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Case Report

Cervicomedullary Junction Tuberculosis with Atlantoaxial Dislocation: a Case Report and the Role of Surgery in the Atlantoaxial Tuberculosis Treatment

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Abstract The author reports a rare case of a 51-year-old female with C1-2 tuberculosis and dislocation presented with complained neck pain and a rapidly progressive neurological deficit. The patient underwent posterior decompression, debridement, tissue biopsy and occipitocervical fusion because of clinical worsening during admission and received anti-tuberculous chemotherapy continued for12 months. Clinical symptoms and x-ray imaging of the cervical spine were performed to evaluate the therapeutic outcome. The patient was followed up until the radiographic improvement of bone healing. Completed resolution of pain was observed in the third month, followed by normal activity in the sixth month. Although the management of cervicomedullary junction tuberculosis has remained controversial and the conservative treatment has a good prognosis, but the surgery still has a role in a patient with neurological deficit, atlantoaxial instability, failure after conservative treatment or uncertain diagnosis and require tissue biopsy. The insidious symptoms of severe neurological complications and sudden death are due to cervicomedullary compression, and the treatment is therefore different from the lesion at another spine level. However, early diagnosis and treatment are necessary to prevent the serious complications of the disease.

***Keywords*: cervicomedullary junction tuberculosis; neurological deficit; atlantoaxial dislocation; conservative treatment**

Introduction

Mycobacterium tuberculosis is a contagious bacterial infection that involves the pulmonary system, but it may spread to extra-pulmonary organs. Approximately 10% of patients with extra-pulmonary tuberculosis have skeletal involvement and the spine is the most common site accounts for almost 50% of cases[1,2]. The incidence of spinal tuberculosis is approximately 2% of all tuberculosis. The thoracolumbar junction is the most common site but the cervical spine involvement is unusual[3-5]. Tuberculosis of the craniovertebral junction occurs in 0.3% to 1% of cases of spinal tuberculosis, 16% is primarily involving the atlas and the axis and the least common presentation of spinal tuberculosis[4,6-9]. However, there has not been reported in Thailand. Insidious symptoms of severe neurological complications and sudden

death result from cervicomedullary compression; and the treatment is different from the infection at other spinal regions[4, 10-12]. The history of chronicity and slow progression of the disease is the main reasons for common misdiagnosis and delay of treatment[1, 13]. Early diagnosis and treatment are also essential to prevent permanent neurological disability and life-threatening[2,13,14]. Although non-surgical or surgical management can be performed, it has remained controversial[4, 9].

Case report

A 51 years old female came to hospital with a complaint of neck and right shoulder pain for five months. Three days later she was admitted to the hospital with painful neck and rapidly progressive right paralysis. She was healthy and no medical or surgical history; the BCG vaccine history was not known. The neurological examination revealed motor strength of 4/5 and decreased sensation on the right side. The deep tendon reflexes of both arms and legs were increased, with positive Hoffmann's and Babinski's sign. The lymph nodes were not palpable. Laboratory results, including serologic tests, complete blood count, electrolytes, blood urea nitrogen, creatinine and liver function test were normal except for a slightly elevated erythrocyte sedimentation rate (ESR) of 94 mm./hour. HIV serology was negative. Chest radiography showed no evidence of pulmonary lesions. The plain cervical x-ray showed C1-2 deformity and prevertebral soft tissue was minimal swelling at the atlantoaxial region (Figure 1)

The computed tomography showed the irregular cortical bony destruction of the right anterior and poste-

Figure 1 The film chest x-ray showed no evidence of pulmonary tuberculosis (a), a film x-ray c-spine showed the right C1-2 deformity and prevertebral soft tissue was minimal swelling at the atlantoaxial region (b and c).

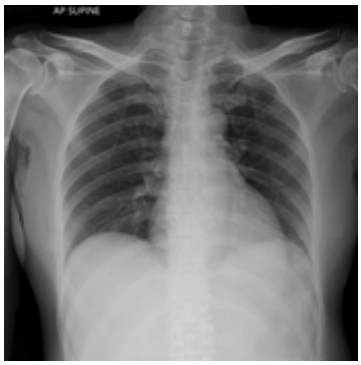
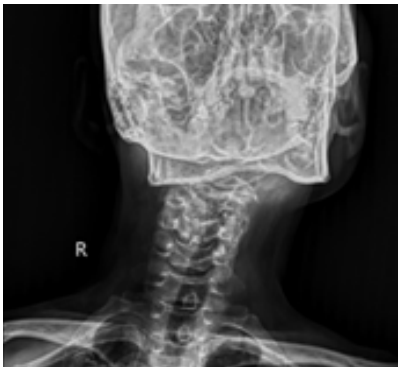
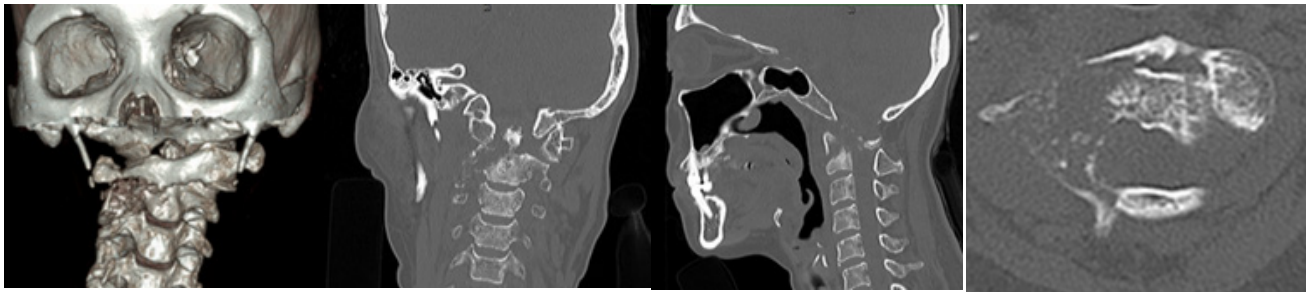
(a)  (b)  (c) 

Figure 2 The computed tomography showed the irregular cortical bony destruction of the right anterior and posterior arch of C1, odontoid process, right side vertebral body, transverse process of C2 and C1-2 dislocation



rior arch of C1, odontoid process, right side vertebral body and transverse process of C2 resulting in C1-2 dislocation (Figure 2). The magnetic resonance imaging showed bony erosion and abscess formation compress cervicomedullary junction and myelopathic change (Figure 3).

During admission, the patient developed quadriparesis with motor grade of 3/5 and decreased sensation on both limbs. This patient underwent posterior decompression and posterior occipitocervical fusion (Figure 4) because of exacerbation of neurological impairment and marked bone destruction with complete obliteration of the anterior arch of C1 in stage III by Lifeso's classification. The whitish-yellow calcified and necrotic tissue were debrided and biopsy was obtained. Post-operative, the patient immobilized neck with a Philadelphia collar for three months. The acid-fast bacillus (AFB) stain was negative and culture for tuberculosis was no growth. Bone and tissue biopsy revealed caseous granulomatous inflammation with few giant cells and no evidence of malignancy.

The patient received anti-tuberculous chemotherapy 12-month regimen consisted of Isoniazid, Rifampicin, Pyrazinamide and Ethambutol for two months followed by Isoniazid and Rifampicin for ten months. The patient was followed up until the radiographic improvement of bone healing (Figure 5). She had a complete resolution of pain in the third month and normal activity in the sixth month.

Discussion

Tuberculosis remains a major public health problem in developing countries[1,4,15-17]. Spinal tubercu-

Figure 3 The magnetic resonance imaging showed bony erosion and abscess formation compress cervicomedullary junction and myelopathic change

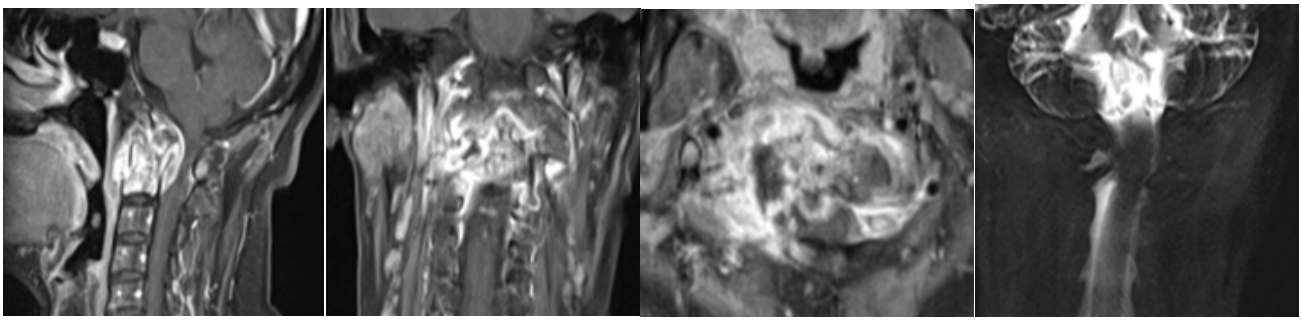
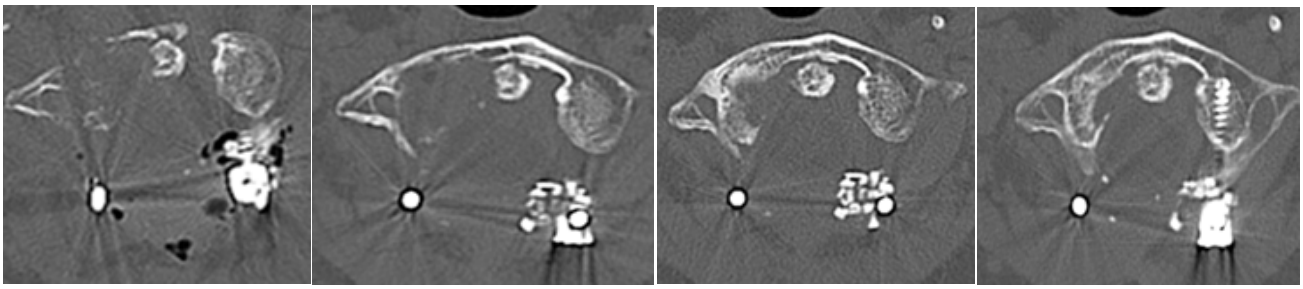


Figure 4 The film x-ray c-spine post posterior decompression and occipitocervical fusion.

Figure 5 The computed tomography showed posterior decompression and occipitocervical fusion in the 1st, 3rd, 6th and 12th month (a, b, c and d).



(a) (b) (c) (d)

losis is usually a secondary infection through hematogenous spreading from a primary site in the pulmonary lesion or genitourinary system[18]. Batson's paravertebral venous plexus in the vertebra is a valveless system that depending on the intraabdominal and intrathoracic cavities pressure result in the thoracolumbar is the common especially in the subchondral and paradisical regions[4,18]. Also, cervical tuberculosis may be caused by direct invasion into the retropharyngeal space via the lymphatic and surrounding structures by trauma to pharynx and esophagus[6,14,19-23]. The infection begins from the anterior vertebral body adjacent to the endplate, involving the disc results in disc destruction and spinal deformity[24]. The craniovertebral junction tuberculosis is rare and the odontoid invasion is not many reports. Besides, the cervicomedullary junction of the spinal cord is a life-threatening condition by unstable atlantoaxial subluxation and upward translation of the dens or a tubercular abscess compress the spinal cord, direct tuberculous invasion to meninges and cord by granulation tissue and spinal cord inflammation[13,15,25]. The history of chronicity and slow progression of the disease pose diagnostic difficulty as a result, it is a common misdiagnosis and delay of treatment[1,13].

Atlantoaxial tuberculosis has been classified into 3 stages by Lifeso's classification depending on radiographic appearance[26].

Stage I: minimal bone destruction with intact ligaments and no evidence of anterior displacement of C1 on C2, with or without proximal translocation of the dens.

Stage II: minimal bone destruction with ligamentous disruption and anterior displacement of C1 on C2 with or without proximal translocation of the odontoid.

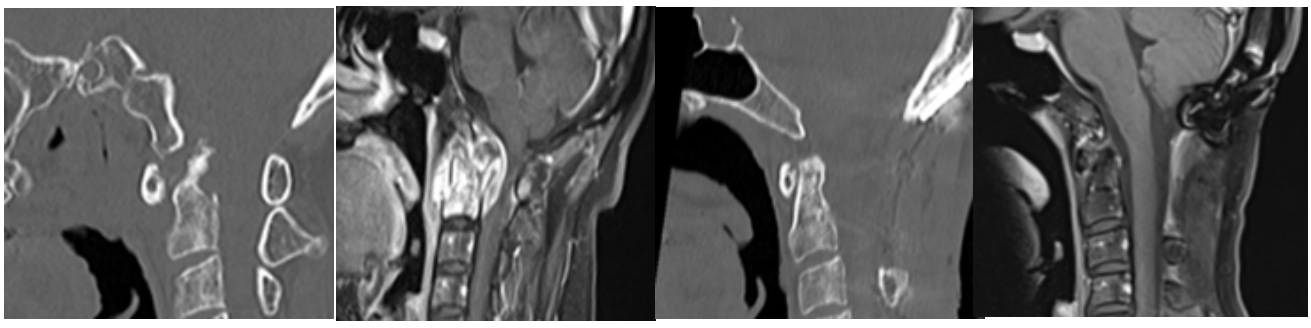
Stage III: marked bone destruction with complete obliteration of the anterior arch of C1.

The diagnosis of atlantoaxial tuberculosis may be difficult from infection and metastasis of nonspecific symptoms and physical findings; most patients complained of limitation of neck mobility and neck pain or torticollis[2,12,15,16,18,27,28]. However, it is difficult to visualize early changes of disease on plain cervical X-rays but may show an increased prevertebral soft tissue shadow in front of the atlantoaxial area[15,29]. The computed tomography and the magnetic resonance imaging of the cervical spine are very useful and important for making a correct diagnosis. The computed tomography detects bony involvement whereas magnetic resonance imaging is better to detect soft tissue

abnormalities, abscess and spinal cord compromise[11]. The bone scan help differentiates from metastatic lesions; however, there is limited accuracy[16,18]. The chest x-ray is an almost negative finding. The negative tuberculin skin test does not rule out the disease; especially in Thai is usually positive because received a BCG vaccine which causes false-positive result[13,30]. Extra-pulmonary tuberculosis can present with variable hematologic abnormalities, leukocytosis may be noted in cases of active disease, but rarely pancytopenia[14,16,31]. The erythrocyte sedimentation rate is an inexpensive, easily available investigation, particularly in pulmonary and extra-pulmonary tuberculosis but is a non-specific test for a wide range of pathological conditions and may also be due to the other factors which affect the values of erythrocyte sedimentation rate[3,32]. The erythrocyte sedimentation rate may be generally raised many folds in the majority of patients and declines to normal or near-normal when the active tuberculous lesion is controlled[18]. The C-reactive protein has a high sensitivity for active tuberculosis while delivering low specificity[33]. Although the erythrocyte sedimentation rate and C-reactive protein are high sensitivity, limited used to follow up the clinical because it was a non-specific marker and may increase in many inflammatory conditions and non-inflammation like physical stress[34-36]. The positive acid-fast bacilli smear shows positive less than half of the patients. However, the mycobacterial culture is a sensitive test available but is not a gold standard[7,16,18,33,37]. The typical histomorphological findings reveal chronic granulomatous inflammation, caseous necrosis with epithelioid cells and Langhans' giant cell, confirm the diagnosis in approximately 60 % of the patient[1,8,11,18,38-40]. The polymerase chain reaction in spinal tuberculosis has high sensitivity and specificity results for the early and rapid diagnosis. It is also an effective method for bacteriological diagnosis of tuberculosis and might be helpful in the case does not conclusively just by smear and culture findings but not feasible in the most endemic settings[7,16,18,37].

In this case, although the erythrocyte sedimentation rate slightly decreases of 88 mm./hour and the symptoms have a complete resolution of pain in the third month and improves neurological functions in the sixth month. The radiographic bone healing after the patient received anti-tuberculous chemotherapy 12 months

Figure 6 The CT scan and MRI c-spine showed bony erosion and abscess formation, compressing cervicomedullary junction and myelopathic change (a, b). Post posterior decompression with occipitocervical fusion and received anti-tuberculous chemotherapy 12 months (c, d).



(a) (b) (c) (d)

(Figure 6).

What is the optimal treatment for atlantoaxial tuberculosis?

Although the anti-tuberculous chemotherapy shows excellent clinical recovery and the majority of cases do not need surgery. The anti-tuberculous drugs penetrate well into tuberculous vertebral lesions and the most commonly prescribed regimen for sensitivity does not differ for pulmonary and extra-pulmonary tuberculosis[5,14,16,22]. In recent years, the non-surgical management in patients with atlantoaxial tuberculosis is a remarkable clinical improvement with anti-tuberculous chemotherapy[9]. The craniocervical junction, neither all of the cases should be treated conservatively with anti-tuberculous medication and external fixation. However, there is no consensus on the optimal management, the medical therapy alone is better than surgical management is unclear[4,7,13,16,18]. The neurological complications are more common and serious in cervical spine tuberculosis than another level[4]. Gupta et al. regardless of their clinical and radiological grading, in most patients with retropharyngeal mass with atlantoaxial dislocation, gross bony destruction or angulation, the external immobilization was carried out by applying a Halo jacket for 3 months after cervical realignment by skeletal traction and the transoral aspiration and debridement are performed for decompression and tissue diagnosis[9]. Kanaan et al. tried the patient's management in craniocervical junction tuberculosis with myelopathy and atlantoaxial instability by transoral anterior approach for debridement and biopsy without posterior surgical stabilization. The anti-TB medication and cervical traction were continued for 3 weeks then replaced with a halo jacket; however, one case developed cardiorespiratory arrest while in a halo jacket[4]. Lal et al. recommended the posterior decompression and fusion in neurologic complications[4,23]. Also, Sih et al. reported case with dramatic progressive quadriparesis results from atlantoaxial instability and tuberculous mass compresses the cervicomedullary junction successfully treated with anterior and posterior decompression, posterior stabilization and anti-tuberculous drugs management[4,10]. Arunkumar et al. proposed transoral decompression followed by occipitocervical fusion, continuous antituberculosis therapy treatment in craniovertebral junction tuberculosis in cases with neurological deficits due to craniovertebral junction disease and the results were excellent neurological recovery and the long-term prognosis[8,41]. However, Qureshi et al. showed that the appropriated occipitocervical fusion combined with posterior decompression was stabilized and sufficiently immobilize, then the anterior surgery may not necessary[8].

Despite the diagnosis and treatment in the many literatures is unclear, there are still no straightforward guidelines for the management[17,18]. More aggressive management in the cervicomedullary junction may be indicated because of it much more serious complications[4,7,12]. Although many present studies reveal the conservative management seems to be more successful in atlantoaxial instability and neurological deficit. The transoral debridement or drainage epidural abscess by needle aspiration should be performed for proving tuberculosis infection[4,5,9,25,26]. The many studies show Lifeso's treatment protocol in stage I was treated nonoperatively and surgical stabilization was performed in stages II and III after correcting atlantoaxial instability and traction[26].

In Lifeso's classification stage I and no neurolog-

ical deficit, the non-surgical management includes anti-tuberculous medications and traction or external fixation is sufficient[21,26]. However, the aims of surgery are neurological decompression, maintenance of spinal stability, debridement, tissue biopsy and non-responding to medical management[4,8]. The patient with neurological deficits, Lifeso's classification stage II/III, fail to respond to 4-6 weeks of antituberculous chemotherapy or uncertain diagnosis should be performed surgery[8,12,17,28,39]. The anterior approach was still more popular compared to the posterior approach because of direct decompression, radical debridement and drainage[3]. The combined anterior and posterior approach is impressive neurological improvement and shortening recovery period. In severe instability and destructive bony structure form disease, the anterior approach cannot be performed stabilize result in more severe instability. The posterior debridement and decompression and fusion are sufficient, the effect of surgery is quick, minimal complication, and high rate of bony fusion and continues neck immobilization with the cervical brace should be performed at least 3 to 6 months[4,6,9,12,13,21,23,26,42].

If the patient with Lifeso's classification stage I, the anti-tuberculous chemotherapy regimens should be begun as soon as enough evidence supports the diagnosis of spinal tuberculosis and who are at risk of having pulmonary tuberculosis[13,17,25]. Unfortunately, the majority of patients with spinal tuberculosis does not have chest radiographic abnormalities or symptoms[5,17]. If empiric treatment is not effective, the tissue diagnosis is essential[4,39]. A biopsy can achieve diagnosis and sufficiency decide to initiate anti-tuberculous therapy[1,13,18,25]. The corticosteroids in spinal tuberculosis indicate in cases of spinal arachnoiditis which associated with tuberculous meningitis[5,18,28].

Should be considered preoperative anti-tuberculous chemotherapy?

The preoperative anti-tuberculous chemotherapy regimens two weeks reduce the number of systemic and local bacterial toxins before surgery and immobilization are required to ensure surgical safety[3-5,8,17,25,43]. However, the duration of preoperative anti-tuberculous chemotherapy has not been determined, near-normal erythrocyte sedimentation rate is generally regarded for determining the timing of surgery[3]. Although the risk of transmission of extra-pulmonary tuberculosis has not been adequately documented in the literature, the respiratory transmission of the disease has been documented in patients with sputum acid-fast bacillus testing-negative, chest radiographic abnormalities or not show the neurological symptoms. Additionally, approximately 33-50% of patients with spinal tuberculosis is concomitant pulmonary tuberculosis[5]. The patients diagnosed with extra-pulmonary tuberculosis disease should be evaluated for the presence of concurrent pulmonary tuberculosis[5,18]. If the exacerbation of neurological is impairment or uncertainty of diagnosis, the duration of preoperative anti-tuberculous chemotherapy before surgery maybe not necessary to consider[3,15] (Figure 7).

How long the patient should the anti-tuberculous chemotherapy receives?

The efficacy of medical therapy regimens has been shown in several studies and the duration of treatment remains controversial[44]. The World Health Organization (WHO) proposed regimen of treatment for spinal tuberculosis with a total duration of 6 months,

the initial or intensive phase consists of Isoniazid, Rifampicin, Pyrazinamide and Ethambutol for two months followed by and a continuation phase for four months of therapy with Isoniazid and Rifampicin. However, WHO recommends 9 months of treatment for tuberculosis of bones or joints because of the difficulties in assessing treatment response, whereas the American Thoracic Society recommends 6 months for spinal tuberculosis in adults and 12 months for children. The Canadian Thoracic Society recommends a total time of treatment as long as 9 to 12 months, while the British Thoracic Society recommends 6 months and the four drugs of daily treatment with Rifampicin and Isoniazid, supplemented in the initial 2 months with Pyrazinamide and either Ethambutol or Streptomycin, irrespective of age. Although the anti-tuberculous drugs penetrate well into tuberculous vertebral lesions and drug regimens of treatment is considered sufficient; the sclerotic bone, the dead bone and tissue with probably poorer anti-tuberculous chemotherapy penetration results in different drug concentrations into the pathologic lesion, many experts still prefer a duration of 12 to 24 months. The patients should be received appropriate anti-tuberculous chemotherapy at least 12 months because of difficulties in assessing treatment response and the disease may be recurrence if received medications for less than 6 months[2,3,11,16,18,43,44]. Anti-tuberculous chemotherapy should be continued until clinical improvement and normal radiographic markers of healing[4,6,16].

In this study has compiled treatment guidelines cervicomedullary junction tuberculosis from the literature reviews as follows:

In case of suspicion at C1-2 tuberculosis, if the patient has a clinical of pulmonary or extra-pulmonary tuberculosis and Lifeso's classification stage I which no neurological deficit, the conservative treatment may be the first consideration for treatment. However, if no history of tuberculosis must have transoral debridement and biopsy. The anti-tuberculous chemotherapy for at least 12 months with rigid cervical brace at least 3 months. The failure of conservative treatment must be posterior decompression, internal stabilization and tissue biopsy again for rule out of the tumor or other diseases (Figure 7).

In case Lifeso's classification type II/ III or neurological deficits result from atlantoaxial instability considers surgical management. The posterior approach or anterior combination with the posterior approach is still controversial. In the current, the many studies prefer the posterior approach for stabilization and biopsy follow the anti-tuberculous chemotherapy for at least 12 months with rigid cervical brace at least 3 months is enough (Figure 8).

The preoperative anti-tuberculous chemotherapy regimens for two weeks before the operation and follow the patients continue until clinical improvement and normal radiographic markers of healing. In this case, the emergency decompression, debridement, internal posterior stabilization and tissue biopsy must have been performed because she has an exacerbation of neurological impairment and uncertainty of diagnosis then the patient had not received the preoperative anti-tuberculous chemotherapy.

Conclusion

Although spinal tuberculosis and atlantoaxial dislocation is a rare condition that optimal management is unclear. In many present literatures try to conservative treatment in tuberculosis at the cervicomedullary

Figure 7 The algorithm for the conservative treatment of the cervicomedullary junction tuberculosis

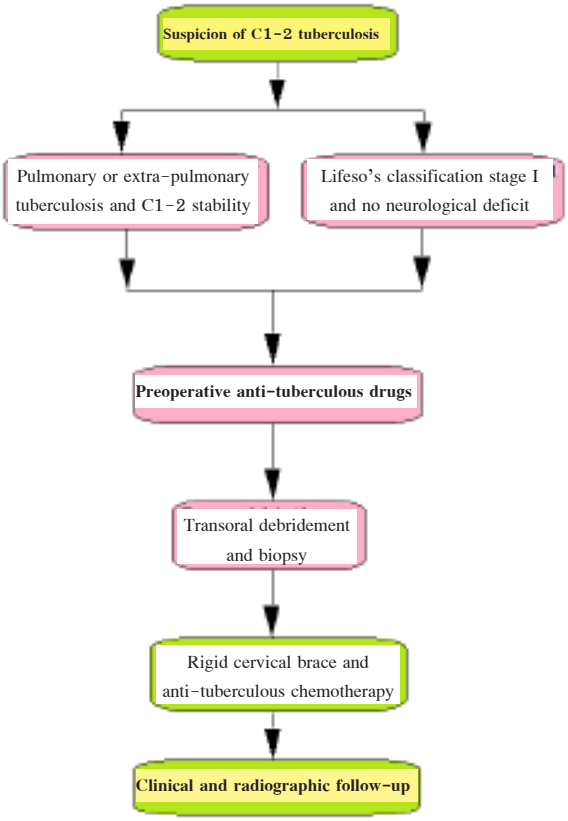
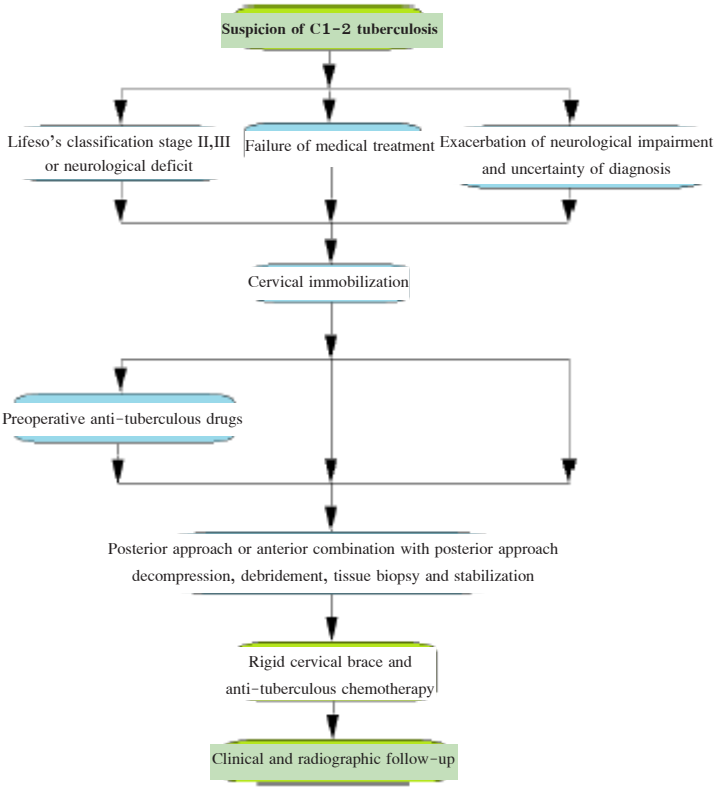


Figure 8 The algorithm for the surgical and emergency management of the cervicomedullary junction tuberculosis



region, but the surgery still has a role in the patients with neurological deficit, Lifeso's classification stage II, III and failure medical treatment because of serious neurological complications and life-threatening than other regions. The efficacy of medical therapy regimens has been shown in several studies, many experts still prefer a duration of 12 to 24 months until clinical improvement and normal radiographic markers of healing.

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บทคัดย่อ: วัณโรคบริเวณ Cervicomedullary และการเคลื่อนตัวของกระดูกสันหลังต้นคอบริเวณ Atlantoaxial: รายงานผู้ป่วยและบทบาทของการผ่าตัดในการรักษาวัณโรคบริเวณ Atlantoaxial

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กลุ่มงานศัลยกรรม โรงพยาบาลปทุมธานี จังหวัดปทุมธานี

วารสารวิชาการสาธารณสุข 2564;30:169-80.

รายงานผู้ป่วยวัณโรคกระดูกสันหลังและมีการเคลื่อนของกระดูกบริเวณ C1-2 ซึ่งเป็นบริเวณที่พบได้ไม่บ่อยในผู้ป่วยหญิงวัย 51 ปีมาด้วยอาการปวดต้นคอและเสียการทำงานระบบประสาทไขสันหลังที่ ในระหว่างนอนโรงพยาบาล ผู้ป่วยมีอาการบกพร่องทางระบบประสาทไขสันหลังแย่ลงอย่างรวดเร็ว จึงได้รับการผ่าตัดเปิดหลังคากระดูก, กำจัดเนื้อเยื่อติดเชื้อ ส่งตรวจเชื้อทางห้องปฏิบัติการ เพาะเชื้อ และชิ้นเนื้อทางพยาธิวิทยาพร้อมกับทำการยึดตรึงกระดูกต้นคอด้านหลัง และได้รับยาต้านวัณโรคต่อเนื่องอีก 12 เดือน ประเมินและติดตามผลการรักษาจากอาการทางคลินิกและภาพเอกซเรย์คอมพิวเตอร์ของกระดูกสันหลังส่วนคอ แม้ว่าการรักษาวัณโรคบริเวณ cervicomedullary ยังคงเป็นที่ถกเถียงกันระหว่างการรักษาแบบอนุรักษ์ที่ได้ผลที่ดี แต่การผ่าตัดยังคงมีบทบาทในผู้ป่วยที่มีอาการบกพร่องทางระบบประสาทไขสันหลัง ความไม่มั่นคงบริเวณข้อต่อกระดูกคอ การรักษาแบบอนุรักษ์ล้มเหลวหรือการวินิจฉัยที่ยังไม่สามารถระบุแน่นอนและต้องการผลชิ้นเนื้อยืนยันการวินิจฉัย การที่ผู้ป่วยวัณโรคกระดูกสันหลังและมีการเคลื่อนของกระดูกบริเวณ C1-2 ทำให้มีภาวะแทรกซ้อนทางระบบประสาทที่รุนแรงและอาจทำให้เสียชีวิตอย่างรวดเร็วอันเป็นผลมาจากการกดทับไขสันหลังบริเวณของ cervicomedullary จึงทำให้การรักษามีแตกต่างจากบริเวณกระดูกสันหลังส่วนอื่น อย่างไรก็ตามการวินิจฉัยและการรักษาอย่างรวดเร็วนั้นมีความจำเป็นและสำคัญเป็นอย่างมากเพื่อป้องกันภาวะแทรกซ้อนที่ร้ายแรงของโรคดังกล่าว

คำสำคัญ: **วัณโรคบริเวณรอยต่อของไขสันหลังและก้านสมอง; การสูญเสียการทำงานระบบประสาท; การเคลื่อนตัวของกระดูกต้นคอข้อที่หนึ่งและสอง; การรักษาแบบอนุรักษ์**