INEFFECTIVE ONE-STAGE SURGICAL TREATMENT OF DISSEMINATED TUBERCULOUS SPONDYLITIS: A CLINICAL CASE AND LITERATURE REVIEW

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The paper presents a clinical case of ineffective one-stage surgical treatment of disseminated tuberculous spondylitis. Female patient with extensive destruction of the vertebrae was treated by simultaneously performed posterior decompression and drainage of the abscess and short posterior fixation using dynamic titanium nickelide implant. After 4 months, inadequate primary surgical sanitation of the inflammation focus through posterior approach resulted in the progression of tuberculosis lesions of the spine. After repeated staged surgical treatment, the patient achieved favorable outcome of the disease.

A review of the literature on disseminated forms of tuberculosis spondylitis has shown that at present there are staged and single-step approaches to the treatment of this disease. Most modern researchers of tuberculosis spondylitis tend to single-step combined operations.

Key Words: tuberculosis spondylitis, disseminated forms, complications, surgical treatment.

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The growing interest to surgical treatment of infectious spondylitis in recent years is associated with an increased surgical activity in countries with a high burden of tuberculosis (India, China, Bangladesh, etc.), as well as with an increased numbers of cases with drug resistant Mycobacterium tuberculosis, which reduces the efficacy of conservative treatment.

Modern surgical methods for treating tuberculous spondylitis have been elaborated in detail and include diverse one-step and staged decompression and stabilization spinal surgeries [8, 10, 44, 47, 48, 54, 57, 64, 65] typically performed through anterolateral or combined approaches [2, 6, 7, 17, 18, 22, 23, 32]. The subject of discussion is the choice of the sequence of surgical stages, the use of different options for posterior fixation and methods for sanitation of the focus and spine fixation, including those through posterior approaches.

In the PubMed, Medline, Web of Science search engines, we found more than 400 papers on the results of surgical treatment of tuberculous spondylitis published mainly by authors from South-East Asia, with 18 papers being focused more on causes of postoperative complications rather than positive outcomes of treatment.

In some cases, operations are performed in non-specialized hospitals, where consistency and principles of treating tuberculous infection are not always followed, which increases infectious complications [4]. The surgical clinic of St. Petersburg Research Institute of Phthisiopulmonology has considerable experience in the treatment of destruction processes in the spine, including treatment performed upon progression of destruction or postoperative complications. The number of patients who underwent not quite adequate surgical interventions is steadily rising among the patients with infectious spondylitis operated on annually. One such case is interesting to describe in this paper.

The purpose of the study is to analyze the causes for complicated course of tuberculous spondylitis in one-step surgical intervention.

A female patient A. aged 34 years was admitted to the clinic on January 16, 2017 after surgical treatment conducted at the place of residence.

Diagnosis on admission was generalized tuberculosis, tuberculous spondylitis at T5–T11; the patient's condition after surgery on the thoracic spine performed on August 30, 2016 was: infiltrative pulmonary tuberculosis in decay phase, microbiologically proven. Complications: intrathoracic congestive abscess. Epidural abscess. Lower paraparesis of Frankel grade C. Hyper-reflexive type of pelvic organ dysfunction. Concomitant diseases: stage I arterial hypertension, risk 2, medium severity.

The patient was examined and treated based on the National Clinical Recommendations on Phthisiology [18]. The diagnosis of tuberculosis spondylitis was confirmed by histological and bacteriological analyses of the surgical material. The etiological agent was detected via seeding of the operative material (tissues from the focus of destruction, purulence, granulation) into liquid nutrient medium and solid nutrient Levenshtein–

Jensen and Finn II media with fluorescent detection of microbial growth. The efficacy of the surgical treatment was evaluated according to standard scales: assessment of life quality (Oswestry Disability Index – ODI), VAS, neurological scale ASIA (1996); spine instability was assessed using SINS scale (2012).

The medical record reports that in January 2012 the patient was diagnosed with infiltrative pulmonary tuberculosis that was treated for 6 months according to chemotherapy regimen I [18]. In June 2012, the treatment regimen was associated with appearance of pain in the thoracic spine and weakness in the legs, which progressed over month up to the loss of ability to move independently; delayed urination appeared but the patient did not seek medical advice. CT of the spine was first performed in August 2016; generalized tuberculosis affecting lungs (infiltrative pulmonary tuberculosis in decay phase) and the spine (tuberculous spondylitis at T5–T11 complicated by intrathoracic abscesses) was diagnosed. Complications related to lesions of the spine were as follows: lower deep paraparesis, of Frankel grade C, hyper-reflexive type of pelvic organ dysfunction. After further examination, CT and MRI of the spine, a decision was made on surgical treatment at the place of residence. Decompressive laminectomy at T8–T9, drainage of the intrathoracic abscess, and posterior instrumental fixation by titanium nickelide (NiTi) shape-memory implants possessing thermomechanical properties at T7–T10 level were performed.

Postoperative period was characterized by slight positive dynamics in form of a decrease in clonuses in the legs and a reduction of conductive sensitive disorders. A culture of Mycobacterium tuberculosis was isolated from seeded sputum specimens of August 29, 2016 that retained sensitivity to all anti-tuberculosis drugs. Progressive destruction at T5–T11 vertebral bodies was revealed on control CT of the spine of January 23, 2017 (Fig. 1). The patient was referred for surgical treatment in St. Petersburg Research Institute of Phthisiopulmonology.

Upon admission, the patient complained of severe pain in the thoracic spine (VAS score 7), weakness in the legs, impaired urination; and inability to move independently. Thoracic kyphosis was aggravated along T6–T11. Strength in the legs was reduced to 3 scores. Conductive type of pain sensitivity disturbance down from the level of T12. Pathological signs and clonuses in the legs were revealed (up to 3 scores on the Ashworth's scale). Hyperactive type of urination dysfunction. ODI score was 74 %, ASIA – 82/98. The Spinal Instability Neoplastic Score (SINS) conditionally used for the patient with non-oncologic disease, was 16 indicating severe instability.

Fig. 1
CT of the spine, a female patient A., 34 years, lateral and frontal views

Radiography (Fig. 1) revealed a disseminated destructive process in the thoracic spine complicated by bilateral intrathoracic paravertebral abscesses. Thus, disseminated (6 spinal motion segments) lesion of the thoracic spine complicated by abscesses, neurological disorders and spinal instability was a definite indication for surgical treatment. The first stage involved sanitizing surgery on the anterior column of the spine and partial recovery of its support ability (anterior spinal fusion), the second stage – posterior instrumental fixation.

Destruction of T5–T11 vertebral bodies was revealed. T5 body was destroyed at 2/3, T6 – at 2/3 with involvement of arches, T7–T8 – subtotally with involvement of arches and rib heads, T9 – at 2/3 with involvement of arches and heads, T10 – at 2/3 with involvement of the head of the right rib, T11 – with focal destruction. The interbody disc space contains sequesters and opens into the spinal canal as an epidural abscess at T5–T6 level with sizes of 15 x 46 x 54 mm, flattening the anterior surface of the spinal cord to 4 mm. Multi-compartment paravertebral abscesses on the right and left sides were present.

The patient was operated on at February 02, 2017. Right thoracotomy, abscessotomy, resection of the T5–T11 bodies, removal of an epidural abscess, anterior spinal cord decompression, drainage of the left-sided abscess, combined anterior fusion using titanium mesh cage and autologous rib fragments (Fig. 2).

Histological examination of surgical material of February 13, 2017: morphology corresponds to tuberculous inflammation, productive-necrotic form. On bacteriological examination of surgical material of February 08, 2017: Mycobacterium tuberculosis DNA was revealed (resistance to tubazid (Isoniazid) and rifampicin was not detected).

Postoperatively, transfusion of red blood cells was performed for anemia. Operative wound healed by primary intention. After surgery, there was a positive neurological dynamics: strength in the legs increased to 3 scores or higher, level of sensitive disorders reduced and pelvic organ function was restored.

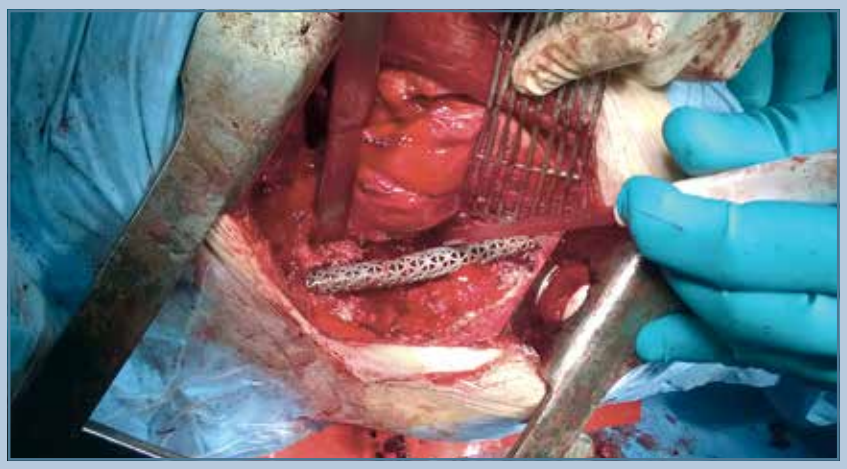

Fig. 2
Operative wound of a female patient A., 34 years, post-resection defect at T5–T11 vertebral bodies, titanium mesh cage with autologous rib fragments was implanted

Before and after surgery, the patient underwent intensive phase of chemotherapy treatment according to regimen IV with five drugs [18].

Control CT examination of the spine on February 22, 2017 is presented in Fig. 3.

Upon stabilization of the general condition after 1 month, the second stage of surgical treatment was conducted through combined approach: abscessotomy, removal of epidural abscess at T7–T9 level, necrectomy at the head of the seventh left rib were performed through thoracotomy approach on the left side; removal of NiTi implant with replacement by posterior laminar fixation at T3–L1 was conducted through posterior approach. The postoperative period was without complications. The wound healed by primary intention. Within 2 months, the patient was treated with chemotherapy regimen IV with five drugs.

Control radiography of the spine on March 21, 2017 is presented in Fig. 4.

Positive clinical and neurological dynamics was observed in the postoperative period for 2 months (Table).

In 2 months after surgery, the patient was discharged in a satisfactory condition for treatment in an antituberculous center at the place of residence. Inpatient anti-tuberculosis treatment by intensive phase of chemotherapy IV up to 4 months and then with continuation phase of chemotherapy depending on the results, physical therapy, massage, sanatorium-resort treatment was recommended.

Discussion

Upon certain stabilization of the epidemiological situation of tuberculosis in Russia and abroad over the past decade, including the incidence of tuberculous spondylitis comprising 1.0–2.5 cases per 100 000 population [5, 11, 17, 29, 33, 46, 62], the proportion of patients with multiple and disseminated forms of the disease has grown [12, 14, 15, 26–28, 37, 59, 62] and the number of diseases caused by drug-resistant forms of Mycobacterium tuberculosis has increased twofold [14, 17]. Moreover, the number of postoperative infectious complications recorded in such patients reached 6–12 % [4, 14].

Inadequate primary surgical sanitation of the inflammation focus through posterior approach led to the progression of tuberculous process in the spine. Laminectomy was a destabilizing surgery upon failure of the anterior spinal column. Fixation of the posterior column was performed without taking into account dissemination of the lesion, and the used implant (NI-Ti) did not provide solid stability to the spine.

Modern methods of surgical treatment of tuberculous spondylitis allow staged or one-step removal of destructive processes in the spine, permit conducting repair of vertebral body defect and recovery of spinal supporting ability [21, 44, 57]. However, the tactics of surgical treatment, especially in cases of disseminated tuberculous spondylitis, remains a subject of discussion.

Indications for surgical treatment include the focus of bone destruction, paravertebral and epidural abscesses, spinal deformities with severe kyphosis, neurological dysfunction [16, 45, 56]. For a long time abscessotomy, anterior decompression of the spinal cord and anterior spinal fusion have been the gold standard in surgery for infectious spondylitis [2, 6, 7, 16, 18, 19, 22, 23, 32–34, 49]. Due to the high risk of failure of artificial block, non-biological implants are used instead of autografts [1, 9]. The disadvantages of anterolateral approach to the spine include the risk of injury to the great vessels, insufficient possibility of kyphosis correction and some (within 5–10 %) loss of deformity correction in the postoperative period [1, 9, 22]. In order to avoid injury to the great vessels, some operations on the lumbosacral spine are performed under supervision of a vascular surgeon [3]. In most cases, second surgical stage is performed in case of disseminated destructive processes of the spine for fixation of the posterior spinal column [3, 13, 39, 40].

The development of minimally invasive spinal surgery using endoscopic instruments led to publications of papers that demonstrate adequate sanitation operations for limited active tuberculosis thought posterior approaches [20, 25, 36, 40, 41, 43, 45, 48, 50, 53 –55, 58, 63]. According to some authors [30, 42, 48, 51, 63], an interlaminar or transpedicular approach to the vertebral bodies reduce intraoperative trauma, create conditions for kyphosis correction, and diminish injury to the great vessels. Some papers reported an effective combina-

Fig. 3
CT of the spine, female patient A., 34 years, 3D-image: vertebral bodies are resected at T5–T11 level, the upper end of the implant is in the dorsal parts of T5 body remnants, the lower end of implant is fixed in groove of T11 body remnants; paravertebral tissues are not altered

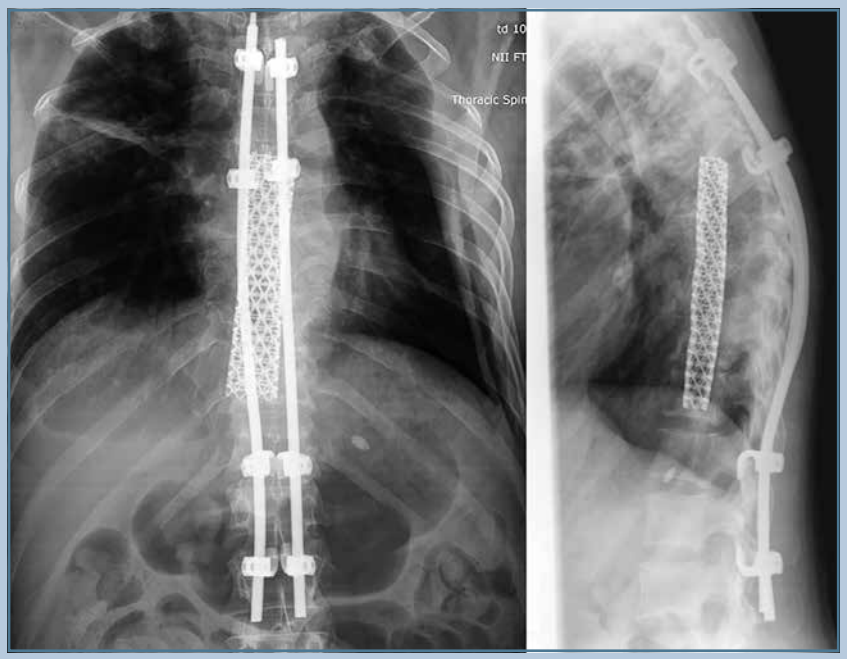

Fig. 4
Radiograms of female patient A., 34 years, after posterior instrumental fixation, 3D-assembly at T3–L1 level: laminar hooks are inserted supralaminary at T3–T12 level and sublaminary at T5–L1 level

tion of transpedicular fixation and local administration of antibiotics [24, 60, 61].

Despite opinions of some surgeons favoring for one-step combined operations in disseminated forms of tuberculous spondylitis [26, 28, 31, 35, 38, 44, 48, 52, 62], we believe that the tactics of staged surgical treatment is warranted and clinically justified. This is confirmed by the case report demonstrating that drainage of abscess and posterior short dynamic fixation of the spine are ineffective in disseminated spondylitis, in contrast to limited inflammatory processes. Staged surgical treatment allowed us to sanitize the inflammatory focus in the vertebral bodies in the short-term postoperative period, restore supporting ability of the spine, eliminate spinal cord disorders and arrest progression of the disease.

Conclusion

Different approaches exist for the treatment of disseminated forms of tuberculous spondylitis: staged and one-step surgery. Currently, most researchers are inclined to single-step combined operations. However, one-step surgery requires compliance with two rules: adequate sanitation of the focus and long 360° spinal fixation. These conditions were not met in our case report, which led to progression of the disease in 4 months. Only repeated staged surgical treatment resulted in a favorable clinical outcome.

Thus, at present, early surgical treatment of tuberculous spondylitis is necessary to reduce the rate of complicated forms and progression of tuberculous infection. The main principle in reconstructive surgery of infectious spondylitis is a syndromic/nosological approach. This necessitates creation of national clinical recommendations and standards for the diagnosis and treatment of tuberculous spondylitis.

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Table

Pre- and postoperative parameters of female patient A. aged 34 years

Parameter	Preoperative	1 month after surgery	2 months after surgery
Length of lesion, number of spinal motion segments	6	0	0
Pain scores according to VAS	7	3	2
Oswestry disability index ODI, scores	74	64	44
Motion impairment according to Frankel	C	C	D
Pelvic organ dysfunction	Hyperactive type	Absent	Absent
Neurologic status according to ASIA, scores	82/98	90/102	90/102

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