



COMORBIDITY IN PATIENTS WITH HIV INFECTION AND TUBERCULOUS SPONDYLITIS AS A RISK FACTOR FOR INFECTIOUS COMPLICATIONS

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Objective. To determine how the presence of comorbidity, including the fact of the presence of HIV infection, affects the risks of developing infectious postoperative complications in patients with tuberculous spondylitis.

Material and Methods. A monocenter comparative retrospective analysis of 116 HIV-infected patients and 158 HIV-negative patients operated on for tuberculous spondylitis was carried out, with an analysis of risk factors for postoperative complications – concomitant diseases, the Charlson comorbidity index, the anesthesia-related and operative risk according to the ASA scale.

Results. Concomitant pathology and classes 3 and 4 according the ASA criteria were observed in 88.3 % of patients in the general cohort. In class 4 patients, infectious complications occurred 1.5 times more often, primarily due to early complications of immunodeficiency, while in the group of HIV-negative patients, the frequency of complications did not differ significantly between these classes. In HIV-infected patients with a moderately higher operative and anesthesia-related risk (risk increase factor = 1.19), the risk of postoperative complications increased by 1.76 times. Specific postoperative complications in HIV-infected patients were more common than in the control group ($\chi^2 = 4.53$, OR = 2.76).

Conclusion. The presence of HIV infection in patients with tuberculous spondylitis in comparison with HIV-negative patients is a risk factor that significantly increases the risk of early (occurring up to 1 year after surgery) postoperative complications, such as postoperative pneumonia, exacerbation (progression) of spondylitis and the development of tuberculous meningitis. At that, the risk of developing late postoperative complications does not depend on the fact of HIV infection.

Key Words: tuberculosis, spondylitis, ASA scale, Charlson comorbidity index, surgical complications.

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At present, one of the persisting features of tuberculous spondylitis in the Russian Federation is the prevalence of disseminated and multiple forms of spinal lesions [1]. This is associated with increased incidence of HIV infection, which is characterized as an epidemic of severe and comorbid conditions with high mortality [2]. According to the St. Petersburg AIDS Center, only 1/4 of patients die directly from consequences of immunosuppression, while most patients die from combination of various diseases, including tuberculosis [3, 4].

Regardless of HIV + tuberculosis co-infection, spondylitis complications (progressive spinal deformities, abscesses, fistulas, and neurological disorders) are indications for surgical treatment, which is inevitably associated with the risk of postoperative complications. The most significant complications are infectious ones that are caused by both immunosuppression

and concomitant diseases, age, and surgical features, such as a surgery duration, a repair type, an approach, a surgical wound contamination class, etc. [5–9]. Studies in the last 10 years have shown the possibility to predict the outcome of treatment for infectious spondylitis, based on calculation of the Charlson comorbidity index (CCI) [10], American Association of Anaesthetists (ASA) score [11], and postoperative infection treatment score for the spine (PITSS, 2012) [6, 12, 13]. In this case, along with immunodeficiency states and drug resistance of microorganisms, risk factors for postoperative complications include long-term multi-stage interventions involving implants and internal systems [5, 14, 15].

The purpose of this study was to answer the question of how comorbidity, in particular HIV infection, affects the risks of infectious postoperative complications in patients with tuberculous spondylitis.

Study design: a retrospective monocentric group-control study of a 2-year clinical cohort.

Material and Methods

We analyzed data of 274 patients who were included in the study according to the following criteria:

- bacteriologically and histologically verified diagnosis of tuberculous spondylitis;
- a single surgical site;
- surgery performed by the same surgical team;
- consecutive operations in the period between January 01, 2016 and December 31, 2017;
- patient age over 18 years (maximum: 74 years);
- a follow-up period of not less than 1 year.

In accordance with the study purpose, two groups of patients with tuberculous spondylitis were retrospectively formed:

Group 1 included 116 (42.3 %) patients with HIV infection (HIV+); and Group 2 included 158 (57.7 %) HIV-negative patients (HIV-).

A total of 418 staged surgeries for active and torpid tuberculous spondylitis were performed within the study period. In 183 (66.3 %) patients, there were complications: abscesses, neurological and neurotrophic impairments, and dysfunctions of the pelvic organs; 82 (29.9 %) patients underwent interventions for a multi-level process.

Generalized tuberculosis forms prevailed in both groups and amounted to 87.1 % and 67.1% of cases (101 and 106 patients), respectively.

Postoperative complications developed within one year after surgery were assessed.

Infectious complications occurred in 57 (20.8 %) patients, including septic complications in 15 (5.5 %) cases. The study objective was to analyze the impact of risk factors, such as comorbidities, integrally evaluated using the CCI and ASA scale, on the development of complications. The effect of concomitant HIV infection on the risk of complications was studied separately.

Patients' condition before and after surgery was evaluated using VAS, ASIA, ODI, and SF-36 scales; however, comparison of these parameters with the risk of complications was not included in the study objective.

Statistical data processing was performed with the Statistica 7.0 software using the odds ratio, F-test, and Chi-square test.

Results

An analysis of premorbid history revealed chronic infectious hepatitis B and C in 150 (54.7 %) patients, other infectious diseases in 86 (31.3 %) cases, and trophic disorders in the form of pressure sore in 13 (4.7 %) cases; 5 (1.8 %) patients had cancer history. In 82 (29.9 %) patients, there were neurological disorders in the form of complete and partial plegia (ASIA grade A, B, and C).

Comparison of the groups is presented in Table 1. Group 1 feature was the

predominance of concomitant infections (48 (41.4 %) patients; OR = 1.8), viral hepatitis (108 (93.1 %) patients; OR = 3.5), and generalized tuberculosis. Endocrine and vascular diseases were more common in Group 2.

CCI assessment shows that this indicator in Group 1, despite a lower number of comorbid diseases, more than doubles that in Group 2 (mean: 8.2 ± 2.5 and 3.1 ± 1.3 , respectively; Table 2) due to the immunodeficiency state. In 88.3 % of patients, the surgical and anesthesia-related risk was ASA grade 3 and 4. The distribution of risks and their relationship with HIV infection and the onset of postoperative complications are presented in Table 3, and the distribution of complications is given in Table 4.

Therefore, upon planning surgical treatment of patients with tuberculous spondylitis, it should be remembered that the risk of each of the potential complications in HIV-infected patients, being significantly higher than that in HIV-negative patients, is not more than 15 %. In this case, the presence of HIV infection adversely affects only the risk of early postoperative complications, in particular those with a statistically significantly higher risk non-specific pleuritis, spondylitis progression, and tuberculous meningitis.

Discussion

Most patients (88.3 %) admitted for surgical treatment are of ASA grade 3–4 risk and have different somatic diseases of the gastrointestinal tract and cardiovascular system, uroinfection, and pneumonia. In turn, mainly immunocompromised patients (54.7 %) are detected with chronic infectious hepatitis B and C; 87.1 % of patients have generalized tuberculosis; 5.5 % patients have a septic course due to generalization of the tuberculous and secondary non-specific microflora. These diseases aggravate the somatic status and worsen the prognosis of treatment, including the risk of death [16].

An analysis of comorbidity indicators and surgical and anesthesia-related risks in comparison with the presence of HIV

infection provides a broader view of the problem of postoperative complications in these patients. Exceeding the CCI value by 5 points (in the group of HIV(+) patients, the mean CCI was 8.2 ± 2.5) significantly worsens the prognosis for the patient's life [17]. A quarter of patients in this group are of ASA grade 4, which doubles the risk of postoperative complications in them compared to that in ASA grade 3 patients.

At a sufficiently high (20.8 %) rate of infectious complications in patients with tuberculous spondylitis, the presence of HIV infection significantly increases the risk of non-specific pleuritis after surgery (OR = 3.17; $F = 0.02$; $2 = 5.73$), while the risk of other infectious complications (pneumonia, sepsis, and wound infection) is comparable to that of HIV-negative patients. In HIV-positive patients, the risk of postoperative spondylitis progression (OR = 2.84) and specific central nervous system lesion (OR = 8.56) is significantly higher.

Therefore, our findings enable more detailed evaluation of the current features of tuberculous spondylitis. In addition to the thoroughly studied issues of the pathomorphism of tuberculosis associated with growth of resistant strains of mycobacterium tuberculosis [18–20], analysis of comorbidities is no less important for predicting treatment outcomes.

Given increasing attention to hospital septic and infectious complications after elective spinal surgery [21], including those associated with the use of implants that increase the risk of infection by 4–15 % [22], surgical treatment of tuberculous spondylitis requires special attention. In the study group, 8.8 % of all complications were deep wound infections, which required removal of fixation instrumentation.

Patients with tuberculous spondylitis had concomitant pathology in 88.3 % of cases, which increased the surgical and anesthesia-related risk to ASA grade 3 and 4. In this case, the status of HIV-infected patients in comparison with HIV(-) patients was 1.5–2-fold more often evaluated as ASA grade 4 than grade 3.

Table 1

Risk factors and concomitant diseases in the compared groups of patients with tuberculous spondylitis, n (%)

Risk factors	Group 1 (n = 116)	Group 2 (n = 158)
Concomitant infection	48 (41.4)	38 (24.1)
Cardiovascular diseases	9 (7.8)	26 (16.4)
Endocrine diseases	0 (0.0)	9 (5.7)
Chronic purulent bronchitis and effects of pulmonary embolism	4 (3.5)	6 (3.7)
Uroinfection and renal insufficiency	28 (24.1)	36 (22.8)
Hepatitis and liver failure	108 (93.1)	42 (26.6)
Severe neurological deficit (type A–C)	34 (29.3)	48 (30.4)
Pulmonary tuberculosis	101 (87.1)	106 (67.1)
Age over 60 years	0 (0.0)	14 (8.8)
ASA grade 3–4 risk	108 (93.1)	134 (84.8)

Table 2

Assessment of comorbidity using the Charlson index

Assessment criteria	Score	Group 1	Group 2
Myocardial infarction	1	0	6
Heart failure	1	0	22
Peripheral vascular disease	1	2	18
Transient ischemic attack or cerebrovascular accident with minimal residual effects	1	0	19
Dementia	1	0	2
Bronchial asthma	1	0	8
Chronic non-specific lung diseases	1	5	12
Collagenoses	1	0	0
Peptic ulcer (stomach or duodenal ulcer)	1	32	39
Hepatic cirrhosis without portal hypertension	1	2	7
Controlled type 2 diabetes mellitus	1	0	9
Cerebrovascular accident with plegia	2	0	0
Chronic renal failure with a creatinine level of more than 300 mmol/L	2	0	0
Diabetes with end-organ damage	2	0	0
Malignancies without metastasis	2	1	2
Acute or chronic myeloid leukemia	2	1	1
Lymphomas	2	0	0
Hepatic cirrhosis with portal hypertension	3	0	4
Malignancies with metastasis	6	0	0
Acquired immunodeficiency syndrome	6	116	0
Mean	—	8.2 ± 2.5	3.1 ± 1.3

With a comparable number of late postoperative complications in the compared groups, early infectious complications were significantly more often detected in patients with HIV infection ($\chi^2 = 4.53$; OR = 2.76), which may be explained by combination of their characteristic risk factors, including those considered when determining the CCI. In this case, the study demonstrated significance of the HIV infection influence only on certain anticipated postoperative complications.

Conclusions

1. More than 3/4 of patients with tuberculous spondylitis have severe comorbidities and are scored with high (grade 3–4) ASA risk.

2. The risk of postoperative complications is 2.5-fold higher in patients with tuberculous spondylitis and HIV infection than in HIV-negative patients.

3. The presence of HIV infection in patients with tuberculous spondylitis, compared with HIV-negative patients, is a factor that significantly increases the risk of early (within 1 year after surgery) postoperative complications, such as postoperative pneumonia, exacerbation (progression) of spondylitis, and tuberculous meningitis, while the risk of late postoperative complications does not depend on HIV infection.

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Table 3

Risks of postoperative complications depending on the ASA grade and presence of HIV infection, n (%)

Complications	ASA grade 3		ASA grade 4		Total (n = 242)
	HIV(+) (n = 80)	HIV(-) (n = 97)	HIV(+) (n = 28)	HIV(-) (n = 39)	
Early	12 (15.0)	9 (9.2)	7 (25.0)	5 (12.0)	33 (13.1)
Late	6 (7.5)	8 (8.2)	4 (14.3)	6 (15.4)	24 (9.5)
Total	18 (22.5)	17 (17.4)	11 (39.3)	11 (27.4)	57 (22.6)

Table 4

Postoperative complications in HIV(+) and HIV(-) patients operated on for tuberculous spondylitis, n (%)

Complications	HIV(+) (n = 116)	HIV(-) (n = 158)	Odds ratio, Fisher test
<i>Nonspecific</i>			
Plevritis	14 (12.1)	6 (3.8)	OR = 3.17; F = 0.02; $\chi^2 = 5.73^*$
Pneumonia	6 (5.2)	9 (5.7)	OR = 0.9; F = 0.99; $\chi^2 = 0.04$
Sepsis	4 (3.4)	6 (3.8)	OR = 0.9; F = 0.99; $\chi^2 = 0.02$
Wound healing by secondary intention	11 (9.5)	13 (8.2)	OR = 1.17; F = 0.83; $\chi^2 = 0.13$
<i>Specific</i>			
Local process aggravation	17 (14.7)	9 (5.7)	OR = 2.84; F = 0.02; $\chi^2 = 6.25^*$
Progression of pulmonary tuberculosis	4 (3.4)	2 (1.3)	OR = 2.79; F = 0.24; $\chi^2 = 1.49$
Tuberculous meningitis	6 (5.2)	1 (0.6)	OR = 8.56; F = 0.04; $\chi^2 = 5.54^*$
Death	4 (3.5)	3 (1.9)	OR = 1.85; F = 0.46; $\chi^2 = 0.65$

*statistically significant differences.

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