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Peculiarities of Spondylitis in the Patients Undergoing Program Hemodialysis (Case Report)

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Abstract

Relevance. The surgical treatment of spinal diseases and injuries in the patients on hemodialysis is one of the most complicated problems of the spine surgery, since such a surgery is associated with an increased risk of infectious complications and perioperative mortality. ***The case description.*** A 59-year-old female came to the clinic complaining back pain. Th8-9 vertebrae spondylitis complicated by an epidural and paravertebral abscess with

Introduction

Surgical treatment of diseases and injuries of the spine in the patients undergoing the program hemodialysis (PH) is one of the most challenging problems of spine surgery. In the first place, it is associated with an increased risk of perioperative mortality [1, 2]. Renal osteodystrophy decreases the quality of bone and cartilage tissues, leading to destructive spondyloarthropathy. The latter is the most common spine condition in the patients with terminal stage of chronic kidney disease (CKD) [3, 4]. The presence of concomitant diseases along with PH, such as diabetes mellitus, anemia, cardiovascular failure, also increases the risk of infectious complications [5, 6, 7]. To date, little attention has been unfairly paid to this problem in domestic, as well in foreign literature.

The purpose of the article was to present a case of severe renal osteodystrophy in the patient on program hemodialysis. The case provided understanding of the complexity of the problem and the potential for the complications, both predictable orthopedic, associated with instrumental fixation, and unpredictable, possibly life-threatening (bleeding, thromboembolism, cardiovascular complications).

The case description

The patient gave an informed consent for the publication of this clinical case.

A 59-year-old female was admitted to the University Clinic of the Pavlov First Saint Petersburg State Medical University in early September 2015 complaining of a back pain. From the history of the present illness it

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was known that the patient had been undergoing hemodialysis for 18 years due to terminal stage of CKD 5D, complicated by uremic osteodystrophy. Three months prior to hospitalization, the patient was diagnosed with bilateral community-acquired pneumonia. And she received an inpatient treatment at an internal medicine department. At the same time, she was diagnosed with Th 8-9 vertebral spondylitis, which was repeatedly treated on an outpatient basis for 2 months at various orthopedic and neurosurgical departments with empirical antibiotic therapy. However, the patient was denied hospitalization and surgical treatment due to the need for hemodialysis. On admission, the patient's condition was serious, she kept the involuntary supine position with prominent pain in the thoracic spine, aggravated by an attempt to change the position of the body. The intensity of the pain syndrome was 9 points according to visual analogous scale. In addition, the pain radiated along the costal arch and at the left hypochondrium. The hemodialysis procedure was carried out using narcotic analgesics due to severe pain. Low-grade fever. There was no neurological impairment, Frankl grade E [8]. Systemic Inflammatory Response Syndrome (SIRS) score was 3 (leucocyte count was 16.7×10^9/L, respiratory rate — 22 breaths/min, heart rate — 90 beats/min). Sepsis-related Organ Failure Assessment (SOFA) score was 4 (due to the renal component). An increase in ESR to 55 mm/h. The condition was rated as sepsis. A complex radiological study (MRI, MSCT) revealed the subtotal destruction of the Th8 body and total destruction of the Th9 with the formation of pre- and paravertebral, as well as epidural abscesses, local kyphotic deformation of Th7-9 with Cobb angle 20°, bilateral pneumonia with pneumofibrosis (Fig. 1).

The spine lesion was regarded as spondylitis complicated by paravertebral and epidural abscesses with severe mechanical instability, accompanied by pain. The general somatic state of the patient against the background of renal osteodystrophy and program hemodialysis progressively worsened.

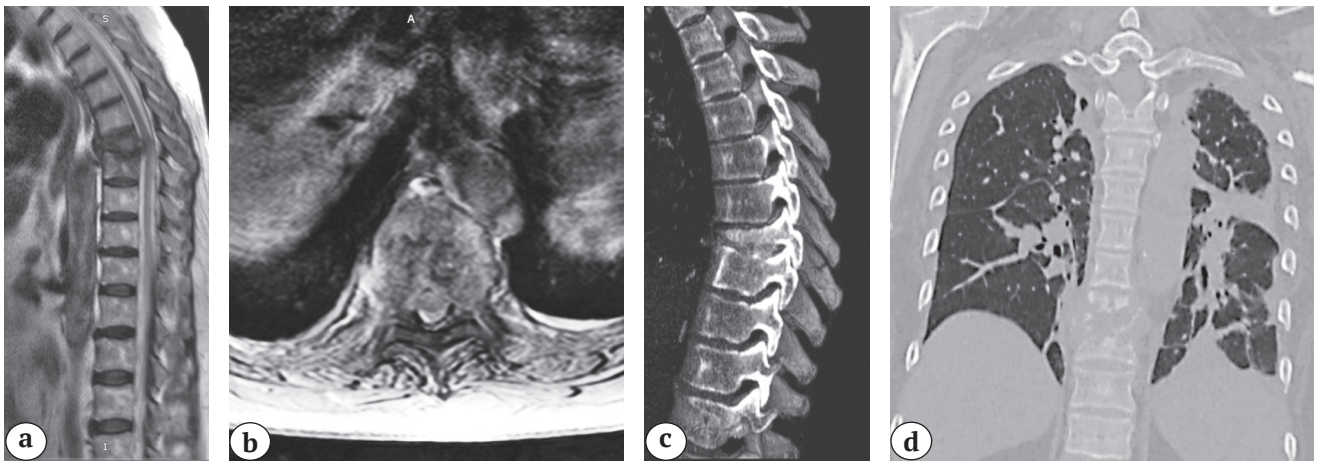

Fig. 1. Spine and chest MRI and MSCT images of the patient on admission:
a, b — T2-weighted sagittal and transverse planes; c — sagittal plane of the thoracic spine;
d — MSCT coronal plane of the chest (see explanation in the text)

On the 17th of September 17, 2015, in order to verify the causative agent of the infection, the transpedicular trepanobiopsy of the Th8 vertebral body on the right was performed. Because it was not possible to identify the pathogen, in agreement with the clinical pharmacologist, the empirical antibiotic therapy was started: imipinem + cilastatin 500 mg twice a day intravenously, vancomycin 1 g once every 5 days, taking into account the ongoing sessions of hemodialysis. It should be noted that antibiotic therapy in the patients on hemodialysis is a debatable issue, as such therapy is associated with a large number of complications due to drugs cumulation. The patient's condition progressively worsened. An increase of neurological deficit was noted during the week in the form of right-side distal lower monoparesis up to 3–4 points. The deterioration of neurological symptoms, as well as somatic state was considered as an absolute indication for the surgery. The risk of surgery is regarded as ASA 4.

On the 1st of October, 2015, in one step from the posterior approach, a right-sided costotransversectomy was peformed, following by the debrigement of the vertebral bodies destruction site (subtotal resection of Th8, resection of the body of Th9), 360° spinal stabilization (transpedicular fixation of Th6-10, Th7-9 corporodesis using a titanium block-mesh with autobone), Fig. 2.

The early postoperative period was uneventful with regression of neurological disorders and a decrease in pain. The results of bacteriological examination of the surgical material were still negative. The histological examination revealed non-specific inflamation.

On MSCT of the spine and chest before discharge (10th day after surgery), a stable position of the metal structures and a significant decrease in the infiltrative changes in the lung were noted (Fig. 3). On the 4th day, the patient was verticalized. After wound healing (on the 12th day), she was discharged for outpatient treatment.

Two months after surgery, against the background of a stable general condition, a fistulous course was formed in the area of the postoperative scar. *Klebsiella pneumoniae*, sensitive to imipenem, amikacin, ciprofloxacin, was noted in the discharge culture. For antibacterial therapy, moxifloxacin was selected due to the sensitivity and no necessity for dosage adjustment in patients with CKD. The duration of monotherapy was 2 months, and resulted in the fistulous course healing.

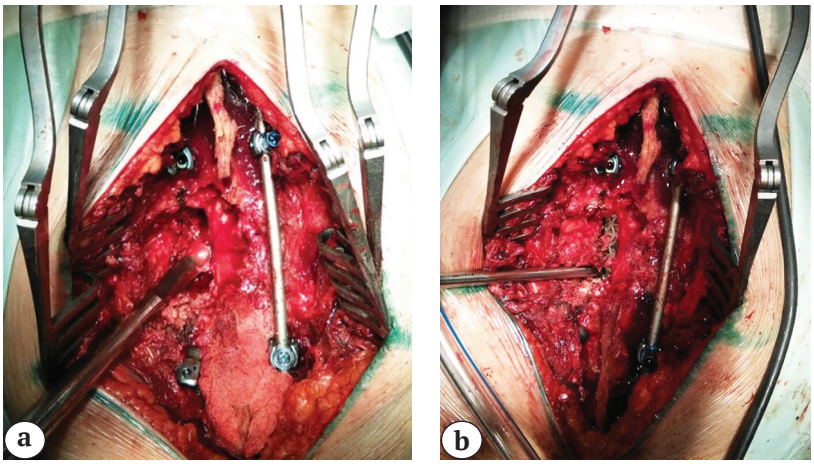

Fig. 2. Removal of Th8-9 vertebrae bodies and the circular decompression of the spinal cord (a); a support mesh implant placement (b)

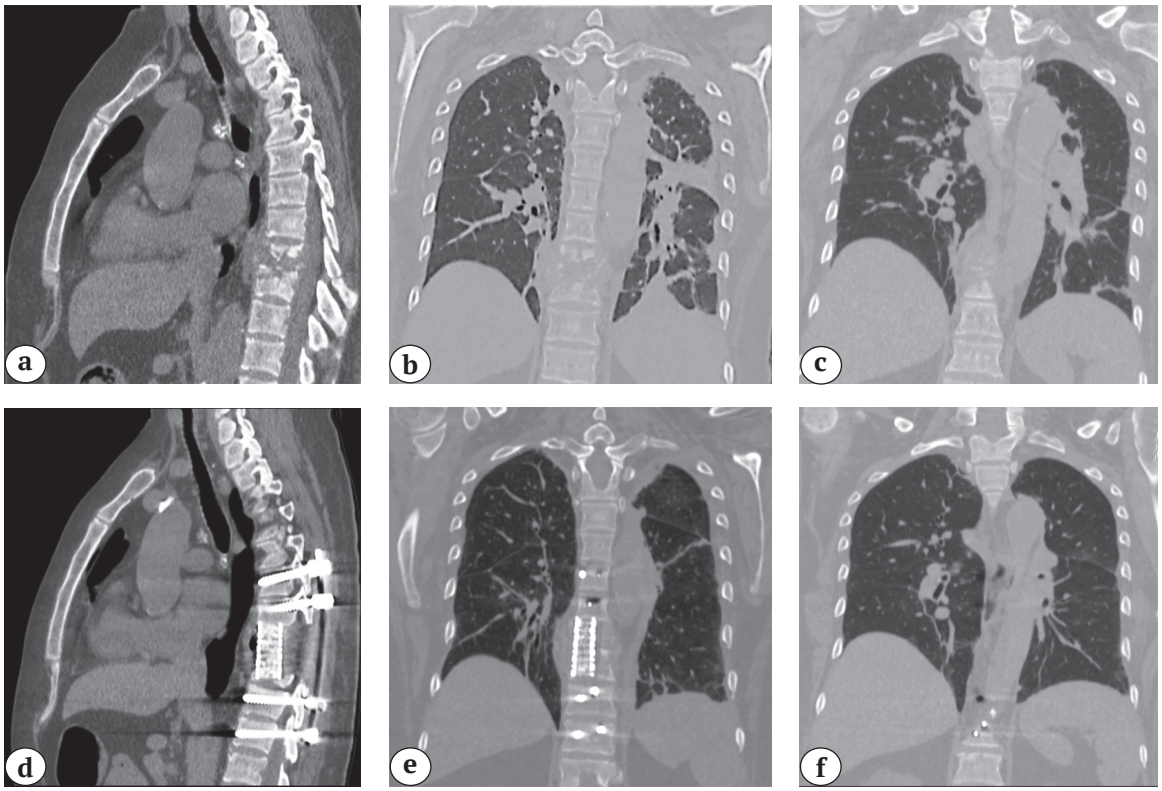

Fig. 3. MSCT of the chest and spine, sagittal and coronal planes:
a, b, c — before surgery; d, e, f — on the 10th day after: a stable position of the metal structures and a significant reduction of the lung infiltration are visualized

Over the next 1.5 years (until April, 2017), the patient did not notice any deterioration. However, then back pain appeared and began to increase with a change in body position and verticalization. MSCT revealed the posterior metal structures instability with graft adaptation inside the mesh implant with an upper blocked vertebra (4/5 points according to Baulin [9]) and prolapse into the lower disk with a small radiolucent lines around the mesh (3/5 points), Fig. 4. Given the clinical and radiological signs of instability, as well as the general severity of the somatic disease, we decided to remount the rear construction.

On the 9th of June, 2017, the spine restabilization was performed. Given uremic osteodystrophy, the potential risks of repeated periimplant resorption, fixation was performed by a laminar system with intermediate fixation points. The intraoperative microbiota culture revealed no growth. The low pathogenic microbiota culture with ultrasound treatment of the implants was not carried out.

Over the next 1 year and 2 months (until August 2018), the patient's condition regarded as stable. Then, the patient began to notice a moderate back pain during movements and weakness of the right lower limb. During the staged radiological examination, osteoresorption was detected around the end elements of the fixing laminar system at the level of Th5-12, as well as the ischemic spine cord lesion at the level of Th8-9 (Fig. 5). The position of the interbody mesh implant was not changed.

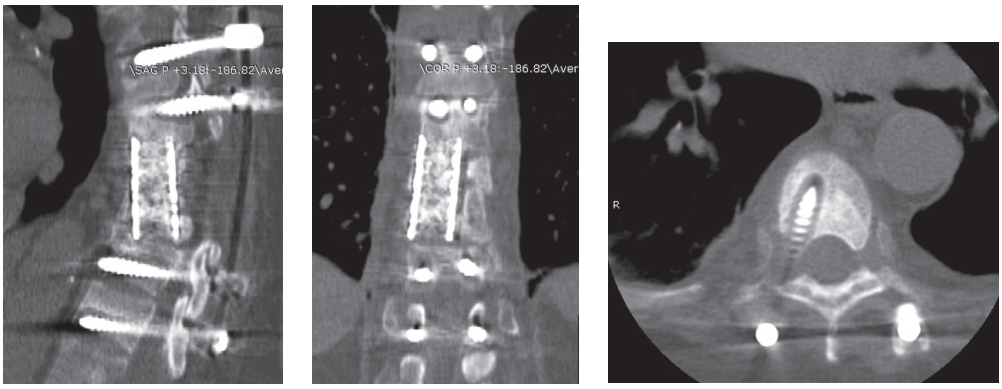

Fig. 4. MSCT of the spine 1.5 years after the initial surgery: instability of the posterior metal structures, adaptation of the graft inside the mesh implant with the upper blocked vertebra, prolapse into the lower disk with a small radiolucent line around the titanium mesh

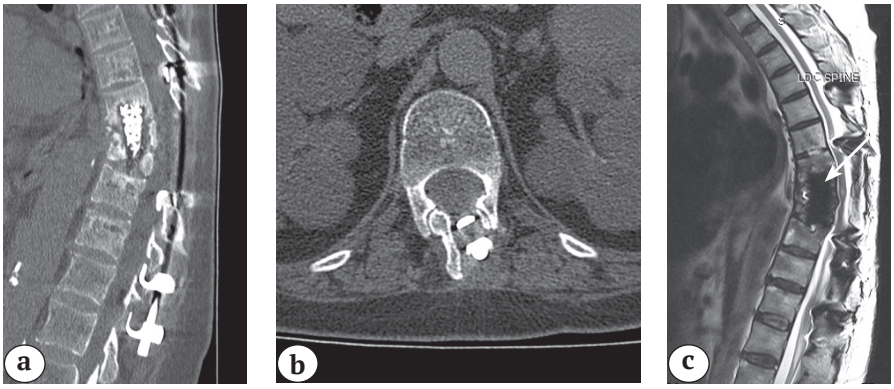

Fig. 5. MSCT (a, b) and MRI (c) of the spine in 2 years and 9 months after the initial spine reconstruction and in 13 months after the posterior stabilization: resorption of the Th12 vertebra arch under the caudal support hook. Myelopathic lesion is indicated by an arrow

A decision was made to perform the repeated posterior restabilization of the spine with a change in laminar fixation points and minimal structural stress. The surgery with posterior osteoplastic fusion was performed on the 25th of September, 2018. Immediately after surgery, the patient developed the deep right lower limb monoparesis with preserved sensory. MSCT and MRI data turned out to be uninformative in exclusion of the spinal cord compression by metal elements. Therefore, an emergency revision surgery was performed. Although, no signs of compression of the dural sac were detected (Fig. 6).

Over the next three weeks, restoration of the lower extremities motor functions from 25 to 40 points on the ASIA scale (max = 50) was noted, while the patient during this time had 6 episodes of bleeding from the first appeared rectal ulcers required repeated blood transfusions and surgical hemostasis. The complicacy of stopping bleeding, as well as their recurrent nature, arose from the impossibility to completely cancel the anticoagulant therapy in a patient needing the program hemodialysis on vital indications. After that, the patient's follow-up was traced for another year (in total — 3 years and 10 months). The patient did not seek the medical attention because of pain in the back. There was a single episode of rectal bleeding treated conservatively.

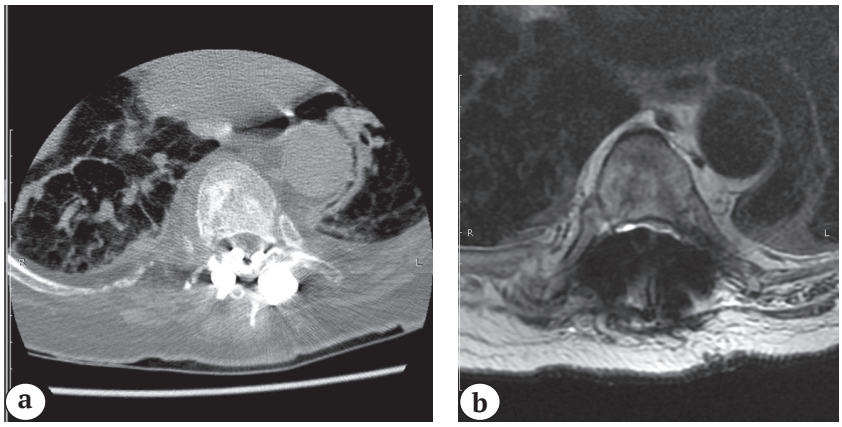

Fig. 6. The transverse planes of MSCT (a) and T2-weighted MRI image (b) of the spine at the Th7 vertebra level. Artifacts from the laminar system on MRI simulate critical spinal stenosis

Discussion

Nonspecific spondylitis and spondylodiscitis accounted for 5–7% of inflammatory diseases of the musculoskeletal system [10]. In the patients on hemodialysis, these indicators doubled and can reach 11.9% [11, 12]. Among the causes of death of the dialysing patients, the infectious complications amounted to 12% [13]. However, Hori et al. did not find any statistical differences in the rate of infectious complications and fixative systems destabilization in the patients, undergone decompression-stabilizing lumbar spine surgery, compared with the patients with CKD and without it [14]. At the same time, the authors indicated an increase in the rate of revision surgeries in general in the spinal patients on hemodialysis. In addition, Yamada et al. and Sasaki et al. reported the early revisions in 27.6% and 12.5%, respectively [15, 16].

In a systematic review of publications over 20 years, Madhavan et al. (2019) were obtained the data on the most common microbial spectrum in patients with spondylodiscitis and concomitant hemodialysis. The most common microbiota were *Staphylococcus aureus*, *Staphylococcus epidermidis* and gram-negative bacteria, and antibacterial monotherapy was used in 76.8% of cases [17]. The surgery carried out only for the patients with neurological deficit. The latter occurred in 1/4 of the patients on hemodialysis. The other authors found that in 1/3 of spine infection was cased by *Escherichia coli* [18, 19]. According to Kuo et al., the bacteria entry point was the vascular access for hemofiltration on a hemodialysis apparatus [20]. 30.5% of spondylodiscitis, mediated by MRSA ,were associated with arteriovenous fistulas inflamation.

Another relevant problem in the patients on hemodialysis is severe perioperative bleeding [21, 22]. The source of bleeding can be both the surgical wound itself and other organs (gastrointestinal bleeding, stroke). The cause of bleeding may be prolonged use of anticoagulants during the hemodialysis procedure, as well as disturbances in coagulation factors due to uremic toxins accumulation. The mortality rate due to bleeding from stercoral ulcers could reach 50% [23]. The hospital mortality among the patients on program hemodialysis was 2.2 times higher than in the general population [24].

According to published data, the functional and neurological results of the patients with end-stage CKD undergone surgery, are worse compared to patients in the general population. Yu et al. reported that the average severity of pain according to the visual analogous scale was higher in patients on hemodialysis [7]. Although, the other authors did not found any statistical difference in the severity of pain and neurological deficit [14].

Thus, the surgery of the patients with spine infectious lesion and CKD terminal stage is associated with higher risks of intra- and postoperative complications. The presence of equipment for hemodialysis and a multidisciplinary approach to treatment allow the improvement of quality of life and increase the life expectancy of this group of patients.

Publication ethics

The patient had given the voluntary informed consents for this clinical case publication.

Competing interests: The authors declare that there are no competing interests.

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Authors' contributions

M.A. Mushkin — collection of material and data processing, literature review, data interpretation, text preparation.

A.K. Dulaev — research coordination, data analysis and interpretation.

A.N. Tsed — research concept and design, literature review, text preparation and editing.

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