Abstract

**Objective:** Spinal osteomyelitis is an uncommon cause of back pain but it has potential to compromise nervous system and even death may occur if not treated effectively. We compared the underlying diseases, clinical, and complications among patients with pyogenic (PVO), brucellar (BVO), and tuberculous vertebral osteomyelitis (TVO).

**Patients and Methods:** In this descriptive-comparative study, all patients older than 1 year who were hospitalized at Rasoul-e-Akram Hospital from 1999 to 2009 with a confirmed diagnosis of VO were included. The diagnosis of VO was confirmed in the presence of compatible clinical features, vertebral CT scan or MRI. Etiological diagnosis of VO was defined when the microorganism was isolated from blood culture, bone biopsy, paravertebral abscess aspiration; typical histopathological pattern of tuberculosis (caseating granuloma) or malignancy in bone biopsy; Wright’s or serum agglutination test ≥ 1/80 or 2ME ≥ 1/40 according to the national guidelines. Analytical statistics such as the chi-square and t test were used to find correlation and relationships among the variables. P< 0.05 was considered to indicate statistical significance.

**Results:** A total number of 87 patients studied. There were 62 (71.26%) males and 25 (28.73%) females. Thirty-eight (43.67%) patients had PVO, 26 (29.88%) had TVO, 18 (20.68%) had BVO, 3 (3.4%) had malignant disorder with metastasis to bone, and the remaining 2 (2.29%) cases had fungal VO. Fever and back pain were the most common symptoms in PVO (12), but in TVO the most common symptom was back pain. DM and previous bone spinal surgery were the most common underlying diseases in PVO patients (P=0.000). Paravertebral abscess was reported in 6 (23.7%) patients with TVO and 6 patients (15.78%) with PVO, but no such complication was noted in BVO group.

**Conclusion:** There are significant differences between VO by different microorganisms that help physician to start empirical medical treatment while waiting to definite diagnosis by blood culture, culture from paravertebral abscess, serology and bone biopsy.

**Keywords:** Vertebral osteomyelitis; pyogenic osteomyelitis; brucella osteomyelitis; tuberculous osteomyelitis

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**Introduction**

Spinal osteomyelitis is an uncommon cause of back pain but it has potential to compromise nervous system and even death may occur if not treated effectively. The clinical feature of vertebral osteomyelitis (VO) is nonspecific. It starts gradually and follows an indolent course making early diagnosis difficult (1).
with attention to the differential aspects of TVO, PVO, and BVO, admitted to the Rasoul-e-Akram Hospital during 10 years.

**Patients and Methods**

In this descriptive-comparative study, all patients older than 1 year who were hospitalized in Rasoul-e-Akram Hospital between 1999 and 2009 with a confirmed diagnosis of VO were included. The diagnosis of VO was confirmed in the presence of compatible clinical features (fever and spinal pain with inflammatory features) and imaging studies (irregular erosions in the end plates of adjacent vertebral bodies, narrowing of the intervening disk space, and epidural, paraspinal or psoas abscess). Vertebral CT scan or MRI was done for all patients.

Etiological diagnosis of VO was defined when the microorganism was isolated from blood culture, bone biopsy, or paravertebral abscess aspiration; typical histopathological pattern of tuberculosis (i.e., caseating granuloma) or malignancy was observed in bone biopsy; Wright’s or serum agglutination test ≥ 1/80 or 2ME ≥ 1/40 according to national guidelines (8).

All demographic data, clinical manifestations, underlying disease, laboratory findings (CBC, ESR, CRP, culture results, pathology, and serology), Tuberculin Skin Test (TST), surgery and other necessary data were recorded in special data sheets.

WBC ≥ 12000/μl, ESR > 17mm/hr for men and > 25mm/hr for women and CRP ≥ 12mg/l, TST ≥ 10 mm were considered as the cut-off levels.

After that, all the data were brought out from the data sheets and analyzed by the statistical software SPSS 15. Descriptive statistics of frequency, central tendency indices consisting of mean, and dispersion indicator consisting standard deviation were used to evaluate the results. Analytical statistics such as the chi-square and t test were used to find correlation and relationships among the variable. P< 0.05 was considered to indicate statistical significance.

This study was approved by the Research Deputy of Tehran University of Medical Sciences, Faculty of Medicine (Pardis Hemmat).

**Results**

During the study period, a total number of 114 patients had been diagnosed as having VO in Rasoul-e-Akram Hospital but only 87 cases had confirmed diagnosis. Of this, 62 (71.26%) patients were male and 25 (28.73%) patients were female. Mean age of the patients was 44.8 years (range, 5-76 years).

Thirty-eight cases (43.67%) had PVO, 26 (29.88%) had TVO, 18 (20.68%) had BVO, 3 (3.4%) had malignant disorder with metastasis to bone, and the remaining 2 cases (2.29%) had fungal VO (FVO, candida albicans diagnosed by culture).

Clinical manifestations and laboratory data are shown in Tables 1 and 2, respectively.

**Table 1. Frequency (percentage) of clinical manifestations in patients with vertebral osteomyelitis (VO)**

Paravertebral abscess was reported in 6 (23.7%) patients with TVO and 6 (15.78%) patients with PVO (P= 0.000 with respect to BVO). We do not have P value of 0 in biostatistics, please correct it. If the number is very small, you may use P< 0.001. The sentence should be rewritten. How many paravertebral abscesses were recorded in brucella patients?

In patients with TVO, 2 patients (7.6%) had positive smear for acid-fast bacilli (AFB) in bone biopsy specimen and the other had pathologic finding consistent with tuberculosis. DM and previous bone spinal surgery were the most common underlying diseases in PVO patients (P= 0.001). The mean duration of symptoms before diagnosis is shown in Table 3.

**Table 2. Laboratory data in patients with VO**

Paravertebral abscess was reported in 6 (23.7%) patients with TVO and 6 (15.78%) patients with PVO (P= 0.000 with respect to BVO). We do not have P value of 0 in biostatistics, please correct it. If the number is very small, you may use P< 0.001. The sentence should be rewritten. How many paravertebral abscesses were recorded in brucella patients?

In patients with TVO, 2 patients (7.6%) had positive smear for acid-fast bacilli (AFB) in bone biopsy specimen and the other had pathologic finding consistent with tuberculosis. DM and previous bone spinal surgery were the most common underlying diseases in PVO patients (P= 0.001). The mean duration of symptoms before diagnosis is shown in Table 3.
Blood culture was performed in all cases. It was negative in all patients with TVO and BVO. However, blood culture was positive in 26 cases of PVO. *S. aureus* was isolated in paravertebral abscess material in 8 cases who underwent surgery, but blood culture was negative in 4 cases.

Eight patients (30.7%) with TVO and 10 patients (26.3%) with PVO underwent surgery because of paravertebral abscess and pathologic fracture, but all BVO patients were treated by medical therapy (P= 0.001).

In BVO group 14 patients and in TVO group 20 cases were followed for one year. All of them were symptom-free. Unfortunately patients with PVO were not followed.

### Discussion

Vertebral osteomyelitis is an uncommon infection. However, its incidence is increasing owing to frequent use of invasive procedures, spinal surgery, and growing number of immunosuppressed patients and people with debilitating diseases (9, 10).

We found that most patients suffered from PVO and in consistent with other studies, *S. aureus* was the most frequent isolated organism in this group followed by gram negative bacilli (11, 12).

We confirmed that underlying diseases have discriminative role to diagnose PVO from TVO and BVO. The association of some underlying diseases such as diabetes mellitus (DM), injection drug use and surgery with PVO has been reported. Colmenero et al. found that previous focal infection and/or bacteremia, DM, and bone spinal surgery were the most common risk factors in patients with PVO, respectively (11). Allan et al. reported that vascular disease, immunosuppressive therapy, and DM were the most predisposing factors in patients with PVO (3).

In compatible to other studies we found that fever and back pain were the most common symptoms in PVO (13), but in TVO the most common symptom was back pain, so TVO should be considered in the differential diagnosis of patients with chronic back pain (14).

In consistent with Colmenero study, the absence of fever, neurological symptoms, and paravertebral and epidural abscess were significantly more frequent in TVO in comparison to two others groups (11). Delaying in diagnosis may explain the high frequency of complication in this group because a clear relation exists between delayed diagnosis and the presence of more destructive lesions and neurologic deficits (15, 16).

Sacroiliitis and spondylitis are the most frequent clinical forms of osteoarticular involvement in patients with brucellosis. Hassanjaniroshan reported that 32 cases out of 469 patients (6.82%) with brucellosis suffered from spondylitis (5). Colmenero et al. showed that the incidence of VO among 918 patients with brucellosis was 10.4% (17).

Brucellar epidural abscess is very rare (18) and we did not find any complication in patients with BVO. In contrast to the current finding and other studies (18-20), Colmenero showed that 10% of patients with BVO had psoas abscess (17).

Inflammatory markers such as ESR and CRP are sensitive, but lack the specificity required to be clinically useful in ruling out PVO (21). We found that increased ESR and leukocytosis were more frequent in PVO, in fact, when leukocytosis, increased ESR and CRP are present, these findings are suggestive of PVO (16, 22).

In our study patients with BVO had more frequent elevated CRP levels in comparison to other groups. Colmenero reported that 75% of patients with BVO had elevated serum CRP levels (17).

Etiologic diagnosis of VO is difficult, requiring in 93.2% of cases the performance of bone biopsies (11). The success rate of CT-guided bone biopsy for identification of etiologic agent in VO is 76-91% (24). In our study nearly 50 percent of patients needed bone biopsy to make the diagnosis. Bone biopsy was necessary to establish the diagnosis in 100% of TVO and 21% of PVO, because of high diagnostic yield of standard agglutination test for brucellosis, bone biopsy was not done for any patient in this group. Colmenero showed that 45% of patients with VO underwent surgical intervention for therapeutic purposes (11), but in our study only in 20.68% of the patients, surgical intervention was performed to treat the osteomyelitis. Since surgical intervention is generally
indicated in cases who develop complications, the lower rate of surgical intervention here compared to Colmenero study may be related to less prevalence of complications such as paravertebral abscess or neurologic deficits in our series.

In conclusion, we showed that there are significant differences between TVO, BVO, and PVO according to clinical and laboratory findings. These differences help physicians to after obtaining blood culture, bone biopsy, paravertebral abscess culture, serology, and other useful diagnostic tests.

Acknowledgment
This study is a summary of Dr. Jabari-Lak thesis (No. 10403). We thank the members of the Research Deputy of Faculty of Medicine, Tehran University of Medical Sciences.

References