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13 Maret 2022 pukul 04.14

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Kepada: Muhammad Faris <mfarisns@fk.unair.ac.id>

Ms. Ref. No.: IJSCASEREPORTS-D-22-00325

Title: Surgical Treatment Approach of Cervicothoracic Junction Spinal Tuberculosis in Pediatric: A Case Report
International Journal of Surgery Case Reports

Dear Dr. Faris,

Your submission "Surgical Treatment Approach of Cervicothoracic Junction Spinal Tuberculosis in Pediatric: A Case Report" has been assigned manuscript number IJSCASEREPORTS-D-22-00325.

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Your submission

2 pesan

International Journal of Surgery Case Reports

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21 April 2022 pukul
23.23

Balas Ke: International Journal of Surgery Case Reports <ijscasereports@elsevier.com>

Kepada: Muhammad Faris <mfarisns@fk.unair.ac.id>

Ms. Ref. No.: IJSCASEREPORTS-D-22-00325

Title: Surgical Treatment Approach of Cervicothoracic Junction Spinal Tuberculosis in Pediatric:
A Case Report

International Journal of Surgery Case Reports

Dear Dr. Faris,

Reviewers have now commented on your paper. You will see that they are advising that you revise your manuscript. If you are prepared to undertake the work required, we would be pleased to reconsider our decision.

For your guidance, reviewers' comments are appended below.

If you decide to revise the work, please submit a list of changes or a rebuttal against each point which is being raised when you submit the revised manuscript.

To submit a revision, please go to <https://www.editorialmanager.com/ijscasereports/> and login as an Author.

Your username is: mfarisns

<https://www.editorialmanager.com/ijscasereports/l.asp?i=658099&l=XEJ4T56W>

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Finally, we would appreciate if you could submit your revised paper by May 01, 2022.

Yours sincerely,

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International Journal of Surgery Case Reports

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<http://www.scareguideline.com> and submit a completed SCARE 2020 checklist.

Please pay particular attention to the following criteria which are often missed:

- Who performed the procedure? (item 9d)
- patient perspective (item 12)
- Drug history, family history including any relevant genetic information, and psychosocial history (item 5d)
- Where relevant - intervention adherence and tolerability (item 10c)
- Post-intervention considerations (item 9f)

2. Please also ensure you state that the work has been reported in line with the SCARE 2020 criteria:

Agha RA, Franchi T, Sohrabi C, Mathew G, for the SCARE Group. The SCARE 2020 Guideline: Updating Consensus Surgical CAse REport (SCARE) Guidelines, International Journal of Surgery 2020;84:226-230.

3. Please cite the SCARE 2020 paper above in your text in the methods section and the add the reference to your references section.

4. Please ensure you submit a structured abstract with sub-headings as follows: Introduction and importance, Case presentation, clinical Discussion, Conclusion

5. Can you also please ensure you go through the entire manuscript and check the spelling, grammar and syntax and ensure the language is concise. If you need our author support services, you can access them here:

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6. Please be very clear about what this adds to the existing literature and clearly detail learning points.

7. Please ensure you submit your work with a Research Registry unique identifying number (UIN) if its first in man i.e. the first time a new device or surgical technique is performed: www.researchregistry.com – it can't progress without being registered. Please ensure you also state your registration UIN in your methods section and reference it including a hyperlink to it if registration is appropriate.

8. If you haven't already, please include your "highlights" which are 3-5 bullet points summarising the novel aspects and/or learning points (maximum 85 characters, including spaces, per bullet point).

9. The consent statement in the author form is not suitable. We need a statement like this:

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.

Please see consent section in instructions to authors for further information.

10. Please ensure any images/figures/photos are suitably anonymised with no patient information or means of identifying the patient.

11. Please add a Guarantor on the Author form, if you haven't already.

The guarantor is that individual who accepts full responsibility for the work and/or the conduct of the study, had access to the data, and controlled the decision to publish.

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Provenance and peer review

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13. Above references, please state the following headings with your response (if something doesn't apply, say N/a or none or none declared):

- conflicts of interest
- sources of funding
- ethical approval
- consent
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Reviewer #2: * Some minor grammatical revisions are needed.

- * It is better to mention the epidemiology of the tuberculosis prevalence in the region.
- * What was the family story of TB?
- * Do the surgical team prescribe the anti TB treatment prior the surgery?
- * What treatment plan was planned for after surgery?
- * Were other foci of the disease found outside the spine?

Reviewer #3: Abstract : In case presentation : where is the location of paraplegia ? superior or inferior ? please mention the motoric score of the gradual weakness in the lower extremities.

Highlight : please revise word paediatric to pediatric

Please give detail mark using arrow mark the pathology and important anatomy landmark at the figures

Reviewer #4: 1. What is new in this paper?

2. It is known junctional areas are difficult for surgery.
3. In developing country with high pulmonary TB, spinal TB is frequently
4. Progressive para plea? What is progressive paraplegia? Paraplegia is 'O' power/- How can progress?
5. Patient had good recovery - what is muscle power? At last follow up Authors have not mentioned anything about Ant tuberculosis treatment.
6. How long ATT given? What resigm?
7. What happened to kyphosis
8. Reference are not uniform and many are incomplete

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muhammad faris <mfarisns@fk.unair.ac.id>
Kepada: "Galih I. Permana" <md.galih@gmail.com>

22 April 2022 pukul 09.32

Muhammad Faris, MD, PhD, FINSS

(NeuroSpine Surgeon)

Secretary of Neuro-Spine committee, Indonesian Society of Neurosurgical Surgeons

Secretary General of Fellowship Indonesian Neuro-Spine Society

Secretary of Health Research Ethics Committee, Medical Faculty Airlangga University

**Head of Spine Division, Medical Faculty Airlangga University, Dr. Soetomo General Academic
Hospital**

[Kutipan teks disembunyikan]

Submission Confirmation for IJSCASEREPORTS-D-22-00325R1

2 pesan

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6 Mei 2022 pukul
08.38

Balas Ke: International Journal of Surgery Case Reports <ijscasereports@elsevier.com>

Kepada: Muhammad Faris <mfarisns@fk.unair.ac.id>

Ms. Ref. No.: IJSCASEREPORTS-D-22-00325R1

Title: Surgical Treatment Approach of Cervicothoracic Junction Spinal Tuberculosis in Pediatric:
A Case Report

International Journal of Surgery Case Reports

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International Journal of Surgery Case Reports

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From: "International Journal of Surgery Case Reports" ijscasereports@elsevier.com
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Ms. Ref. No.: IJSCASEREPORTS-D-22-00325R1

Title: Surgical Treatment Approach of Cervicothoracic Junction Spinal Tuberculosis in Pediatric: A Case Report
International Journal of Surgery Case Reports

Dear Dr. Faris,

I am pleased to inform you that your paper "Surgical Treatment Approach of Cervicothoracic Junction Spinal Tuberculosis in Pediatric: A Case Report" has been accepted for publication in International Journal of Surgery Case Reports.

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Yours sincerely,

The Editors
International Journal of Surgery Case Reports

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International Journal of Surgery Case Reports

Surgical Treatment Approach of Cervicothoracic Junction Spinal Tuberculosis in Pediatric: A Case Report

--Manuscript Draft--

Manuscript Number:	IJSCASEREPORTS-D-22-00325R1
Article Type:	Case Reports
Keywords:	Cervicothoracic junction; spinal tuberculosis; pediatric; posterior approach
Corresponding Author:	Muhammad Faris, M.D., Ph.D. Universitas Airlangga Fakultas Kedokteran Surabaya, East Java INDONESIA
First Author:	Muhammad Faris, M.D., Ph.D.
Order of Authors:	Muhammad Faris, M.D., Ph.D. Galih Indra Permana, M.D. Eko Agus Subagio, M.D., Ph.D. Abdul Hafid Bajamal, M.D., Ph.D.
Manuscript Region of Origin:	INDONESIA
Abstract:	<p>Introduction and importance</p> <p>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.</p> <p>Case presentation</p> <p>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.</p> <p>Conclusions</p> <p>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.</p>

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The following information is required for submission. Please note that failure to respond to these questions/statements will mean your submission will be returned. If you have nothing to declare in any of these categories, then this should be stated.

Please state any conflicts of interest

All authors must disclose any financial and personal relationships with other people or organisations that could inappropriately influence (bias) their work. Examples of potential conflicts of interest include employment, consultancies, stock ownership, honoraria, paid expert testimony, patent applications/registrations, and grants or other funding.

The authors declare that they have no conflict of interest

Please state any sources of funding for your research

All sources of funding should be declared as an acknowledgement at the end of the text. Authors should declare the role of study sponsors, if any, in the collection, analysis and interpretation of data; in the writing of the manuscript; and in the decision to submit the manuscript for publication. If the study sponsors had no such involvement, the authors should so state.

None

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Author contribution

Please specify the contribution of each author to the paper, e.g. study concept or design, data collection, data analysis or interpretation, writing the paper, others, who have contributed in other ways, should be listed as contributors.

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

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In accordance with the Declaration of Helsinki 2013, the Editors of IJS Case Reports require that reports that are ‘First in Man’ studies should be registered prospectively and failing that retrospectively. There are many places to register your First in Man case report:

- Clinicaltrials.gov – for all human studies – free
- Chinese Clinical Trial Registry chictr.org.cn – for all human studies - free
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- ISRCTN.com – for all human studies – charge
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Not applicable

Guarantor

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Dr. Muhammad Faris

Title of the Manuscript: Surgical Treatment Approach of Cervicothoracic Junction Spinal Tuberculosis in Pediatric: A Case Report

Manuscript Number: IJSCASEREPORTS-D-22-00325

Managing Editor

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- Drug history, family history including any relevant genetic information, and psychosocial history (item 5d)
- Where relevant - intervention adherence and tolerability (item 10c)
- Post-intervention considerations (item 9f)

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3. Please cite the SCARE 2020 paper above in your text in the methods section and the add the reference to your references section.
4. Please ensure you submit a structured abstract with sub-headings as follows:
Introduction and importance, Case presentation, clinical Discussion, Conclusion
5. Can you also please ensure you go through the entire manuscript and check the spelling, grammar and syntax and ensure the language is concise. If you need our author support services, you can access them here:
<https://www.ijspg.com/services/author-support>
6. Please be very clear about what this adds to the existing literature and clearly detail learning points.
7. Please ensure you submit your work with a Research Registry unique identifying number (UIN) if its first in man i.e. the first time a new device or surgical technique is performed: www.researchregistry.com – it can't progress without being registered. Please ensure you also state your registration UIN in your methods section and reference it including a hyperlink to it if registration is appropriate.

8. If you haven't already, please include your "highlights" which are 3-5 bullet points summarising the novel aspects and/or learning points (maximum 85 characters, including spaces, per bullet point).
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10. Please ensure any images/figures/photos are suitably anonymised with no patient information or means of identifying the patient.
11. Please add a Guarantor on the Author form, if you haven't already.
The guarantor is that individual who accepts full responsibility for the work and/or the conduct of the study, had access to the data, and controlled the decision to publish.

12. Please add the following statement above references:

Provenance and peer review
Not commissioned, externally peer-reviewed

13. Above references, please state the following headings with your response (if something doesn't apply, say N/a or none or none declared):
 - conflicts of interest
 - sources of funding
 - ethical approval
 - consent
 - author contribution
 - research registration (for case reports detailing a new surgical technique or new equipment/technology)
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Please also make sure that you complete each section of the form.

Authors' Response:

1. I have checked the criteria that often missed.
2. Yes, I have.
3. Yes, I have add in my manuscript.
4. Yes, I have changed as mentioned.
5. Yes, I have.
6. This report showed a rare cases of cervicothoracic junction spinal TB in pediatric and performed with the single-stage posterior approach to treat the patient (usually with combined surgical approach), which showed a good clinical and radiological result.
7. There are no new device or surgical technique.

8. I have add it in the highlight
9. Yes, I have changed
10. Yes, I have ensure
11. Yes, I have add
12. Yes, I have add
13. Yes, I have add
14. Yes, I have completed it

Reviewer 2

Comment:

1. Some minor grammatical revisions are needed.
2. It is better to mention the epidemiology of the tuberculosis prevalence in the region.
3. What was the family story of TB?
4. Do the surgical team prescribe the anti TB treatment prior the surgery?
5. What treatment plan was planned for after surgery?
6. Were other foci of the disease found outside the spine?

Authors' Response:

1. Thanks for the advice. I'll check the grammatical.
2. Thanks for the advice. I have added in my manuscript the epidemiology in my region.
3. There was no history of family TB. The information have been added.
4. Yes, we prescribed when patient was diagnosed with spondylitis TB and before performing surgery.
5. Early medical rehabilitation and anti-tuberculosis medicine continued. I have added in my manuscript.
6. No, there weren't.

Reviewer 3

Comment:

1. Abstract : In case presentation : where is the location of paraplegia ? superior or inferior ? please mention the motoric score of the gradual weakness in the lower extremities.
2. Highlight : please revise word paediatric to pediatric
3. Please give detail mark using arrow mark the pathology and important anatomy landmark at the figures

Authors' Response:

1. Inferior paraplegia and the muscle strength score from 5 to 0 within a month. I have added in my manuscript.
2. Thanks for the advice. I have changed in my highlights.
3. Thanks for the advice. I have marked in my figures.

Reviewer 4

Comment:

1. What is new in this paper?
2. It is known junctional areas are difficult for surgery.
3. In developing country with high pulmonary TB, spinal TB is frequently
4. Progressive para plea? What is progressive paraplegia? Paraplegia is 'O' power/- How can progress?
5. Patient had good recovery - what is muscle power? At last follow up Authors have not mentioned anything about Ant tuberculosis treatment.
6. How long ATT given? What resigm?
7. What happened to kyphosis
8. Reference are not uniform and many are incomplete

Authors' Response:

1. The majority of cervicothoracic junction cases involving bigger paravertebral abscesses were treated using a combined anterior and posterior approach. In this case report, we used a single step posterior technique with excellent radiologic and clinical outcomes.
2. Thanks. We tried to share our experienced with this difficult cases for surgery with the good result.
3. Yes, it happens frequently. However, because most patients arrive at our hospital after experiencing severe complications, there is no clear epidemiology data.
4. Before the diagnosis, the patient's motor strength was 5, but after being diagnosed with spinal TB, his motor strength declined rapidly to 0 or paraplegia within a month.
5. Patient with the motoric strength became 5 (good recovery) from paraplegia (0). Anti-tuberculosis treatment was given in 9 month from the first diagnosed until after surgery.
6. Anti-tuberculosis treatment was given in 9 month. The regimen Rifampicin, Isoniazid, Pyrazinamide, and Ethambutol.
7. The Cobb angle was improved from 42° to 11°, so the kyphosis was corrected.
8. Thanks for the advice. I have corrected in my reference.

Highlights:

- Spinal tuberculosis cases are one of the most common infection cases that happen in the most developed country.
- Cervicothoracic junction spinal tuberculosis in **pediatric** is rarely reported, especially with a large paravertebral abscess.
- Surgical approaches of the spinal tuberculosis are varied and include single or staged, anterior or posterior, and anterior-posterior or posterior-anterior combined surgery, most of the cases performed with combined surgery.

Commented [Author1]: Pediatric from paediatric

Title Page

Type of manuscript: Case report

Title: Surgical Treatment Approach of Cervicothoracic Junction Spinal Tuberculosis in Pediatric: A Case Report

Authors: Muhammad Faris, M.D., Ph.D.,¹ Galih Indra Permana, M.D.,¹ Eko Agus Subagio, M.D., Ph.D.,¹ Abdul Hafid Bajamal, M.D., Ph.D.¹

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¹Department of Neurosurgery, Universitas Airlangga – Dr. Soetomo General Academic Hospital, Surabaya, East Java, Indonesia

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Surabaya, East Java, Indonesia

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

Surgical Treatment Approach of Cervicothoracic Junction Spinal Tuberculosis in Pediatric: A Case Report

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.

Keywords: Cervicothoracic junction, spinal tuberculosis, pediatric, posterior approach

Commented [Author1]: Inferior paraplegia

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 tuberculosa 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.

Commented [Author2]: Epidemiology in region

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 **Figure 1**. There was also an upper motor neuron lesion sign, such as an increased Achilles and Patellar reflex, clonus in 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.

Commented [Author3]: History of lung TB and family history

Commented [Author4]: Anti-tuberculosis treatment started and regimen.

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 **Figure 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 **Figure 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 **Figure 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]

Commented [Author5]: Early post-operative planning

Commented [Author6]: Muscle power

Commented [Author7]: Duration of the anti-tuberculosis treatment

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 extra-pulmonary 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.[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 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 corpectomy 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 an 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.

Commented [Author8]: The kyphosis was corected

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.

List of abbreviations

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

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.

Author contribution

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.

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.

Declaration of competing interest

The authors declare that they have no conflict of interest.

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Figure Legend

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

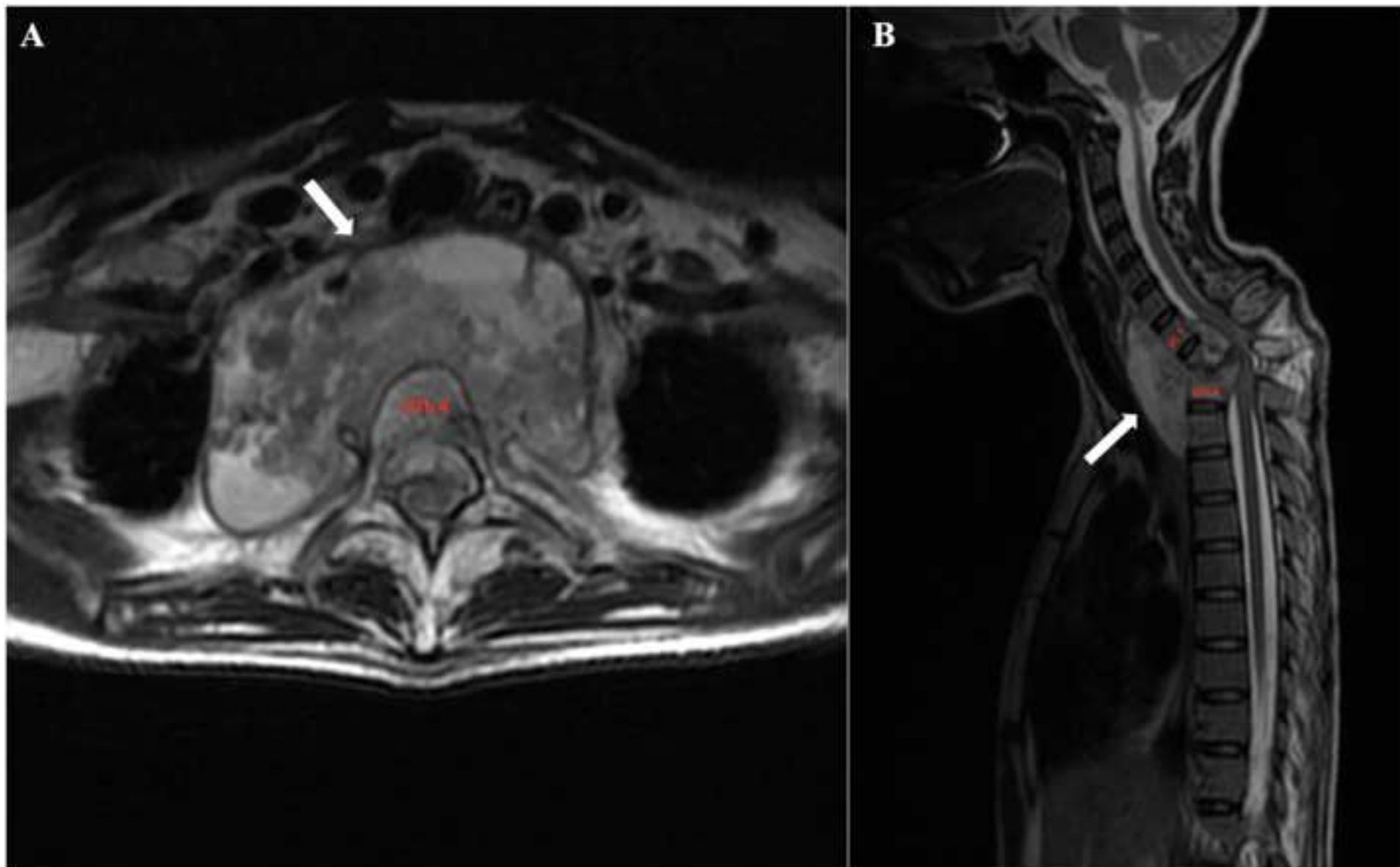
Figure 2. MR imaging of axial (A) at the level vertebral T3 and sagittal (B) views showed a large paravertebral abscess (↑) in the anterior of the level vertebral C5 to T3. In the sagittal view (B), vertebral body destruction and spinal cord compression at the level of vertebral T1 to T3.

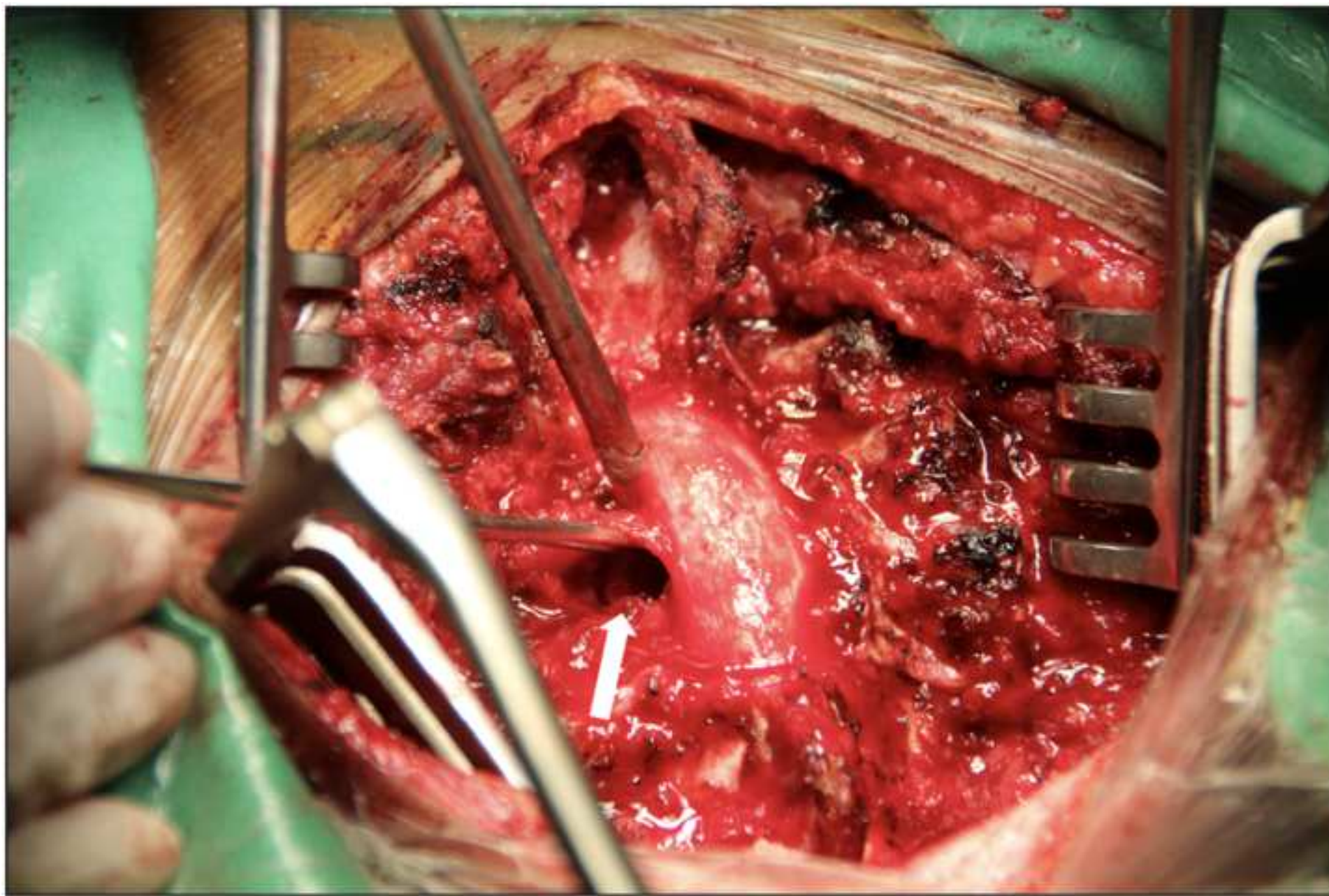
Figure 3. Spinal cord compression due to vertebral body destruction at the level of vertebral T1 to T3. The paravertebral abscess has drained from posterior approach (↑).

Figure 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.









SCARE Checklist			
Topic	Item	Checklist item description	Page Number
Title	1	The words "case report" and the area of focus should appear in the title (e.g. presentation, diagnosis, surgical technique or device or outcome).	1
Key Words	2	3 to 6 key words that identify areas covered in this case report (include "case report" as one of the keywords).	1
Abstract	3a	Introduction—What is unique or educational about the case? What does it add to the surgical literature? Why is this important?	1
	3b	The patient's main concerns and important clinical findings.	
	3c	The main diagnoses, therapeutics interventions, and outcomes.	
	3d	Conclusion — what are the "take-away" lessons from this case?	
Introduction	4	A summary of why this case is unique or educational with reference to the relevant surgical literature and current standard of care (with references, 1-2 paragraphs). Nature of the institution in which the patient was managed; academic, community or private practice setting?	2
Patient Information	5a	De-identified demographic and other patient specific information including age, sex, ethnicity, occupation and other useful pertinent information e.g. BMI and hand dominance.	2
	5b	Presentation including presenting complaint and symptoms of the patient as well as the mode of presentation e.g. brought in by ambulance or walked into Emergency room or referred by family physician.	
	5c	Past medical and surgical history and relevant outcomes from interventions	
	5d	Drug history, family history including any relevant genetic information, and psychosocial history including smoking status and where relevant accommodation type, walking aids, etc.	
Clinical Findings	6	Describe the relevant physical examination and other significant clinical findings (include clinical photographs where relevant and where consent has been given).	2

Timeline	7	Inclusion of data which allows readers to establish the sequence and order of events in the patient's history and presentation (using a table or figure if this helps). Delay from presentation to intervention should be reported.	2
Diagnostic Assessment	8a	Diagnostic methods (physical exam, laboratory testing, radiological imaging, histopathology etc).	2
	8b	Diagnostic challenges (access, financial, cultural).	
	8c	Diagnostic reasoning including other diagnoses considered	
	8d	Prognostic characteristics when applicable (e.g. tumour staging). Include relevant radiological or histopathological images in this section (the latter may sometimes be better placed in section 9).	
Therapeutic Intervention	9a	Pre-intervention considerations e.g. Patient optimisation: measures taken prior to surgery or other intervention e.g. treating hypothermia/hypovolaemia/hypotension in a burns patient, ICU care for sepsis, dealing with anticoagulation/other medications, etc	2,3
	9b	Types of intervention(s) deployed and reasoning behind treatment offered (pharmacologic, surgical, physiotherapy, psychological, preventive) and concurrent treatments (antibiotics, analgesia, anti-emetics, nil by mouth, VTE prophylaxis, etc). Medical devices should have manufacturer and model specifically mentioned.	
	9c	Peri-intervention considerations - administration of intervention (what, where, when and how was it done, including for surgery; anaesthesia, patient position, use of tourniquet and other relevant equipment, prep used, sutures, devices, surgical stage (1 or 2 stage, etc). Pharmacological therapies should include formulation, dosage, strength, route, duration, etc).	
	9d	Who performed the procedure - operator experience (position on the learning curve for the technique if established, specialisation and prior relevant training).	
	9e	Any changes in the interventions with rationale. Include intra-operative photographs and/or video or relevant histopathology in this section. Degree of novelty for a surgical technique/device should be mentioned e.g. "first in-human".	
	9f	Post-intervention considerations e.g. post-operative instructions and place of care.	
Follow-up and Outcomes	10a	Clinician assessed and patient-reported outcomes (when appropriate) should be stated with inclusion of the time periods at which assessed. Relevant photographs/radiological images should provided e.g. 12 month follow-up.	3

	10b	Important follow-up measures - diagnostic and other test results. Future surveillance requirements - e.g. imaging surveillance of endovascular aneurysm repair (EVAR) or clinical exam/ultrasound of regional lymph nodes for skin cancer.	
	10c	Where relevant - intervention adherence and tolerability (how was this assessed).	
	10d	Complications and adverse or unanticipated events. Described in detail and ideally categorised in accordance with the Clavien-Dindo Classification. How they were prevented, diagnosed and managed. Blood loss, operative time, wound complications, re-exploration/revision surgery, 30-day post-op and long-term morbidity/mortality may need to be specified.	
Discussion	11a	Strengths, weaknesses and limitations in your approach to this case. For new techniques or implants - contraindications and alternatives, potential risks and possible complications if applied to a larger population. If relevant, has the case been reported to the relevant national agency or pharmaceutical company (e.g. an adverse reaction to a device).	3,4
	11b	Discussion of the relevant literature, implications for clinical practice guidelines and any relevant hypothesis generation.	
	11c	The rationale for your conclusions.	
	11d	The primary "take-away" lessons from this case report.	
Patient Perspective	12	When appropriate the patient should share their perspective on the treatments they received.	3
Informed Consent	13	Did the patient give informed consent for publication? Please provide if requested by the journal/editor. If not given by the patient, explain why e.g. death of patient and consent provided by next of kin or if patient/family untraceable then document efforts to trace them and who within the hospital is acting as a guarantor of the case report.	Yes, we have obtained from the parent
Additional Information	14	Conflicts of Interest, sources of funding, institutional review board or ethical committee approval where required.	Not applicable

Corrections received - [IJSCR_107173]

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[Kutipan teks disembunyikan]

Surgical Treatment Approach of Cervicothoracic Junction Spinal Tuberculosis in Pediatric: A Case Report

 The corrections made in this section will be reviewed and approved by a journal production editor.

Muhammad Faris*, mfarisns@fk.unair.ac.id, Galih Indra Permana, Eko Agus Subagio, Abdul Hafid Bajamal

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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.

Keywords:

Cervicothoracic junction, Spinal tuberculosis, Pediatric, Posterior approach

Abbreviations

No keyword abbreviations are available

Abbreviations

C Cervical

SVA Sagittal Vertical Axis

T Thoracic

TB Tuberculosis


WHO World Health Organization

1.1 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 tuberculosis 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.

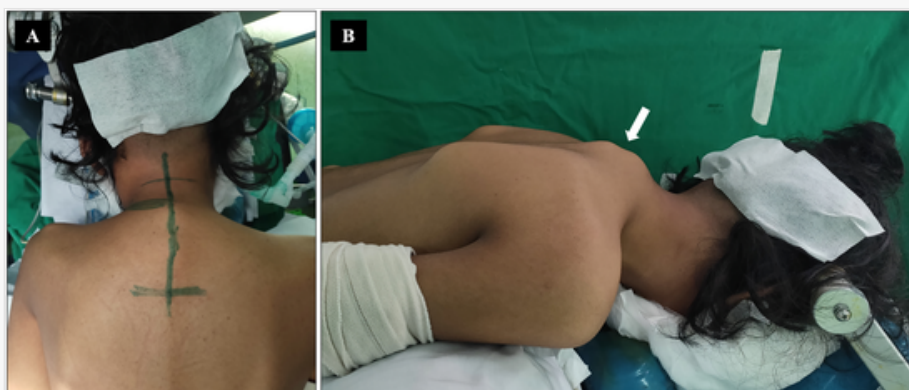
2.2 Case presentation

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 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.

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alt-text: Fig. 1

Figure 1, Fig. 1



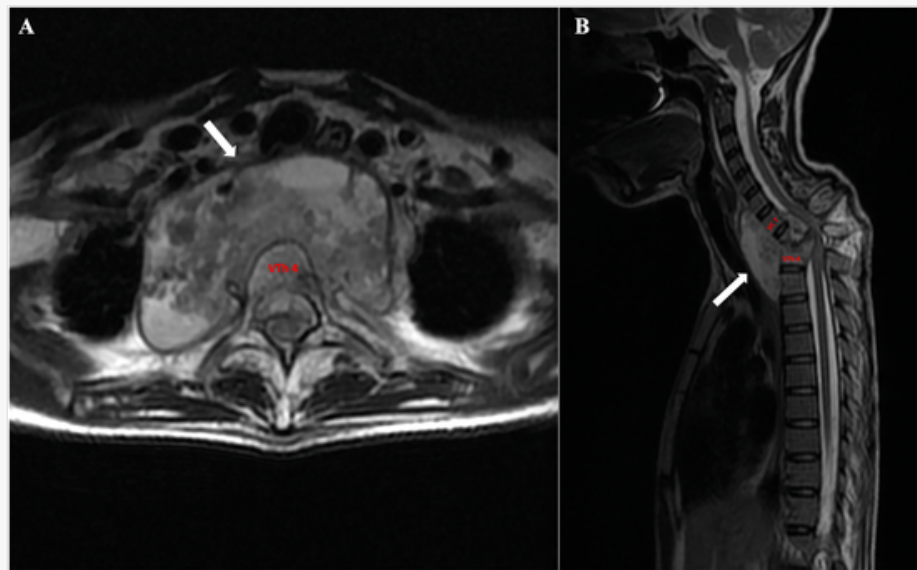
A 15-years old girl patient clinically presented with gibbus (↑) in the cervicothoracic junction in the posterior view (A) and lateral view (B).

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.

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alt-text: Fig. 2


[Figure 2.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.

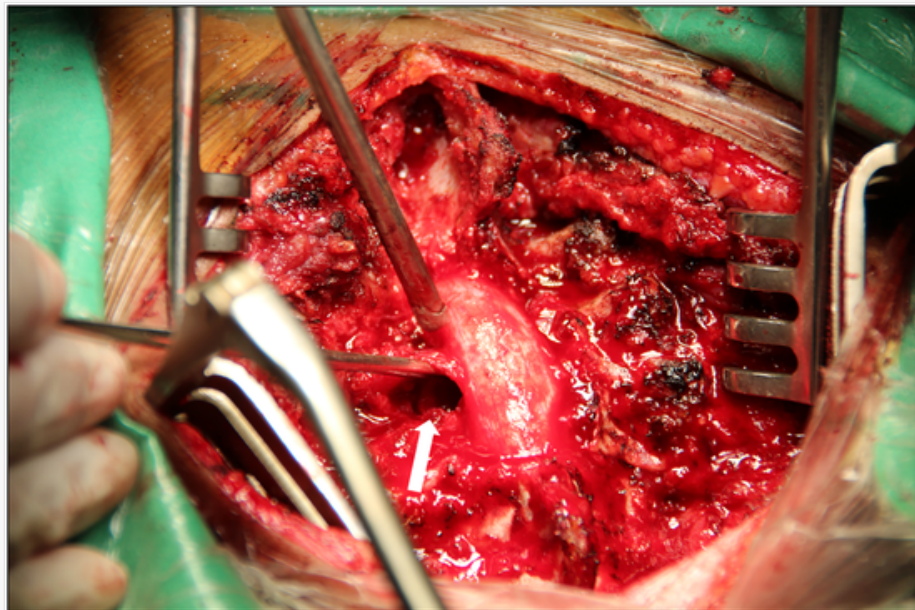
The surgical procedure provides adequate decompression, debridement, maintains and reinforces stability, as well as to correct or halt the deformity. A posterior cervicothoracic midline skin incision was made from C3 to T5. Meanwhile, one of the challenges faced during the surgery was the small pedicle 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]


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alt-text: Fig. 3

Figure 3, Fig. 3

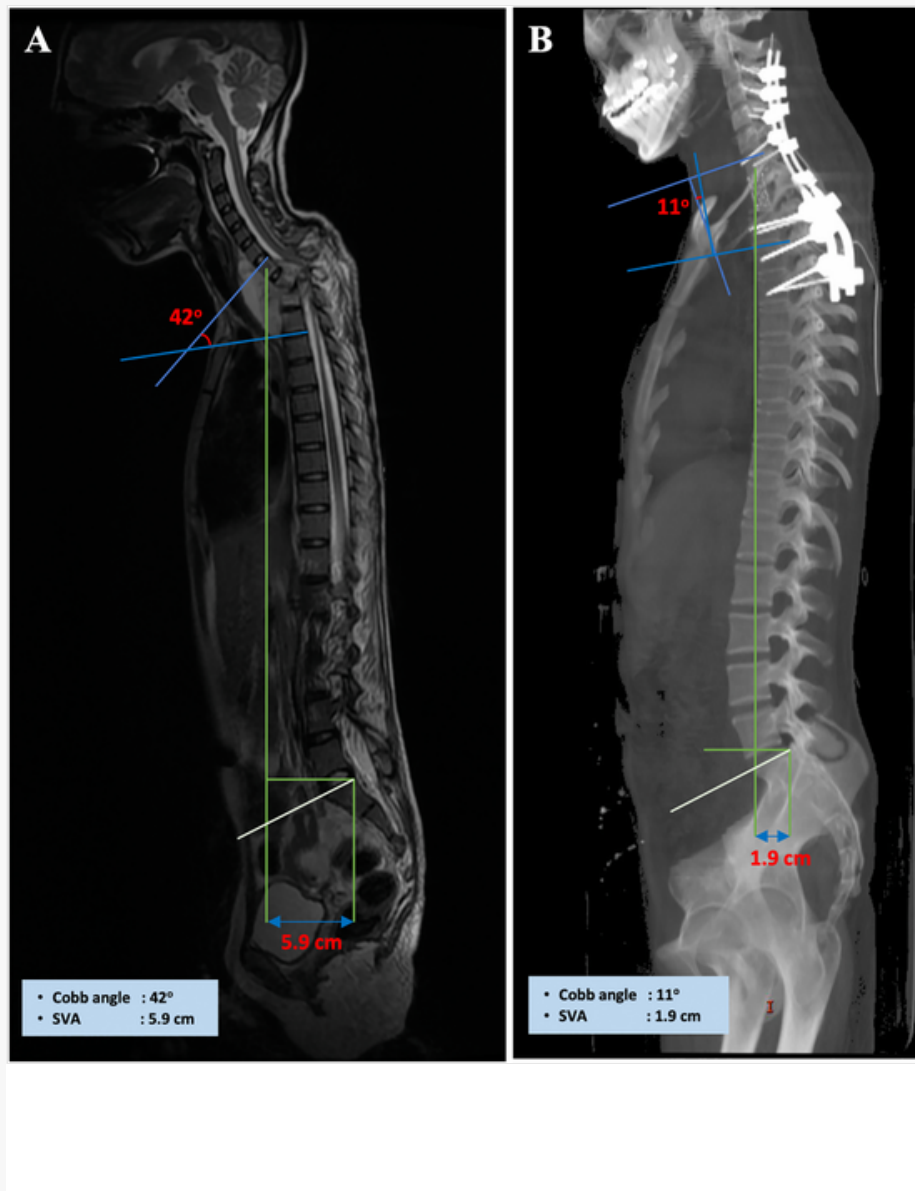


Spinal cord compression due to vertebral body destruction at the level of vertebral T1 to T3. The paravertebral abscess has drained from posterior approach (↑).

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alt-text: Fig. 4

Figure 4, 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.

3.3 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 extra-pulmonary 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].

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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 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 corpectomy 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.

4.4 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

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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

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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

References

 The corrections made in this section will be reviewed and approved by a journal production editor. The newly added/removed references and its citations will be reordered and rearranged by the production team.

- [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.
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Highlights

- Spinal tuberculosis cases are one of the most common infection cases that happen in the most developed country.
 - Cervicothoracic junction spinal tuberculosis in pediatric is rarely reported, especially with a large paravertebral abscess.
 - Q2** • Surgical approaches of the spinal tuberculosis are varied and ~~include single or staged, anterior or posterior, and anterior-posterior or posterior-anterior combined surgery;~~ most of the cases performed with combined surgery.
-

Queries and Answers

Q1

Query: Please review the **given names and surnames** to make sure that we have identified them correctly and that they are presented in the desired order. Carefully verify the spelling of all authors' names as well. If changes are needed, please provide the edits in the author section.

Answer: Yes

Q2

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