



Case report

Surgical treatment approach of cervicothoracic junction spinal tuberculosis in pediatric: A case report

Muhammad Faris^{*}, Galih Indra Permana, Eko Agus Subagio, Abdul Hafid Bajamal

Department of Neurosurgery, Airlangga University – Dr. Soetomo General Academic Hospital, Surabaya, East Java, Indonesia

ARTICLE INFO

Keywords:

Cervicothoracic junction
Spinal tuberculosis
Pediatric
Posterior approach

ABSTRACT

Introduction and importance: The cervicothoracic junction is prone to infection by tuberculosis bacteria, which leads to spinal instability. Meanwhile, cervicothoracic junction spinal tuberculosis is a disease that affects the C7 to T3 vertebral, and it accounts for 5% of all spinal tuberculosis cases. Surgical procedures of treating this disease vary, and the most commonly used method is the combined anterior and posterior approach. This case report presents the disease with uncommon location in pediatric, which is rarely reported, and performed with the single-stage posterior approach to treat the patient, which showed a good clinical and radiological result.

Case presentation: A 15-years old girl with one-month history of progressive inferior paraplegia (within a month, her muscle strength went from score 5 to 0) initially complained of neck pain, gradual weakness of the lower extremities, and hypoesthesia below T4. The spine's MRI also showed a tuberculous spondylitis in the T1 to T3 vertebral and a huge paravertebral abscess at the C5 to T3 level. Subsequently, an adequate decompression, debridement, maintenance and reinforcement of stability as well as deformity correction were carried out using the single-stage posterior approach.

Conclusions: The cervicothoracic junction spinal tuberculosis with huge paravertebral abscess makes surgical procedures difficult, specifically in pediatric patients. However, the single stage posterior approach produced a better clinical and radiological result with a short operation time. The selection of appropriate surgical approach management with good perioperative planning as well as effective medical management improved the patient's condition.

1. Introduction and importance

The cervicothoracic junction spinal tuberculosis is a disease caused by tuberculous infection of the vertebra C7 to T3. The cervicothoracic junction spinal tuberculosis is a rare condition, especially in pediatric population, and the treatment of this case is discussed in unusual case reports published in academic journals as rarities [1]. In 2017, there were 420,994 new cases of tuberculosis in Indonesia. Spondylitis tuberculosus is thought to affect 5% of these people [2]. Young people are rarely affected by this disease, specifically cases with a large paravertebral abscess [3]. Meanwhile, the cervicothoracic junction is a transitional zone between the lordotic and kyphotic thoracic spine. This region plays an essential role in weight-bearing, and damage by infection leads to spinal instability, severe kyphosis deformity, large paravertebral abscesses and progressive neurological disorders, such as paraplegia inferior [4]. Surgical approaches used in treating the disease

vary, including single or staged, anterior or posterior, anterior-posterior or posterior-anterior combined surgery [5]. The selection of a suitable approach is essential, specifically in cases related to the junction due to its complex anatomical structure, which leads to less satisfactory exposure and complicated surgical procedures [6]. We reported a case of uncommon cervicothoracic junction spinal tuberculosis in pediatric, which was successfully treated with corpectomy cage single stage posterior approach.

2. Case presentation

A 15-years old girl with a one month-history of progressive paraplegia initially complained of neck pain, gradual weakness of the lower extremities, and hypoesthesia below T4 vertebrae. Subsequently, a physical examination was carried out, which showed a sign of gibbus in the neck, as shown in Fig. 1. There was also an upper motor neuron lesion sign, such as an increased Achilles and Patellar reflex, clonus in

^{*} Corresponding author at: Department of Neurosurgery, Airlangga University – Dr. Soetomo General Academic Hospital, Mayjen Prof. Dr. Moestopo Street No. 6-8, 60286 Surabaya, East Java, Indonesia.

E-mail address: mfarisns@fk.unair.ac.id (M. Faris).

<https://doi.org/10.1016/j.ijscr.2022.107173>

Received 11 March 2022; Received in revised form 5 May 2022; Accepted 7 May 2022

Available online 10 May 2022

2210-2612/© 2022 The Authors. Published by Elsevier Ltd on behalf of IJS Publishing Group Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Abbreviations

C	Cervical
SVA	Sagittal Vertical Axis
T	Thoracic
TB	Tuberculosis
WHO	World Health Organization

the lower extremities, and a positive sign of Chaddock and Babinski pathological reflexes. Furthermore, the patient had a body mass index of 13.3 kg/m² or underweight conditions with no lung tuberculosis and significant family history. After the patient visited the hospital, anti-tuberculosis treatment was started with the regimen Rifampicin, Isoniazid, Pyrazinamide, and Ethambutol for 9 months.

The spine's MRI showed tuberculous spondylitis in the T1 to T3 vertebral with severe anterior vertebral collapse and retropulsion due to an acute angle as well as central canal stenosis at this level, as shown by Fig. 2. Also, a huge bilateral paravertebral abscess was observed in C5 to T3, with the majority at the right side. The abscess spread into the T1 to T3 spinal and foraminal canal, which led to severe bilateral stenosis. However, there was no skip lesion in the patient, and the Cobb angle before the procedure was approximately 42°, while the sagittal vertical axis (SVA) was 5.9 cm.

The surgical procedure provides adequate decompression, debridement, maintains and reinforces stability, as well as to correct or halt the deformity. A posterior cervicothoracic midline skin incision was made from C3 to T5. Meanwhile, one of the challenges faced during the surgery was the small pedicle diameter, hence, the right screw was carefully selected and the pedicle screw process was carried out with the right technique. All of the surgical procedure performed by the author as the spine surgeon and the team.

An injury was observed in the anterior part of the spinal cord caused by a fracture of the T1 to T3 vertebral body, as shown in Fig. 3. Huge paravertebral abscess, caseosa pus, debris, and necrotic tissues were also found around C5 to T3 vertebral body after decompressing with laminectomy. Subsequently, surgical debridement and evacuation of the paravertebral abscess were carried out with sample collection. The junction's spinal curvature was stabilizing after correction with lateral mass screw of the C3 to C5 and pedicle screw of the C7 and T4 to T6. The pedicle screw process was performed with the in-out-in technique in the thoracic vertebral due to the small pedicle diameter. Stabilization was

first performed using the single rod in the left side after manual maneuver correction of the cervical lordotic, abscess evacuation and drainage were then carried out. The anterior part of the T1 to T3 vertebral body experienced corpectomy, then stabilized with an anterior hollow cage and bone graft. Meanwhile, during the anterior procedure, the nerve roots from C7 to T3 were preserved without sacrifice. The corpectomy cage single-stage posterior approach was carried out, while all other procedures were performed with the posterior approach. Radiology evaluation was also carried out with a significant decrease in the Cobb angle to 11° and SVA to 1.9 cm, as shown in Fig. 4. Medical rehabilitation was started immediately after surgery and anti-tuberculosis medication was continued. Afterward, the patient had a good recovery, and the motoric paraplegia improved in strength (motoric strength from 0 to 5), while the hypoesthesia became normal. After a few months, the patient is able to walk normally and engage in routine daily activities without any neurological deficits. Anti-tuberculosis treatment was given in 9 months. This case report is presented based on the Surgical Case Report (SCARE) Guideline. [7]

3. Discussion

Tuberculosis, caused by *Mycobacterium tuberculosis*, is a disease with a high global morbidity and mortality [8]. The World Health Organization (WHO) reported that approximately 10 million people developed TB, and 1.4 million died in 2019. [2] The most common site of extrapulmonary tuberculosis is the spinal cord, accounting for 15–20% of all cases. Meanwhile, the cervicothoracic junction is a rare site for spinal tuberculosis, which accounts for only 5% [1]. Cervicothoracic junction spinal tuberculosis in pediatric is uncommon because of this distinctive anatomic location. Anatomically, the region is the junction between the mobile lordotic cervical vertebrae and the rigid kyphotic thoracic vertebrae. The complexity of the junction has made surgical treatment approach very difficult and are rarely reported [5].

Furthermore, spinal tuberculosis has nonspecific signs, which often lead to delayed diagnosis, and some of the symptoms include complicated deformity, instability, and neurological deficit [4,9]. This case report presents a patient with severe clinical manifestations, such as gibbus, paraplegia, and UMN type lesion. Three segments of T1 to T3 had huge paravertebral abscess around the vertebral body of C5 to T3 in the patient. The formation of abscess and vertebral body damage was caused by hematogenous dissemination from the primary focus in the lungs or the lymph nodes to the anterior part of the vertebral body. Vein's batson's plexus also contributes in the central type of vertebral tuberculosis, while paradiscal infection spreads through the arteries

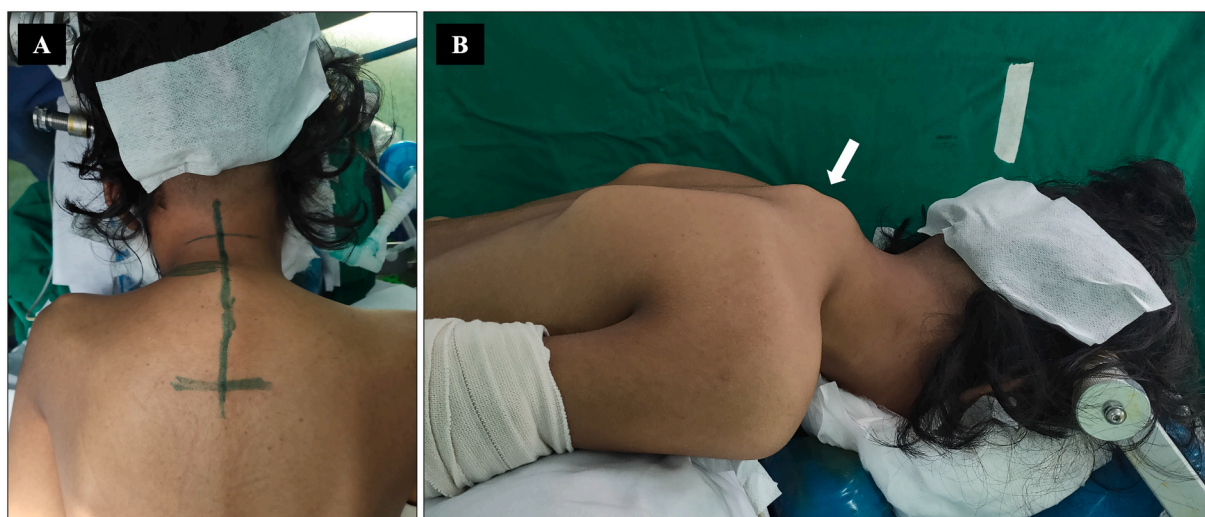


Fig. 1. A 15-years old girl patient clinically presented with gibbus (†) in the cervicothoracic junction in the posterior view (A) and lateral view (B).

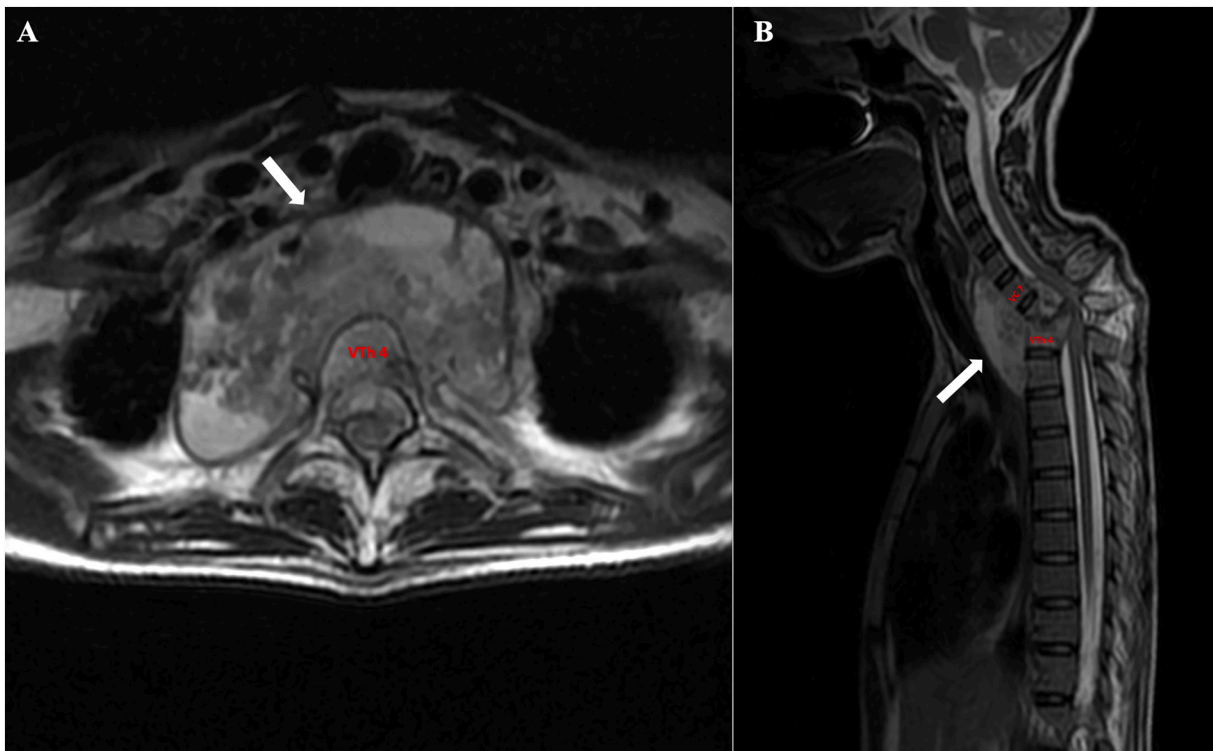


Fig. 2. MR imaging of axial (A) at the level vertebral T3 and sagittal (B) views showed a large paravertebral abscess (†) in the anterior of the level vertebral C5 to T3. In the sagittal view (B), vertebral body destruction and spinal cord compression at the level of vertebral T1 to T3.

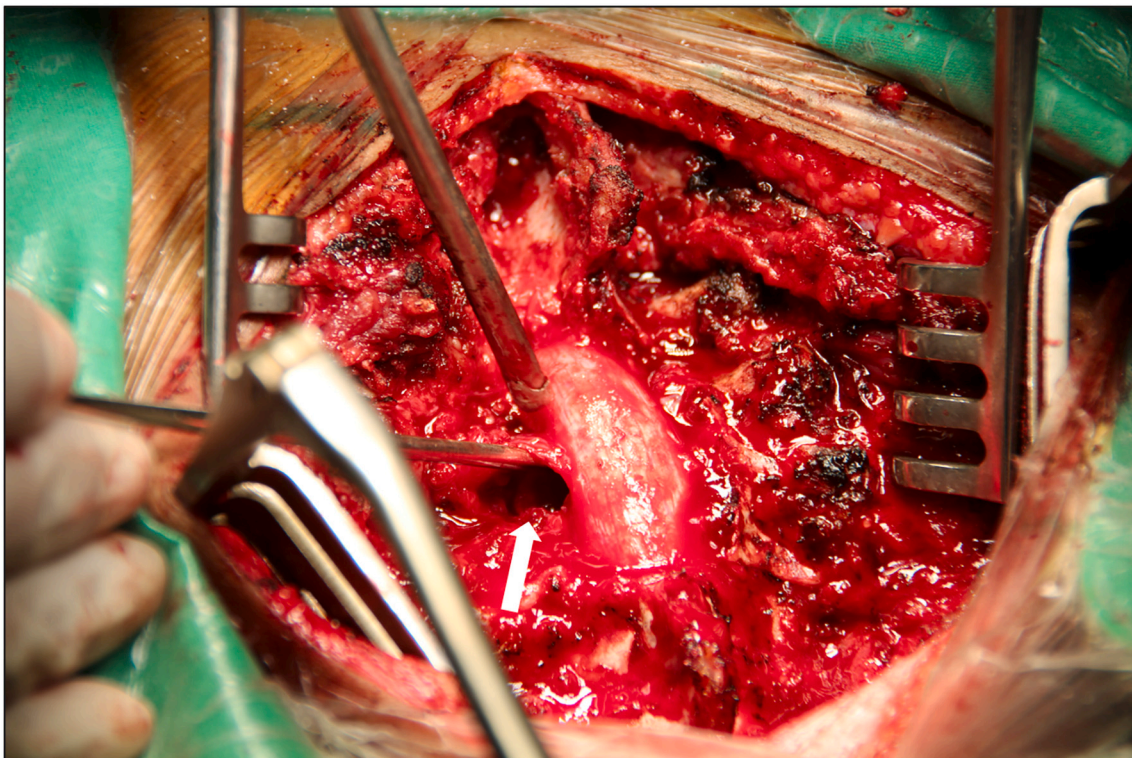


Fig. 3. Spinal cord compression due to vertebral body destruction at the level of vertebral T1 to T3. The paravertebral abscess has drained from posterior approach (†).

[3,4].

Cervicothoracic junction plays a role in stability and biomechanics of the weight-bearing area [10]. Furthermore, deformity of this junction is

associated with a high degree of spinal cord compression, which leads to severe neurological deficits. Cervicothoracic junction spinal tuberculosis is rarely reported, and there is no specific consensus on the surgical

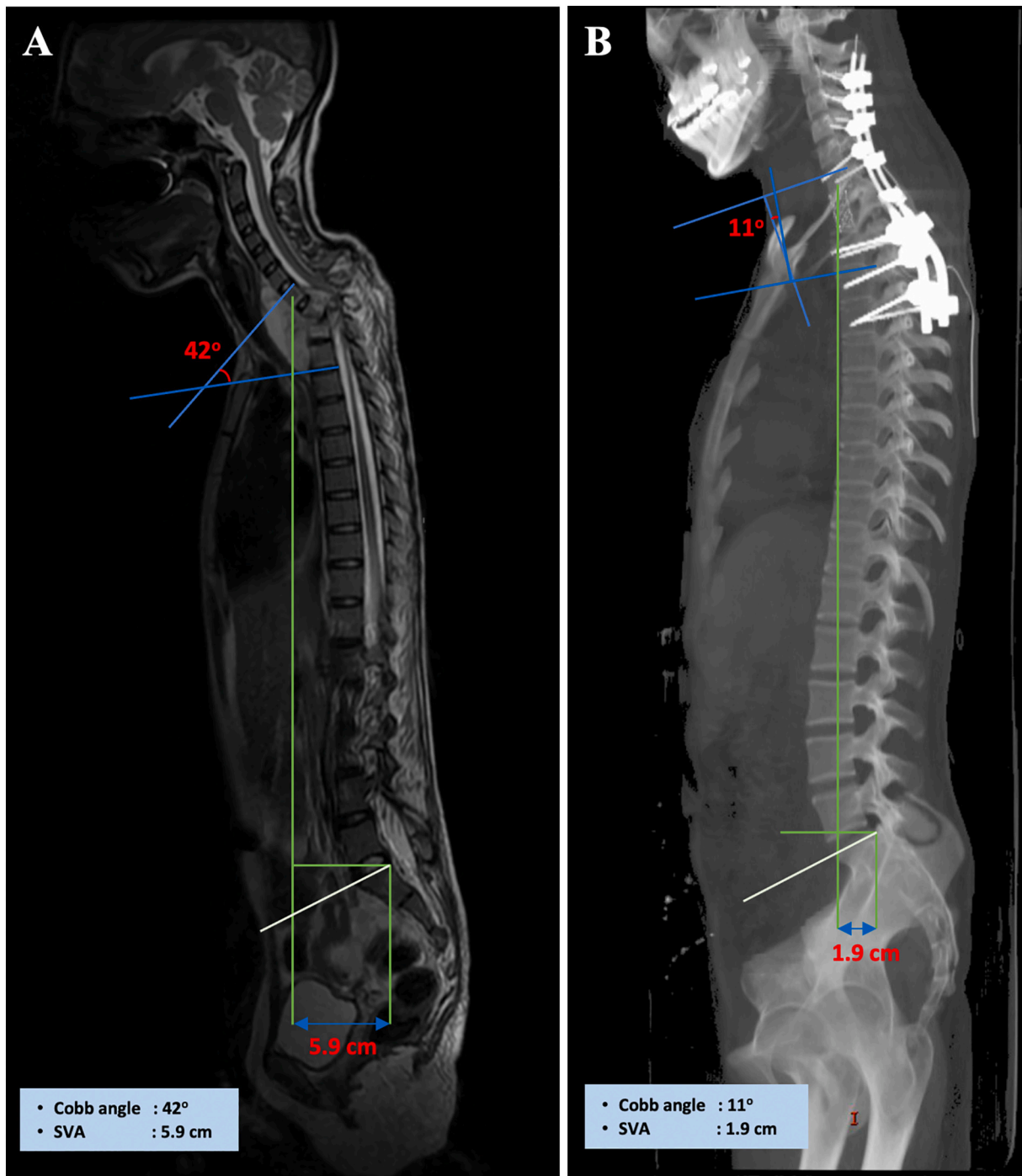


Fig. 4. Preoperative MRI (A) and postoperative radiograph (B) demonstrated decreased of the Cobb angle from 42° to 11° and sagittal vertical axis (SVA) from 5.9 cm to 1.9 cm that resulted in improved kyphotic deformity.

treatment approaches. The criteria for surgery in patients include kyphosis of $\geq 20^\circ$, instability, neurological deficits, and persistent pain [1,4]. Patients with severe kyphosis and huge paravertebral are corrected through the anterior and posterior approaches. The anterior approach allows the surgeon to reach the lesion and abscess or infected vertebral bodies directly, but it has a higher risk of bleeding due to several organs and blood vessels [5]. Meanwhile, the posterior approach is disadvantageous due to destabilization effect, inadequate visualization of the pathology, and requires a long posterior construct to restore stability, but it has reduced bleeding risk. Most surgeons perform a combined anterior and posterior approach [9,11] but in this case report,

the correctomy cage single-stage posterior approach was used to decompress, debride, evacuate abscess, correct the deformity, and maintain stability. Clinical and radiological evaluation showed a good result with a Cobb angle correction from 42° to 11° and SVA from 5.9 cm to 1.9 cm. Subsequently, the patient experienced medical rehabilitation and showed an increased motoric strength by 5 points and normality of sensory.

4. Conclusion

The cervicothoracic junction spinal tuberculosis with huge

paravertebral abscess makes surgical procedure challenging, specifically in pediatric patients. However, the posterior surgical approach was used to treat the disease effectively.

Source of funding

None.

Ethical approval

All ethical principles were considered in conducting this case report. All patient information kept confidential.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Research registration

Not applicable.

Guarantor

Dr. Muhammad Faris.

Provenance and peer review

Not commissioned, externally peer-reviewed.

Submission statement

This manuscript is original and has not been submitted elsewhere in part or in whole.

CRediT authorship contribution statement

Muhammad Faris - data collection, manuscript writing, critically

revising article, reviewed final version of article.

Galih Indra Permana - study concept, patient contribution, revising article, reviewed final version of article, study oversight, creation of figures.

Eko Agus Subagio - data collection, critically revising article, reviewed final version of article.

Abdul Hafid Bajamal - study concept, patient contribution, revising article, reviewed final version of article.

Declaration of competing interest

The authors declare that they have no conflict of interest.

References

- [1] I. Saleh, D. Librianto, P. Phedy, T.S. Efar, A.F. Canintika, An unusual case of extensive contiguous cervicothoracic spinal tuberculosis involving fourteen damaged segments: a case report, *Int. J. Surg. Case Rep.* 69 (2020) 109–113.
- [2] World Health Organization, Global Tuberculosis Report 2020, World Health Organization, New York, NY, US, 2020.
- [3] X. Wang, C. Zhou, C. Xi, C. Sun, J. Yan, Surgical treatment of cervicothoracic junction spinal tuberculosis via combined anterior and posterior approaches in children, *Chin. Med. J.* 125 (2012) 1443–1447.
- [4] S. Rajasekaran, D.C.R. Soundararajan, A.P. Shetty, R.M. Kanna, Spinal tuberculosis: current concepts, *Glob. Spine J.* 8 (2018) 96S–108S.
- [5] T. Zhang, J.-M. Yu, Y.-Q. Wang, D.-D. Yin, L.-J. Fang, WHO grade I meningioma subtypes: MRI features and pathological analysis, *Life Sci.* 213 (2018) 50–56.
- [6] R.K. Garg, D.S. Somvanshi, Spinal tuberculosis: a review, *J. Spinal Cord Med.* 34 (2011) 440–454.
- [7] R. Agha, T. Franchi, C. Sohrabi, G. Mathew, the S. Group, The SCARE 2020 guideline: updating consensus Surgical CAse REport (SCARE) guidelines, *Int. J. Surg.* 84 (2020) 226–230.
- [8] S.K. Sharma, H. Ryan, S. Khaparde, K.S. Sachdeva, A.D. Singh, A. Mohan, R. Sarin, C.N. Paramasivan, P. Kumar, N. Nischal, Index-TB guidelines: guidelines on extrapulmonary tuberculosis for India, *Indian J. Med. Res.* 145 (2017) 448.
- [9] S.M. Knoeller, L.F. Brethner, Treatment of tuberculous spondylitis at the cervicothoracic junction. Clinical impact of surgery by means of a sternotomy, *Saudi Med. J.* 23 (2002) 1414–1418.
- [10] M.-S. Moon, S.-J. Kim, M.-S. Kim, D.-S. Kim, Most reliable time in predicting residual kyphosis and stability: pediatric spinal tuberculosis, *AsianSpine J.* 12 (2018) 1069–1077.
- [11] H. Yin, K. Wang, Y. Gao, Y. Zhang, W. Liu, Y. Song, S. Li, S. Yang, Z. Shao, C. Yang, Surgical approach and management outcomes for junction tuberculous spondylitis: a retrospective study of 77 patients, *J. Orthop. Surg. Res.* 13 (2018) 312.