, C-RP 9.86 mg/L, WBC 7.42×10^9/L, NEUT% 60.9%. Considering the history of spi-

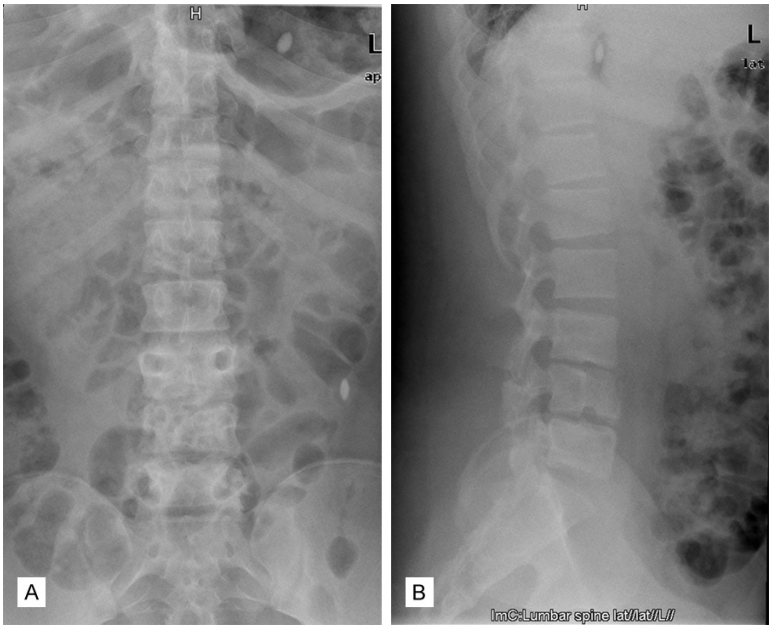

Figure 4. The postoperative lumbar anterior-posterior and lateral X-rays showed the successful removal of pedicle screws and rod system in this patient.

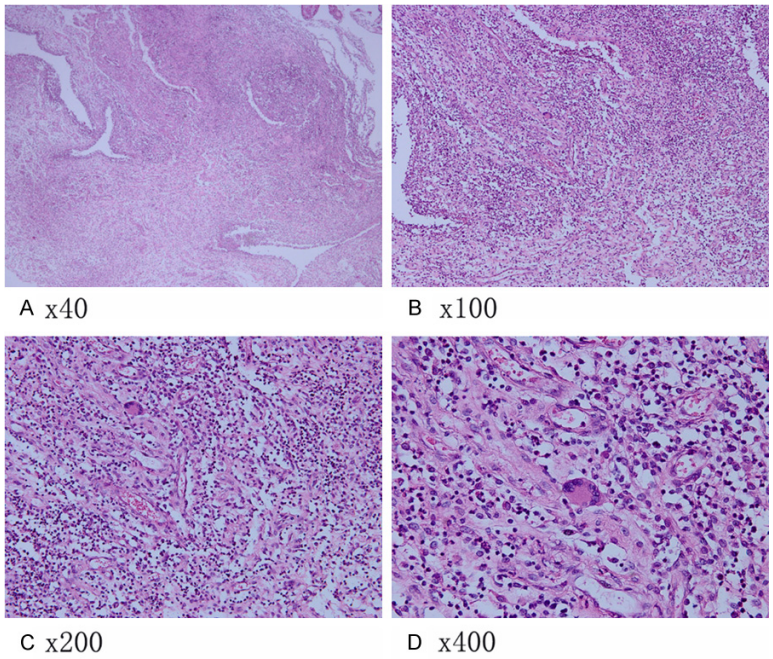

Figure 5. Pathological tissue around the screws hematoxylin and eosin (HE) staining supported a pyogenic infection (A. ×40; B. ×100; C. ×200; D. ×400).

nal tuberculosis, the "recurrent" symptoms, the radiological results and the elevated ESR and C-RP, we tend to the recurrence of tuberculosis. In order to avoid the subsequent complications, we decided to remove pedicle screws and rod system. During surgery the screws loosening was confirmed again and tissues around the screws were sent to department of pathology and department of clinical laboratory for pathological and microbial examination. Hemostasis is rechecked and a drainage tube was inserted before the skin was sutured subcutaneously. The postoperative lumbar anterior-posterior and lateral X-rays showed the successful removal of pedicle screws and rod system in this patient (**Figure 4**).

24 hours after surgery the patient suffered a sustained fever (around 38.3°) and 4 days after the surgery the incision began to appear secretions. Dressing change every day was performed and secretion samples were collected for microbiological detection every day. To our surprise, pathological tissue around the screws hematoxylin and eosin (HE) staining supported a pyogenic infection (**Figure 5**) and the acid fast staining returned a negative result (**Figure 6**). Microbial cultivation (from tissues around the screws and secretions from the deep incision) repeatedly supported a staphylococcus aureus infection and drug sensitivity test showed that it is sensitive to antibiotics such as Gentamicin, levofloxacin, Oxacillin, Tetracycline, Vancomycin but it is resistant to Rifampin. Dressing change and intravenous levofloxacin was performed every day. After a two-week intensive therapy, the patient' symptoms were relived and the ESR, C-RP and WBC returned to normal level. After a follow-up of 12 months, the patient was free of any discomfort, the the ESR, C-RP and WBC were all in normal level.

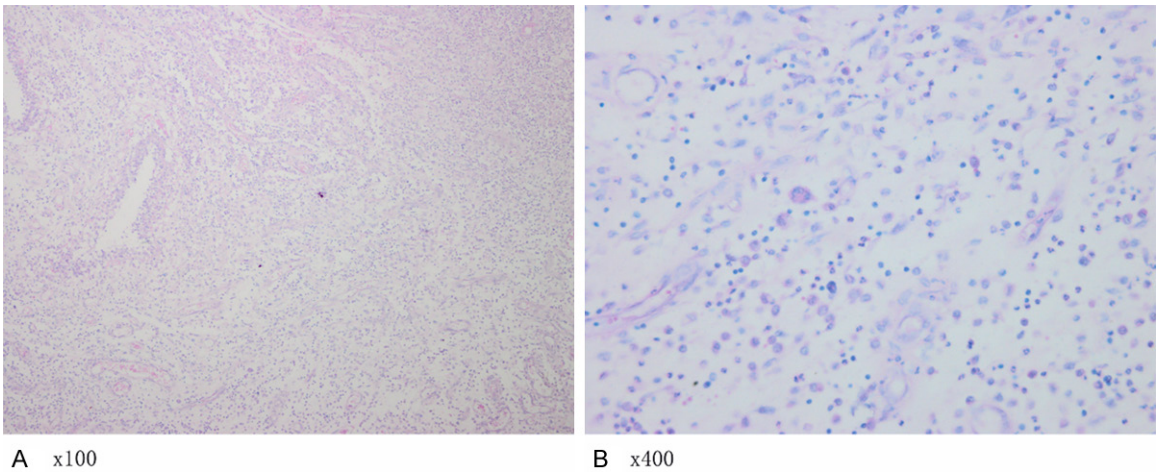

Figure 6. The acid fast staining returned a negative result (A. ×100; B. ×400).

Discussion

In some spinal tuberculosis patients such as severe kyphosis, an evolving neurological deficit, and clinical deterioration, surgeries of debridement, bone graft and internal fixation are recommended. The surgeries can be performed through anterior, posterior or an anterior-posteriorunion approach [9-12]. Surgeries combined with anti-tuberculous chemotherapy were effective for most spinal tuberculosis patients [13]. However, postoperative deterioration of the condition has been reported to be as high as 9% [14]. Considering the "recurrent" symptoms and signs along with the imaging manifestations at the same segments, doctors often tend to the diagnosis of "recurrence of tuberculosis". However, in some cases, the patients may suffered from a new type of infection or metastasis. Failure to consider a new type of infection or metastasis may lead to a wrong diagnosis, a delay of the right treatment method and a catastrophic result for the patient. Lakshmi et al. reported a case of thoracic spinal osteomyelitis due to Salmonella enteritidis in an immunocompetent mimicking tuberculosis [15]. Mathur et al. reported a 22-year-old female patient of aneurysmal bone cyst was earlier wrongly diagnosed with tuberculosis of spine, and received anti-tubercular chemotherapy [16]. Huang et al. reported a case of primary non-Hodgkin's lymphoma of the lumbar vertebrae mimicking tuberculous spondylitis [17]. De Morais et al. reported a case of histoplasmosis mimicking tuberculosis spondylodiscitis in a patient with rheumatoid arthritis [18]. The "recurrent" symptoms and signs along with the history of spinal tuberculosis, anti-tubercular chemotherapy, and surgery of debridement, interbody fusion and internal fixation can really induce doctors to make a wrong diagnosis.

In this case report the patient was diagnosed as spinal tuberculosis in July 2013 and the symptoms and signs reoccurred 24 months after his primary surgery of debridement, interbody fusion and internal fixation. The patient had received an eighteen-month anti-tubercular chemotherapy after his surgery. X-rays and CT scan images confirmed the pedicel screws loosening in this patient. The lumbar MRI showed an abnormal signal in the vertebral body of L4. We considered this patient as the recurrence of spinal tuberculosis before his second surgery. To our surprise, pathological tissue around the screws HE staining supported a pyogenic infection and the acid fast staining returned a negative result. Microbial cultivation repeatedly supported a staphylococcus aureus infection. Even when the patient got infected by staphylococcus aureus still remains unclear (during his first surgery or postoperative infection?), we do think that the patient' symptom and the screws loosening may have a correlation the staphylococcus aureus infection. The incidence of surgical site infection following spinal surgery is usually below 3% but can increase to 12% with instrumentation [19, 20]. In 1880 and 1882, Ogston described staphylococcal disease and its role in sepsis and abscess formation [21, 22]. Staphylococcus

aureus is distinguished from other staphylococcal species on the basis of the gold pigmentation of colonies and positive results of coagulase, mannitol fermentation, and deoxyribonuclease tests [23]. Durkin et al. identified 642 surgical site infections following 57,559 spinal procedures and reported that common causes of surgical site infection were Staphylococcus aureus (n = 380; 59%), coagulase-negative staphylococci (n = 90; 14%), and Escherichia coli (n = 41; 6.4%) [24]. Abdul-Jabbar et al. identified 239 cases of surgical site infections following 7529 operative spine cases and reported that most commonly isolated pathogen was Staphylococcus aureus (45.2%), followed by Staphylococcus epidermidis (31.4%) [25]. Penicillin remains the drug of choice if the isolate is sensitive to it and Vancomycin is the drug of choice for methicillin-resistant isolates. Rifampicin may be effective in some cases which depends on the drug sensitivity test. Sensitive antibiotics according to the results of drug sensitivity test combined with dressing and drainage can be effective for most staphylococcus aureus infection after spinal surgeries. Removal of instruments were recommend in cases such as deterioration of disease, screws loosening, screws pullout, instrument breakout and so on. In this patient the screws were identified as loosening and we choose to remove the instruments to avoid some subsequent mayor complications.

In summary, early diagnosis and anti-tuberculosis treatment is important for spinal tuberculosis. It is really not easy to make a diagnosis of spinal tuberculosis in some atypical patients even we have collected the clinical symptoms and signs, radiological examination results and microbiological detection results. Spinal surgeons should make a careful differential diagnosis from pyogenic spondylitis, brucellar spondylitis, sarcoidosis, metastasis, multiple myeloma, lymphoma, and other diseases before they make a diagnosis of spinal tuberculosis even in a patient with a history of spinal tuberculosis and the “recurrent” symptoms.

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Disclosure of conflict of interest

None.

Address correspondence to: Hao Liu, Department of Orthopedics, West China Hospital, Sichuan University, 37 Guoxuexiang, Chengdu 610041, Sichuan Province, P. R. China. Tel: +86 18980601369; Fax: 028-85423438; E-mail: liuhao6304@hotmail.com

References

[1] Garg RK and Somvanshi DS. Spinal tuberculosis: a review. J Spinal Cord Med 2011; 34: 440-454.

[2] Dobson J. Percivall Pott. Ann R Coll Surg Engl 1972; 50: 54-65.

[3] Yilmaz MH, Mete B, Kantarci F, Ozaras R, Ozer H, Mert A, Mihmanli I, Ozturk R and Kanbergoglu K. Tuberculous, brucellar and pyogenic spondylitis: comparison of magnetic resonance imaging findings and assessment of its value. South Med J 2007; 100: 613-614.

[4] Sharma A, Chhabra HS, Chabra T, Mahajan R, Batra S and Sangondimath G. Demographics of tuberculosis of spine and factors affecting neurological improvement in patients suffering from tuberculosis of spine: a retrospective analysis of 312 cases. Spinal Cord 2016; [Epub ahead of print].

[5] Behrsin RF, Junior CT, Cardoso GP, Barillo JL, de Souza JB and de Araujo EG. Combined evaluation of adenosine deaminase level and histopathological findings from pleural biopsy with Cope’s needle for the diagnosis of tuberculous pleurisy. Int J Clin Exp Pathol 2015; 8: 7239-7246.

[6] Seo KJ, Yoo CY, Im SY, Yeo CD, Jung JH, Choi HJ and Yoo JY. A possible complementary tool for diagnosing tuberculosis: a feasibility test of immunohistochemical markers. Int J Clin Exp Pathol 2015; 8: 13900-13910.

[7] Tuli SM. Treatment of neurological complications in tuberculosis of the spine. J Bone Joint Surg Am 1969; 51: 680-692.

[8] Millet JP, Shaw E, Orcau A, Casals M, Miro JM and Cayla JA. Tuberculosis recurrence after completion treatment in a European city: reinfection or relapse? PLoS One 2013; 8: e64898.

[9] Lin B, Shi JS, Zhang HS, Xue C, Zhang B and Guo ZM. Subscapularis Transthoracic Versus Posterolateral Approaches in the Surgical Management of Upper Thoracic Tuberculosis: A Prospective, Randomized Controlled Study. Medicine (Baltimore) 2015; 94: e1900.

[10] Shen X, Huang X, Xiao S, Liu H, Zhang Y, Xiang T, Wang G, Sheng B, Huang S and Liu X. Surgical treatment of selected patients with

multilevel contiguous thoracolumbar spinal tuberculosis by only posterior instrumentation without any bone fusion. Int J Clin Exp Med 2015; 8: 18611-18619.
[11] Zeng H, Wang X, Zhang P, Peng W, Liu Z and Zhang Y. Single-stage posterior transforaminal lumbar interbody fusion, debridement, limited decompression, 3-column reconstruction, and posterior instrumentation in surgical treatment for single-segment lumbar spinal tuberculosis. Acta Orthop Traumatol Turc 2015; 49: 513-521.
[12] Ekinci S, Akyildiz F, Ersen O, Parlak A and Koca K. A retrospective controlled study of three different operative approaches for the treatment of thoracic and lumbar spinal tuberculosis. Clin Neurol Neurosurg 2015; 136: 51.
[13] Jiang T, Zhao J, He M, Wang K, Fowdur M and Wu Y. Outcomes and Treatment of Lumbosacral Spinal Tuberculosis: A Retrospective Study of 53 Patients. PLoS One 2015; 10: e0130185.
[14] Turgut M. Spinal tuberculosis (Pott's disease): its clinical presentation, surgical management, and outcome. A survey study on 694 patients. Neurosurg Rev 2001; 24: 8-13.
[15] Lakshmi K and Santhanam R. Thoracic spinal osteomyelitis due to Salmonella enteritidis in an immunocompetent mimicking tuberculosis. J Neurosci Rural Pract 2016; 7: 317-319.
[16] Mathur S, Aswani Y, Sankhe SS and Hira PR. Aneurysmal bone cyst of thoracic spine mimicking spinal tuberculosis. J Craniovertebr Junction Spine 2011; 2: 99-101.
[17] Huang B, Li CQ, Liu T and Zhou Y. Primary non-Hodgkin's lymphoma of the lumbar vertebrae mimicking tuberculous spondylitis: a case report. Arch Orthop Trauma Surg 2009; 129: 1621-1625.
[18] de Morais SS, Mafra Mde O, Canterle EM, de Lima LL and Ribeiro SL. [Histoplasmosis mimicking tuberculosis spondylodiscitis in a patient with rheumatoid arthritis]. Acta Reumatol Port 2008; 33: 360-363.
[19] Brown EM, Pople IK, de Louvois J, Hedges A, Bayston R, Eisenstein SM, Lees P; British Society for Antimicrobial Chemotherapy Working Party on Neurosurgical Infections. Spine update-Prevention of postoperative infection in patients undergoing spinal surgery. Spine 2004; 29: 938-945.
[20] Wimmer C, Gluch H, Franzreb M and Ogon M. Predisposing factors for infection in spine surgery: a survey of 850 spinal procedures. J Spinal Disord 1998; 11: 124-128.
[21] Ogston A. Micrococcus Poisoning. J Anat Physiol 1882; 17: 24-58.
[22] Lowy FD. Medical progress-Staphylococcus aureus infections. N Engl J Med 1998; 339: 520-532.
[23] Classics in infectious diseases. "On abscesses". Alexander Ogston (1844-1929). Rev Infect Dis 1984; 6: 122-128.
[24] Durkin MJ, Dicks KV, Baker AW, Moehring RW, Chen LF, Sexton DJ, Lewis SS and Anderson DJ. Postoperative infection in spine surgery: does the month matter? J Neurosurg Spine 2015; 23: 128-134.
[25] Abdul-Jabbar A, Berven SH, Hu SS, Chou D, Mummaneni PV, Takemoto S, Ames C, Deviren V, Tay B, Weinstein P, Burch S and Liu C. Surgical Site Infections in Spine Surgery Identification of Microbiologic and Surgical Characteristics in 239 Cases. Spine 2013; 38: E1425-E1431.