

Application of [18F]FDG-PET/CT Reduces In-Hospital Mortality in Patients Suffering from Pyogenic Spondylodiscitis – A Registry-Based Analysis of 29,362 Cases and the Current Diagnostic Practice in Germany

Siegmund Lang, Nike Walter, Volker Alt¹, Markus Rupp

¹University Hospital Regensburg

INTRODUCTION: Spondylodiscitis is a severe infectious condition requiring early detection and prompt treatment. Various diagnostic modalities, including contrast-enhanced imaging, alongside invasive procedures like biopsies and transesophageal echocardiography (TEE), play crucial roles in diagnosis and management. The role of PET/CT for focused search of additional infection foci and for reliable image quality in implant-associated vertebral osteomyelitis cases is increasingly recognized. This study aimed to evaluate its impact on in-hospital mortality in spondylodiscitis patients.

METHODS: We conducted a nationwide cross-sectional study using German Diagnosis Related Groups system data from 2019 to 2021. Cases with spondylodiscitis diagnoses (ICD-10 codes M46.2-, M46.3-, M46.4-) were analyzed, focusing on comorbidities, concomitant injuries, and procedures (OPS codes). In-hospital mortality was the primary outcome. Statistical comparisons and odds ratio (OR) calculations were done using Chi-Square tests and 95% confidence intervals respectively. The study didn't require informed consent or IRB approval as it used an anonymous, de-identified database.

RESULTS:

Our study of 29,362 spondylodiscitis admissions (60.1% male, 71.8% ≥65 years) from 2019 to 2021 revealed an average length of stay of 22.4 days. N=21,090 (71.8%) patients were aged 65 years or older. The most frequent diagnostic procedures were native CT of the Spine and Spinal Cord (39.4%) and MRI with contrast agent (48.1%). Transesophageal Echocardiography (TEE) was performed in 23.7% of cases. Contrast-enhanced CT scans were performed on 50.7% of patients, with the thorax being the most common area scanned (17.3%).

The PET/CT, our focus of the study, was used in 801 cases (2.7%). Regarding biopsies, open biopsy of the spine was conducted in 1,236 cases (4.2%), percutaneous biopsy of the spine in 1,413 cases (4.8%), and percutaneous needle biopsy of the spine in 393 cases (1.3%). This totals biopsies performed in 10.4% of cases.

In our cohort, the in-hospital mortality rate was 6.5%. Procedures that increased in-hospital mortality rates (OR > 1) included musculoskeletal CT with contrast agent (OR=2.50; 95% CI: 1.67-3.74), abdominal CT with contrast agent (OR=1.81, 95% CI: 1.65-1.99, p<0.001), pelvic CT with contrast agent (OR=2.16, 95% CI: 1.89-2.46, p<0.001), thoracic CT with contrast agent (OR=2.00, 95% CI: 1.82-2.20, p<0.001), CT of the spine and spinal cord with contrast agent (OR=1.10, 95% CI: 0.91-1.33, p=0.786), and other CT scans with contrast agent (OR=2.03, 95% CI: 1.90-2.17, p<0.001). Procedures not associated with a relevant change of the OR for in-hospital mortality (OR close to 1.0) included CT of the spine (OR=1.01, 95% CI: 0.93-1.10, p=0.988), MRI with contrast agent (OR=0.96, 95% CI: 0.89-1.05, p=0.530), and native MRI (OR=1.14, 95% CI: 1.04-1.25, p=0.001).

Notably, open biopsy of the spine (OR=0.86, 95% CI: 0.67-1.09, p=0.643) showed a trend toward reduced odds for in-hospital mortality. Potential protective factors, with OR less than 1, were found in percutaneous needle biopsy of the spine (OR=0.71, 95% CI: 0.56-0.88, p=0.015) and PET scan (OR=0.58, 95% CI: 0.41-0.84, p=0.027). Figure 1 shows the ORs for the tested diagnostic modalities relative to 1.0.

DISCUSSION AND CONCLUSION:

Our study encompassed over 29,000 spondylodiscitis cases, investigating the impact of various diagnostic modalities on in-hospital mortality. Interestingly, we observed a lower odds ratio for mortality in patients diagnosed using PET-CT. PET is taking on an ever more important role in the diagnosis of spondylodiscitis and is increasingly replacing conventional inflammatory scintigraphy, especially in cases where MRI cannot be performed due to metal implants, is inconclusive, or may lead to a misleading result. It's crucial to note that PET-CT is often performed in specialized centers, potentially implying that patients receiving this form of imaging might also be benefiting from superior healthcare overall.

Conversely, imaging modalities utilizing contrast agents were linked with elevated odds ratios. Despite their diagnostic benefits, these contrast agents can lead to complications like contrast-induced nephropathy or nephrogenic systemic fibrosis, especially in vulnerable patients. Contrast-induced nephropathy is a well-documented complication of iodinated contrast media, particularly in patients with pre-existing renal impairment, diabetes, or advanced age.

However, our study's cross-sectional design limits the ability to infer causality. The associations we observed do not definitively prove that the diagnostic modalities themselves directly influenced patient outcomes. It's essential to consider potential confounding factors such as the quality of care or patient characteristics.

Overall, our findings underline the need for careful selection of diagnostic modality, based on the individual patient's risk profile. Further research is necessary to isolate the impact of the imaging technique from the overall standard of care provided at the specialized centers.

Figure 1: In-hospital mortality odds ratios for diagnostic modalities

