

Clinical Study

The utility of image-guided percutaneous needle aspiration biopsy for the diagnosis of spontaneous vertebral osteomyelitis: a systematic review and meta-analysis

Jakrapun Pupaibool, MD^{a,*}, Shawn Vasoo, MD^b, Patricia J. Erwin, MLS^c,
Mohammad Hassan Murad, MD^d, Elie F. Berbari, MD^a

^aDivision of Infectious Diseases, Department of Medicine, Mayo Clinic College of Medicine, 200 1st St SW, Rochester, MN 55905, USA

^bDivision of Clinical Microbiology, Department of Laboratory Medicine and Pathology, Mayo Clinic College of Medicine, 200 1st St SW, Rochester, MN 55905, USA

^cMayo Clinic Library, Mayo Clinic, 200 1st St SW, Rochester, MN 55905, USA

^dDivision of Preventive and Occupational Medicine, Department of Medicine, Mayo Clinic College of Medicine, 200 1st St SW, Rochester, MN 55905, USA

Received 13 January 2014; revised 6 May 2014; accepted 9 July 2014

Abstract

BACKGROUND CONTEXT: Spontaneous vertebral osteomyelitis (SVOM) is mostly acquired via hematogenous seeding. Diagnosis of SVOM is often delayed because of the insidious nature and rarity of this disease. The microbiological yield of image-guided needle biopsy varies between 36% and 91%. The utility and accuracy of this procedure have not been systematically reviewed.

PURPOSE: To systematically review and assess the diagnostic accuracy of image-guided spinal biopsy for SVOM in adults when compared with combined reference standards.

STUDY DESIGN: A systematic review and meta-analysis.

SAMPLE: Seven retrospective studies involving 482 patients with clinical and/or radiologic suspicion of SVOM who underwent image-guided spinal biopsy were included.

OUTCOME MEASURES: The primary outcome measure was diagnostic odds ratio (DOR). Other outcomes included likelihood ratio of a positive test (LRP), likelihood ratio of a negative test (LRN), sensitivity, and specificity.

METHODS: We searched in six medical databases through September 1, 2013 for studies evaluating the performance of image-guided spinal biopsy for SVOM with no limits on language or publication date. Combined reference standards, which included histopathologic findings consistent with vertebral osteomyelitis, identifications of pathogens from open surgery and/or blood cultures, and/or evidence of clinical and radiologic improvement after empiric antimicrobial therapy, were used for comparison. The random-effect model was used for meta-analysis. Two reviewers independently selected the studies.

RESULTS: Three hundred fifty-eight potentially relevant studies were identified. Seven studies were included in our analysis. Two studies that used only single reference standard were excluded in the sensitivity analysis, and five studies involving 352 patients were pooled. Image-guided spinal biopsy had a DOR of 45.50 (95% confidence interval [CI], 13.66–151.56), an LRP of 16.76 (95% CI, 5.51–50.95), an LRN of 0.39 (95% CI, 0.24–0.64), a sensitivity of 52.2% (95% CI, 45.8–58.5), and a specificity of 99.9% (95% CI, 94.5–100). This is based on the assumption that combined reference standards are a valid standard for comparison.

CONCLUSIONS: Image-guided spinal biopsy is highly specific and performs well in predicting SVOM, but has a moderate accuracy for ruling out this diagnosis. This procedure should be

FDA device/drug status: Not applicable.

Author disclosures: **JP:** Nothing to disclose. **SV:** Nothing to disclose. **PJE:** Nothing to disclose. **MHM:** Nothing to disclose. **EFB:** Nothing to disclose.

The authors have no financial, institutional, or other relevant relationships that would constitute a potential conflict of interest with this study. No outside funding was used for this study.

* Corresponding author. Division of Infectious Diseases, Department of Medicine, Mayo Clinic College of Medicine, 200 1st St SW, Rochester, MN 55905, USA. Tel.: (585) 355-1337; fax: (417) 820-3528.

E-mail address: a_jkp@hotmail.com (J. Pupaibool)

considered in the diagnostic work-up of adults suspected with SVOM. © 2015 Elsevier Inc. All rights reserved.

Keywords: Vertebral osteomyelitis; Vertebral spondylodiscitis; Spine infection; Vertebral infection; Biopsy; Aspiration

Introduction

Vertebral osteomyelitis (VOM) or infectious spondylodiscitis is an inflammatory process resulting from an infection affecting the vertebral body and/or the adjacent intervertebral discs. The term “spontaneous vertebral osteomyelitis” (SVOM) is used for VOM that does not arise from a spinal injury or after a spinal procedure. The increasing incidence of SVOM is likely related to an aging population, growing numbers of immunosuppressed hosts, intravenous drug users, and the use of chronic indwelling vascular access catheters [1,2]. The etiologic agents of SVOM include pyogenic bacteria and organisms causing granulomatous inflammation (*Mycobacterium tuberculosis*, *Brucella* spp., and fungal infections). About 40% to 60% of SVOM are caused by *Staphylococcus aureus*, typically acquired via hematogenous seeding [3]. Diagnosis is often delayed as SVOM is not suspected and because the disease often follows an insidious course [4]. It can cause significant morbidity and mortality if not recognized and treated appropriately.

Spontaneous vertebral osteomyelitis often presents with back pain with or without neurologic deficits, fever, peripheral leukocytosis, high serum inflammatory markers, and bacteremia. The most common symptom of VOM is low back pain, which presents in 90% to 95% of patients. Constitutional symptoms such as fever, night sweats, and loss of appetite can be detected in 50% to 70% of patients. Neurologic deficits (particularly lower extremity weakness), which are more specific symptoms, present in less than 50% of patients [5,6]. Magnetic resonance imaging of the spine often establishes the diagnosis and is associated with a high sensitivity and specificity [7,8]. Occasionally, the diagnosis is difficult since the imaging features may be delayed or represent a noninfectious etiology [9]. Early and accurate diagnosis of spinal infections can prevent invasive surgical procedures for the patient [10]. Definitive microbiological and histopathologic diagnosis is often required for optimal management, unless blood cultures guide the treatment in hematogenous SVOM. Open biopsy and cultures remain the reference gold standard for diagnosis of SVOM [11,12]. However, spinal surgery is not indicated for every patient. Open surgery is mostly indicated in patients with neurologic deficits. The diagnosis is often made by a combination of clinical symptoms and radiologic abnormalities, as well as evidence of osteomyelitis/discitis from histopathologic findings and/or identification of pathogens from biopsy specimens or blood cultures. Percutaneous needle aspiration biopsy under computed tomography (CT) or fluoroscopic guidance has been recognized as a valuable method to obtain tissue diagnosis of vertebral disease, and the success rates of

both methods are comparable [13,14]. Its simplicity and costeffectiveness lead to the acceptance of this procedure as the standard tool for the diagnosis of SVOM. Depending on the study, the diagnostic microbiological yields of percutaneous image-guided needle aspiration biopsy have been reported to vary from 36% to 91% [15–17]. The wide range of success rates depend on the organism and multiple factors, such as prior use of antimicrobial therapy, biopsy techniques, and advances in imaging studies.

The overall utility and accuracy of percutaneous needle aspiration biopsy under image guidance has not been systematically reviewed. We, therefore, conducted a meta-analysis and systematic review to assess the accuracy of image-guided spinal biopsy for the diagnosis of SVOM in adults when compared with combined reference standards.

Material and methods

Eligibility criteria

We included peer-reviewed retrospective or prospective studies that evaluated the performance of percutaneous needle aspiration biopsy under CT or fluoroscopic guidance (the index test) as a diagnostic test for SVOM in adult patients suspected to have SVOM based on clinical presentation and radiologic (X-rays, CT scan, or magnetic resonance imaging) abnormalities. Our reference standard for the diagnosis of SVOM included identification of organisms by staining, polymerase chain reaction, or cultures from spinal specimens obtained from open or endoscopic surgery; growth of organisms in blood cultures; histopathology consistent with VOM by demonstration of acute, chronic, or granulomatous inflammation or pathogens; or evidence of clinical and/or radiologic improvement after empiric antimicrobial therapy. Studies with available data for a standard 2×2 contingency table were included in the final analysis. Studies that involved patients with sacral osteomyelitis, VOM after a spinal surgery or spinal procedure, VOM after penetrating spinal injury, or spinal hardware infections were excluded from the analysis.

Literature search and retrieval of studies

The protocol of this systematic review complies with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement [18]. The computerized literature search conducted on September 1, 2013 was conducted by an expert librarian (PJE) in six medical databases, including PubMed, Ovid MEDLINE, Ovid EMBASE, SCOPUS, and ISI Web of Science. No language or publication date restrictions were applied to the search. The search terms

Download English Version:

<https://daneshyari.com/en/article/4096509>

Download Persian Version:

<https://daneshyari.com/article/4096509>

[Daneshyari.com](https://daneshyari.com)