

Clinical Study

# Increased short- and long-term mortality among patients with infectious spondylodiscitis compared with a reference population

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## Abstract

**BACKGROUND CONTEXT:** Information on short- and especially long-term mortality among patients with infectious spondylodiscitis is sparse.

**PURPOSE:** To analyze mortality, factors associated with death, and cause-specific mortality rates among patients with infectious nonpostoperative spondylodiscitis.

**STUDY DESIGN:** A case-cohort study.

**PATIENT SAMPLE:** We identified all patients aged 18 years or older treated for infectious spondylodiscitis from January 1994 to May 2009 at hospitals in Funen County, Denmark.

**OUTCOME MEASURES:** Overall and cause-specific mortality.

**METHODS:** Mortality rates among patients were compared with rates among a reference population using Kaplan-Meier plots and mortality rate ratios (MRRs). Short-term mortality was defined as deaths within first year after admission and long-term mortality was deaths thereafter. Factors associated with death were determined.

**RESULTS:** Among 298 identified patients, 61 (20%) died within the first year. Adjusted MRRs were 16.8 (95% confidence interval: 9.9–28.5) for 0 to 90 days; 4.2 (2.5–7.0) for 91 to 365 days; 2.2 (1.6–2.9) for 1 to 4 years; and 1.7 (1.2–2.5) for 5 to 14 years. Mortality rate ratios stratified on microbiological etiology were 8.8 (3.3–22.1) for 0 to 90 days; 1.4 (0.3–5.8) for 91 to 365 days; 3.2 (2.0–5.1) for 1 to 4 years; and 1.1 (0.5–2.4) for 5 to 14 years for unknown etiology and 24.0 (13.0–44.2) for 0 to 90 days; 6.0 (3.1–11.5) for 91 to 365 days; 1.9 (1.1–3.2) for 1 to 4 years; and 2.7 (1.5–4.7) for 5 to 14 years among *Staphylococcus aureus* infections. The main factors associated with short-term mortality were severe neurologic deficits at the time of admission, epidural abscess, and comorbidities. Long-term mortality seemed independent of microbiological etiology.

**CONCLUSIONS:** Mortality remained high the first year after admission and thereafter decreased with time to a level close to the reference population. Short-term mortality was especially related to infection with abscess formation and neurologic deficits and long-term mortality was related to alcohol dependency. © 2015 Elsevier Inc. All rights reserved.

## Keywords:

Mortality; Spine; Bone diseases; Infectious; Cause of death; Prognosis; Vertebral osteomyelitis; Factors associated with death

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## EVIDENCE & METHODS

### Context

The long term impact of spondylodiscitis on patient survival is poorly understood. The authors present results from a Danish registry that covers the time period from 1994–2009.

### Contribution

Among 298 patients with spondylodiscitis, 20% died within the first year of treatment. Severe neurologic deficit, epidural abscess and medical co-morbidities were associated with an increased risk of mortality. The mortality risk decreased sharply following the first year postinfection and approximated that of the reference population in the long term.

### Implications

As a retrospective study that relied on data imparted to a registry, this work may be confounded by selection and indication bias, as well as the possibility of misclassification. This is particularly important, given the fewer than 300 cases on which determinations are made. When one takes into account the relatively high mortality rate within the first year following infection, it is possible that the lack of substantive differences encountered at periods beyond one year may be due to issues associated with sample power and could be subject to type II error. Given the study design and limitations inherent to this type of work, the evidence presented here should be considered no higher than Level III.

—The Editors

## Introduction

The incidence of infectious spondylodiscitis seems to be rising [1,2]. This is presumably because of a combination of improved diagnostic methods, the increasing elderly population, and a possibly better clinical workup of patients with bacteremia. Despite many reports concerning the clinical characteristics and epidemiology of infectious spondylodiscitis, there is still limited knowledge about the prognosis in terms of mortality.

Descriptive studies of spondylodiscitis have reported mortality within different periods. For example, the in-hospital mortality has been reported to be 4% to 6% among all patients [1,3] and as high as 27% among those aged 65 years or older [4]. The overall 1-year mortality has been estimated to be 11% [5–7]. A study of spondylodiscitis cases related to *Staphylococcus aureus* (*S. aureus*) bacteremia showed that 16% died within the first months after admission [8]. Furthermore, another study described that 18% of spondylodiscitis cases with positive culture of blood or biopsy with *S. aureus* died during the treatment period

[9]. Knowledge of long-term prognosis is still sparse. Only one study has previously compared long-term prognosis with a reference population. They found that patients with *S. aureus* bacteremia and subsequent spondylodiscitis had a mortality rate ratio (MRR) of 1.3 compared with the background population during the 11 years after admission, if they survived the first year [10]. However, it is not known whether the long-term prognosis of patients with infectious spondylodiscitis is independent of the microbiological etiology.

The aim of the present study was to describe the short- and long-term mortality, factors associated with death, and cause-specific mortality rates among patients with infectious nonpostoperative spondylodiscitis and to compare these outcome measures with those of a reference population.

## Material and methods

### Study design and setting

We conducted a case-cohort study on all incident cases of adult patients treated for infectious nonpostoperative spondylodiscitis during January 1994 to May 2009 in hospitals in Funen County, Region of Southern Denmark, Denmark (population of 483,123; June 1st, 2008 [Statistics Denmark]).

As the county has a tertiary referral center for patients with spinal infections from the Region of Southern Denmark (population of 1.2 millions), the patients consisted of both residents of Funen County and the referred patients.

The clinical characteristics of residents of Funen County diagnosed with spondylodiscitis from 1995 to 2008 have previously been described [2].

### Study population

#### Spondylodiscitis patients

We used the Funen County Patient Administrative System to identify all in- and out-patients aged 18 years or older with a discharge diagnosis of possible spinal infection (The International Classification of Diseases version 10 (ICD-10) codes: A02.2; A18.0; A18.8; M46; B67.2; M49.0–3; M86; M90.0). For these patients, we read and evaluated all discharge summaries for information indicating spinal infection and if such information was found, the full medical record was reviewed. The patient was included if the combination of clinical features and results of diagnostic procedures were compatible with infectious spondylodiscitis according to the consulting physicians and the patient was treated with corresponding antibiotics. Cases due to tuberculosis or brucellosis were excluded, as were postoperative cases (ie, registered spinal procedures within 12 months before index and believed to be the origin of infection).

Each case was assigned an index date defined as the admission date to the specific department in which the diagnosis of spondylodiscitis was first suspected.

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