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# Infective spondylodiscitis in hemodialysis patients

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Received : 07 September 2022
Accepted : 31 October 2022
Published : 25 November 2022

**DOI**
10.25259/SNI_821_2022

**Quick Response Code:**

## ABSTRACT

**Background:** Spondylodiscitis is a potentially catastrophic complication in patients on hemodialysis. It is slow and insidious onset and nonspecific symptoms have contributed to the late detection of this infectious process. Here, we reviewed the clinical characteristics and outcomes for patients on hemodialysis who developed spondylodiscitis who were diagnosed with spondylodiscitis.

**Methods:** From 2011 to 2021, 11 (0.4%) of 2557 patients on hemodialysis were diagnosed with spondylodiscitis based on clinical symptoms, patients averaged 56.9 years of age, seven were male, and they presented with fever in just two cases. The most frequent comorbidities included hypertension (ten patients) and diabetes mellitus (seven patients). Here, we reviewed the clinical, radiological (i.e., MR scans), laboratory markers, and treatment choices (i.e., nonsurgical vs. surgical) for these 11 hemodialysis patients.

**Results:** Ten of the 11 patients underwent spinal surgery, and five were later readmitted for recurrent of infections. There was just one nonsurgical mortality.

**Conclusion:** For patients on hemodialysis, the new-onset of spinal pain may signal the onset of spondylodiscitis which should be rapidly diagnosed with MR studies and managed in a timely fashion either with antibiotic therapy and/or with surgery/antibiotics.

**Keywords:** Chronic kidney disease, End-stage renal disease, Hemodialysis, Neurosurgery, Spondylodiscitis

## INTRODUCTION

Although the survival of patients with end-stage renal disease on hemodialysis has increased, the mortality rate for those developing bacteremia/sepsis remains high at 9.7% (i.e., due to repeated vascular access, iatrogenic immunosuppression, and urinary tract infections).[3] Specifically, spondylodiscitis requires early diagnosis and antibiotic treatment with or without surgery to reduce morbidity/mortality rates.[4,6] Here, we retrospectively reviewed the clinical, radiological, laboratory studies, treatment, and morbidity and mortality rates for 11 (0.4%) of 2557 hemodialysis patients who developed infectious spondylodiscitis (2011–2021) in the Dominican Republic.

**Table 1:** Characteristics of hemodialysis patients before the diagnosis of infective spondylodiscitis.

| Case | Age (years) | Sex | Probable cause of CKD | Comorbidity | Duration of HD previous symptoms | Type of access | Tunneling |
|---|---|---|---|---|---|---|---|
| 1 | 35 | F | Diabetic and/ or hypertensive nephropathy | Hypertension type 1 diabetes mellitus | 24 months | CVC | Tunneled |
| 2 | 41 | F | Aminoglycosides | Aminoglycosides-related bilateral ototoxicity | 12 months | CVC | Non Tunneled |
| 3 | 42 | M | Diabetic and/ or hypertensive nephropathy | Hypertension type 2 diabetes mellitus | 12 months | CVC | Tunneled |
| 4 | 50 | F | Systemic lupus erythematosus (SLE) | Hypertension type 2 diabetes mellitus SLE | 36 months | nAVF | N/A |
| 5 | 56 | M | Diabetic and/ or hypertensive nephropathy | Hypertension type 2 diabetes mellitus | 5 months | pAVF | N/A |
| 6 | 59 | F | Diabetic and/ or hypertensive nephropathy | Hypertension type 2 diabetes mellitus cervical cancer | 3 months | CVC | Tunneled |
| 7 | 65 | M | Diabetic and/ or hypertensive nephropathy | Hypertension type 2 diabetes mellitus benign prostatic hyperplasia | 36 months | CVC | Tunneled |
| 8 | 67 | M | Diabetic and/ or hypertensive nephropathy | Hypertension type 2 diabetes mellitus | 1 month | pAVF | N/A |
| 9 | 67 | M | Hypertensive nephropathy | Hypertension | 15 months | nAVF | N/A |
| 10 | 70 | M | Hypertensive nephropathy | Hypertension deep venous insufficiency | 6 months | CVC | Non tunneled |
| 11 | 74 | M | Hypertensive nephropathy | Hypertension | N/A | CVC | Non tunneled |

HD: Hemodialysis, CVC: Central venous catheter; pAVF: Prosthetic arteriovenous fistula, nAVF: Native arteriovenous fistula

**Table 2:** Summary clinical data of hemodialysis patients.

| Variables | Number (*n*=11) |
|---|---|
| Age (years) | |
| Mean±standard deviation | 56.9±12.58 |
| Range | 35-74 |
| Sex | |
| Female | 4 |
| Male | 7 |
| Medical history | |
| Hypertension | 10 |
| Diabetes mellitus | 7 |
| Clinical findings | |
| Low back pain | 9 |
| Cervical Pain | 2 |
| Fever | 2 |
| Duration of HD previous symptoms | 13.6 months |

HD: Hemodialysis

**Table 3:** Inflammatory markers at the time of diagnosis of infectious spondylodiscitis.

| Case | C-reactive protein (CRP) (0 – 5 mgDL) | Erythrocyte sedimentation rate (0–20 mm/h) | Leukocytes (3.98–10.04 × $10^9$/L) |
|---|---|---|---|
| 1 | 115.30 | 81 | 6.11 |
| 2 | 10.4 | 66 | 14.73 |
| 3 | 9.6 | 37 | 7.91 |
| 4 | 57.5 | 57 | 13.23 |
| 5 | 128.4 | 105 | 29.53 |
| 6 | 216 | 55 | 8.53 |
| 7 | 117.07 | 81 | 7.73 |
| 8 | 92.3 | 5 | 9.26 |
| 9 | 182.3 | 83 | 20.17 |
| 10 | 36.6 | 105 | 12.1 |
| 11 | 11 | 1.9 | 55 |

Note: These results correspond to the onset of the disease

## MATERIALS AND METHODS

Spondylodiscitis was diagnosed for 11 (0.4%) of 2557 hemodialysis patients seen over a 10-year period (2011–2021). The mean duration of hemodialysis before the onset of this infection was 13.6 months. Patients averaged 56.9 years of age; seven were male. The most frequent comorbidities included hypertension (ten patients) and diabetes mellitus (seven

**Table 4:** Injury characteristics at the time of diagnosis of infectious spondylodiscitis.

| Case | Injury Location | Involved structure | Type of biopsy | Biopsy results | Blood culture | Urine culture | Causative agent | Instrumentation |
|---|---|---|---|---|---|---|---|---|
| 1 | L3–L4 | Disk Vertebra Paravertebral soft-tissue | Open | Intervertebral disc (–) | Negative | N/A | N/A | Yes |
| 2 | L4–L5 | Disk Vertebra Paravertebral soft-tissue | Open | Intervertebral disc (+) Vertebra (–) | Negative | Negative | Candida tropicalis | No |
| 3 | L2–L3 | Disk Vertebra Paravertebral soft-tissue | Percutaneous | Vertebra (–) Vertebral secretion (–) | Positive | N/A | S. haemolyticus | Yes |
| 4 | L2–L3 | Disk Vertebra Paravertebral soft-tissue | Open | Intervertebral disc (+) Vertebra (+) | Negative | N/A | *Escherichia coli* | No |
| 5 | L4–L5 | Disk Vertebra Paravertebral soft-tissue | Open | Vertebral secretion (–) | Negative | N/A | N/A | No |
| 6 | L3–L4 | Disk Vertebra Paravertebral soft-tissue | Percutaneous | Vertebra (–) Vertebral secretion (–) | Negative | Negative | N/A | No |
| 7 | C5–C6 (1st admission) T9–T10 (2nd admission) L5–S1 (3rd admission) | Disk Vertebra Paravertebral soft-tissue | Open | Vertebra (+) Vertebral secretion (–) | Positive | N/A | *Staphylococcus aureus Escherichia coli* | Yes |
| 8 | T11–T12 | Disc vertebra | N/A | Vertebral secretion (+) | N/A | N/A | *Staphylococcus aureus Escherichia coli* BLEE (+) | No |
| 9 | C4–C7 | Disk vertebra | Percutaneous | Vertebral secretion (+) | Positive | N/A | MRSA | No |
| 10 | T9–T10 | Disk vertebra | Open | Vertebra (+) | N/A | N/A | ORSA | No |
| 11 | L1–L2 | Disk vertebra paravertebral soft tissue | Percutaneous | Vertebral secretion (-) | Negative | N/A | N/A | No |

ORSA: Oxacillin-resistant *Staphylococcus aureus*, MRSA: Methicillin-resistant *Staphylococcus aureus; (+): Positive Results. (-): Negative Results*

**Table 5:** Summary of cases of spondylodiscitis in hemodialysis patients.

| Author and Year | No. of Cases | Age in years, mean±SD | Sex distribution (%) | | Mean duration of HD (Months) | Blood culture/biopsy samples performance (Positive Results %) | Most common pathogens Identified (%) | Surgical intervention (%) |
|---|---|---|---|---|---|---|---|---|
| | | | M | F | | | | |
| Abid *et al.* (2008)[1] | 13 | 70.1±10 | 76.9% | 23% | 30.7 | 69.2% | *Staphylococcus aureus* (46%) | 15.3% |
| Helewa *et al.* (2008)[6] | 22 | NR | NR | | 41 | 91% | *Staphylococcus epidermidis* (50%) | 32% |
| Chen *et al.*(2010)[3] | 16 | NR | 50% | 50% | Range 3-168 | 68.75% | *Staphylococcus aureus* (63.3%) | 100% |
| García-García *et al.*(2010)[5] | 6 | 61.6±12.9 | 83.3% | 16.7% | NR | 83.3% | *Enterococcus faecalis* (50%) | 16.7% |
| Cervan *et al.* (2011)[2] | 23 | 67.22 | 69.6% | 30.4% | NR | 62.2% | *Staphylococcus aureus* (60.9%) | 39.1% |
| Cobo Sánchez *et al.* (2012)[4] | 5 | 66 | 20% | 80% | 32 | 60% | *Staphylococcus aureus* (20%) | 0% |
| Lu *et al.* (2016)[9] | 18 | 64.9±10.8 | 55.6% | 44.4% | 72.8 | 55.55% | *Staphylococcus Coag* (–) (38.9%) | 55.6% |
| Kim *et al.* (2019)[8] | 134 | 66.4 | 49.3% | 50.7% | NR | NR | *Staphylococcus aureus* (50%) | 33.5% |
| Traversi *et al.* (2020)[11] | 9 | 69 | 66.6% | 33.6% | 33 | 62.5% | *Staphylococcus aureus* (80%) | 11.1 |
| Jain and Ravikumar (2020)[7] | 34 | 62 | 64.7 | 35.3 | NR | 82.3 | *Staphylococcus aureus* (50%) | 100% |

NR: Not reported

patients). Their most frequent clinical findings included; low back pain (nine patients), cervical pain (two patients), and fever (two patients). Seven had central venous catheters, while prosthetic arteriovenous fistulas were present in two patients, and two others had native arteriovenous fistulas [Table 1]. The diagnosis was established based on; clinical symptoms, inflammatory markers (100% with high CRPs, 91.8% high ESR, and high white blood cells >45.5%), and diagnostic noncontrast magnetic resonance imaging studies (i.e., note the gold standard is MR studies with contrast) [Tables 2 and 3].

## RESULTS

### Surgery

Ten patients required surgery; six had an open biopsy (i.e., three required instrumentation), and four had percutaneous biopsies. Readmission due to recurrent infections occurred in five cases, with one patient requiring additional surgery (i.e., extension of arthrodesis). Notably, one nonsurgical patient died due to catheter-associated infection, leading to septic shock 15 months after diagnosis of spondylodiscitis.

### Infection Parameters

The most frequent pathogens were: *Staphylococcus aureus* (five patients), *Escherichia coli* (four patients), *Candida tropicalis* (one patient), and *Staphylococcus haemolyticus* (one patient [Table 4]. Ten patients required hospitalization, with an average 28-day length of stay.

## DISCUSSION

Risk factors for patients with spondylodiscitis on hemodialysis include; uncontrolled diabetes mellitus, catheter-associated infections, infective endocarditis, previous spinal surgery, and immunosuppression. We had seven patients with diabetes and seven using central venous catheter for hemodialysis. Nine patients in our study presented low back pain, while hemodialysis patients with spondylodiskitis in general exhibit combinations of: spinal pain, general malaise, mild stiffness, nausea, and headaches (i.e., often due to water overload).[8-10]

### Literature review

In the literature, infectious spondylodiscitis in hemodialysis patients involves the lumbar spine in from 58 to 68% of cases [Table 5]. This is followed by involvement of the thoracic (27–30%) and cervical spine (5–11%). In our series, six patients had lumbar, three thoracic, and two cervical spine spondylodiscitis.[11] Five of our patients developed recurrent infections within 1 year of the initial treatment. We had just one mortality, a rate which compares favorably with the 0–11% mortality rates reported in other studies.[1,2,5,7]

### Surgery

Hemodialysis patients with spondylodiscitis often require percutaneous or open disk-vertebral biopsy to appropriately direct antibiotic therapy. We had better results obtaining diagnostic specimens through open biopsies. Surgical debridement may or may not require additional instrumentation for stability, but its' use remains controversial due to the greater risk of recurrent infection[7] (i.e., as noted here within 1 year of initial treatment/surgery).

## CONCLUSION

For patients undergoing hemodialysis, it is critical to diagnose spondylodiscitis early (i.e., looking for the classical triad for of pain, fever, and neurological deficits) and optimally using enhanced MR scans to establish the diagnosis that can then direct optimal treatment (i.e., antibiotics alone vs. antibiotics with surgery).

### Declaration of patient consent

Institutional Review Board (IRB) permission obtained for the study.

### Financial support and sponsorship

Nil.

### Conflicts of interest

There are no conflicts of interest.

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**How to cite this article:** Cassó-Troche LR, Echavarría-Uceta JA, Quiñones-Robles J, Haché-Pagan C, Herrera I, Encarnación J, *et al*. Infective spondylodiscitis in hemodialysis patients. Surg Neurol Int 2022;13:549.