



REHABILITATION PALLIATIVE CARE FOR METASTATIC SPINAL DISEASE BASED ON TOKUHASHI-TOMITA SCORE: A CASE REPORT

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ABSTRACT Metastatic spinal disease is considered a terminal stage of primary cancer and palliative treatment focuses around symptom control and reducing spinal complications such as cord compression. A 60 years man with complete spinal cord injury AIS A post laminectomy with Th2-Th4 decompression and tumor biopsy due to canal stenosis et causa Th3 compression fracture. Patient has history of paraparesis in level Th4-Th8, also bladder and bowel incontinence. The prognosis of patients with epidural metastasis is not promising and difficult to predict. Tokuhashi and Tomita scores are one of tools that used widely to predict the patient's survival prognosis, in particularly for spinal metastatic treatment decision. These scores provide guidance decision whether aggressive operative or palliative. Tokuhashi score in this patient indicated the survival rate was below 6 months and Tomita score referred to palliative treatment. Physical medicine and rehabilitation treatment focus on palliative treatment for this patient include diminished pain, maintain vertebral stability, improve physical fitness and mobility to reduce further complication of prolonged bedridden and improve quality of life. Other treatment was given according to complaint and symptom. Patient was died less than 2-month post-surgery after readmission to the hospital due to bed ridden complications.

KEYWORDS : Metastatic spinal disease, palliative, rehabilitation, Tokuhashi, Tomita.

INTRODUCTION

Spinal metastases arise frequently for 5%–30% of patients with a primary cancer, mostly originating from the breast, lung, kidney, and prostate. (National Institute for Health and Care Excellence [NICE], 2008), (Delank et al., 2011) Limb weakness is the symptom that commonly appeared in patient with spinal cord compression. The sensory symptom including paresthesia might be presented as loss of sensation and numbness of toes and fingers that may extend to the level of cord compression. Autonomic dysfunction may present as bladder and bowel dysfunction with incidence of urinary retention, incontinence or constipation. (National Institute for Health and Care Excellence [NICE], 2008)

The prognosis of patients with spinal cord metastasis is not promising and difficult to predict. (Candido et al., 2021) Discovering primary site of tumor might help to determine the aggressiveness of the disease, but still hard to predict the prognosis. (Aoude & Amiot, 2014) Therapeutic selection of spinal metastases need to consider not only the tumor origin, but also clinical condition of the patient, neurological status and the survival rate, including life expectancy. (Nater et al., 2017) Therefore, Tokuhashi and Tomita scores were created and are intended to predict the patient's survival prognosis This scoring systems provide the prognosis of spinal metastases regard to patient's general condition, the primary tumor and the metastatic process. They have been widely used for spinal metastasis treatment decisions. (Aoude Amiot, 2014)

Based on Tokuhashi and Tomita scoring, patient with poor prognosis can be treat without surgery. Palliative treatment remains the primary choice of spinal metastatic disease. The goal of palliative rehabilitation treatment is to manage the pain and other symptoms, which furthermore will increase patient's quality of life. (Williamson et al., 2019) Even the surgical treatment in spinal metastasis remains palliative, the surgery is still beneficial for symptom relieve and stabilize the spinal for some cases. (Tokuhashi et al., 2005) It considered to promote effective pain management, improve neurological function, control the progression and spreading of local tumor.

CASE DESCRIPTION

Patient complained the numbness on his toes spreading to his legs and thighs for 7 days before admitted to hospital and gradually ascended to his stomach area. The numbness followed by paralyze of his legs with average of muscle strength was 1 at both legs, pain while urinate and unable to defecate. Patient also complained hematuria for 1 month. There was no history of trauma related to vertebrae. Patient had hypertension with routine consumption of amlodipine 5mg once a day. After admission, patient received methylprednisolone injection 250mg for 3 times/day, Ranitidine injection 1 ampoule twice a day, mecobalamin 500mg 3 times/day, gabapentin 100mg once daily and

meloxicam 7,5 mg twice a day and continued to have laminectomy surgery one week after admission.

Supportive examination with MRI showed spinal metastatic features by suspected multiple lesions on vertebral corpus and pedicle from the thoracic level 3, 4, 5, 12 continued to lumbar level 1, 2 and 3 suspected as metastatic progression. Following MRI, performed CT abdomen that signify the primary site of malignant tumor characteristic from right ureter through pelvis and kidney parenchyma, extended to adrenal gland and para-aortic lymphatic gland. Histology examination showed features of round cell tumor suspected plasmacytoma.

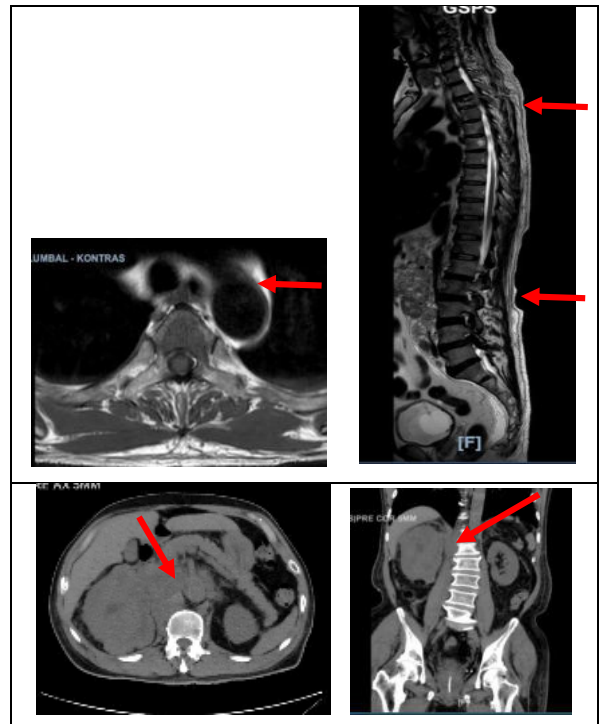


Figure 1a. contrast MRI of spine; 1b. Abdominal CT-scan

Evaluation of disease progression and survival prognostic performed before the decompression surgery (showed in table 1). Based on Tokuhashi dan Tomita scoring, we found that Tokuhashi score was 1 which indicated the life expectancy less than 6 months. Furthermore,

Tomita score was 8 that signify of poor prognosis. Considering of all the examination result, the goals of treatment focus on palliative care that had main goal to reduce pain, minimize complication and improve quality of life at the end stage of life.

The palliative rehabilitation program consisted of preservation of lower extremity muscle strength focused on strengthening exercise of core muscle and quadriceps muscle strengthening concomitant with passive range of motion exercise. Improvement of spinal vertebrae stability by giving spinal brace that reduce pain eventually. Rehabilitation program also focused on preventing the effect of immobilization such as practicing effective cough exercise, bowel and bladder management, reducing pain, family training to assist patient mobilization and family education to inform about the effect of immobilization that might be emerge.

However, one month after decompression surgery, patient readmitted to the hospital due to shortness of breath. On physical examination patient had dyspnea due to sputum retention lead to lung infection, multiple pressure ulcer, anemia, general muscle hypotrophy and increased of blood urea and creatinine level (80 – 1,57 mg/dl).

TABLE – 1
Tokuhashi Score

Characteristic	Score
General Condition (Performance Status)	
Poor (PS 10%-40%)	0
Moderate (PS 50%-70%)	1
Good (PS 80%-100%)	2
No. of extraspinal bone metastases foci	
≥3	0
2	1
1	2
Metastases to the major internal organs	
Unremovable	0
Removable	1
No Metastases	2
Primary site of the cancer	
Lung, osteosarcoma, stomach, bladder, esophagus,pancreas	0
Liver, gallbladder, unidentified	1
Other	2
Kidney, uterus	3
Rectum	4
Thyroid, breast, prostate, carcinoid tumor	5
Palsy	
Complete (Frankel A, B)	0
Incomplete (Frankel C, D)	1
None (Frankel E)	2
Criteria of predicted prognosis: Total score (TS) 0-8 = < 6 Months; TS9-11 = 6-12 Months; 12-15 = >1 year	

Source: (Marchi Candido et al., 2020)

TABLE – 2
Tomita Score

Scoring System				Prognostic Score	Treatment Goal	Surgical Strategy
Point	Prognostic factors					
	Primary tumor	Visceral mets. *	Bone mets. **			
1	slow growth <small>(slow, typical mets.)</small>	/	solitary or isolated	2	Long-term local control	Wide or Marginal excision
			multiple	3		
2	moderate growth <small>(slow, typical mets.)</small>	/	treatable	4	Middle-term local control	Marginal or Intralesional excision
			un-treatable	5		
4	rapid growth <small>(fast, atypical mets.)</small>	/	un-treatable	6	Short-term palliation	Palliative surgery
			un-treatable	7		
				8	Terminal care	Supportive care
				9		
				10		

Source: (Marchi Candido et al., 2020)

DISCUSSIONS

Metastatic Spinal Cord Compression (MSCC) is commonly caused by vertebral compression that contain metastatic disease or tumor extension to vertebral column.(Robson, 2014) The most common symptom in patients with spinal metastases is pain which characterized by localized, radicular or axial pain. Local pain is usually constant and caused by stretching of vertebral body periosteum. In the contrary, radicular pain is resulted from nerve root compression by the tumor mass and might affecting one or both sides of the body. (Wu & Fournay, 2004), (Levack et al., 2002) The other features of spinal cord compression are lower extremity weakness concomitant with sensory loss and autonomic dysfunction. Sensory symptoms might present as decreased of sensation and numbness of toes and fingers, depend on level of spinal cord compression.(Levack et al., 2002)

One of autonomic dysfunction is seen as bladder and bowel dysfunction. Damage of neuron due to spinal cord compression in level S2-S4 results in paralysis of detrusor muscle and urinary retention. Furthermore, spinal cord compression at T10-L2 level will result in urinary incontinence or urinary retention bladder and bowel dysfunction control known as neurogenic bowel.

Neurogenic bowel is divided into two type of bowel syndromes: upper motor neuron (UMN) bowel syndrome and lower motor neuron (LMN) bowel syndrome. UMN syndrome occurs when the lesion or compression is above conus medullaris (T12), results in constipation and fecal retention. While LMN bowel syndrome results in constipation because there is no peristaltic movement occurs (Guideline & Providers, 2006),(Benevento & Sipski, 2002)

Determination of the presence metastatic spinal cord compression through clinical signs only is difficult and often inaccurate. The diagnosis should be made based on imaging technique that able to depict the lesion within the spinal cord to distinguish the metastatic disease with other underlying pathologies. MRI has a high sensitivity to show specific level of cord compression and whole spinal as well.(National Institute for Health and Care Excellence [NICE], 2008). Currently, a scoring system has been developed to determine whether patients with metastatic spinal cancer require surgical or palliative management.

The scoring system provide prognosis and survival prediction have been devised to determine management therapy in patient with metastatic spinal cord compression.(Aoude & Amiot, 2014). Some studies have been using the Tokuhashi scoring system to predict survival rate pre-operatively and for treatment selection. (Tokuhashi et al., 1990) However, it did not evaluate its application to patient receiving conservative management. Therefore, a revised scoring system was made to improve its accuracy for evaluating metastatic spinal cord prognosis. (Tokuhashi et al., 2005) This scoring system consists of 6 variables that considered to affect survival rate and clinical outcome. The variables are patient's general condition, number of extraspinal metastases, metastases to major internal organs, primary site of the cancer and spinal cord function evaluated by Frankel classification. The total score of these prognostic criteria is used to predict the survival period. (Tokuhashi et al., 2014) The prediction of survival periods using revised Tokuhashi scoring system was in accordance with the actual survival period in 87,9% of 183 patients evaluated by Tokuhashi. (Tokuhashi et al., 2009) Previous study also reported that Tokuhashi score had high rate of agreement (79%) despite the type of treatment selection.(Chan, 2008)

The other scoring system to predict survival in patients with spinal metastasis is Tomita score. This scoring provides treatment selection based on three prognostic factors: speed of tumor growth, the presence or absence of visceral metastases, and the number of metastatic bone lesions. (Marchi Candido et al., 2020)

Tokuhashi score consist of 5 items The first item was the general condition of the patient assessed with Karnofsky Performance Status. The patient's general condition was about 30% or in a poor condition. It means that the patient was severely disabled and required hospitalization with active support treatment. The next items are existence of extra spinal bone metastatic and metastatic process to internal organs. Imaging examination showed probable multiple extra spinal metastatic tumor and involvement of major internal organs that irremovable. The primary site of cancer as the last item remained unidentified and patient experienced the complete sensory and motoric loss of lower extremity. In our case, the total score of Tokuhashi scoring was 1 with survival periods was below 6 months.

The treatment decision of spinal metastatic disease is based on each individual conditions and prognosis. Tomita scoring provides prognostic evaluation and has been widely used for spinal metastatic treatment decisions. Tomita score of this patient was 8. The primary tumor was growth moderately with uncontrolled metastases on visceral organ and multiple bone lesions. According to this scoring system, the patient did not meet the criteria for surgical treatment and should be focus on end stage palliative treatment care. The patient with a prognostic score of 8, 9, or 10 points required only the supportive care without surgical intervention. Surgical treatment in spinal metastases had reported good outcomes for the patient with good to moderate prognosis and intended for a short to long-term local control. However, our patient was unlikely to perform surgery due to poor prognosis. (Tomita et al., 2001)

The result of Tokuhashi and Tomita scoring system in this patient were suitable for each other that indicating the life expectancy below 6 months. It was concordance with patient's condition. Patient eventually died within 2 months after diagnosed with spinal cord injury.

Palliative treatment in metastatic spinal cord compression consists of pain management, maintaining spinal stability and reducing complication. Most of patient with metastatic spinal cord compression experience pain. The conventional analgesia such as NSAIDS, non-opiate, and opiate medication has been widely used to manage pain. (National Institute for Health and Care Excellence [NICE], 2008) The most common prescribed steroid is dexamethasone. Steroid has an effect to reduce vasogenic oedema, prevent ischemia and accumulation of intracellular calcium and enhance the metabolism energy in cellular level. (Klimo et al., 2003)

Respiratory problems associated to respiratory failure and respiratory infections often become the cause of death in patient with spinal cord injury. (Burns, 2007) The degree of respiratory failure depends on the level of spinal cord lesions. The lesion on cervical and thoracic level could affects the spinal cords that innervate respiratory muscle. However, the complete spinal cord injury has a general functional impairment. (Galeiras Vázquez et al., 2013) The Consortium for Spinal Cord Medicine (2005) has provided the evidences of respiratory management in patient with metastatic spinal cord compression. The guideline referred to breathing exercise that induce lung secretions clearance, assisted cough exercise. (National Institute for Health and Care Excellence [NICE], 2008) Seated position also improves the oxygenation in acute respiratory distress syndrome. (Deye et al., 2013)

Other consequences of metastatic spinal cord compression in this patient were autonomic bladder and bowel dysfunction that might have contributed to his well-being. The management depend on the affected level, in term of upper motor neuron (UMN) or lower motor neuron (LMN). This patient experienced the LMN bowel and bladder dysfunction presenting urinary retention and constipation. The management of urinary retention in this patient basically focus on free drainage catheterization. If long term catheterization is required, the intermittent catheterization might be initiated. (National Institute for Health and Care Excellence [NICE], 2008) The main goal of bladder management is to prevent urinary complication such as hydronephrosis, bladder calculi, renal calculi, vesicourethral reflex which increase risk of urinary tract infections. (Guideline & Providers, 2006)

In other hand, bowel dysfunction in this patient was treated with rectal laxative agent, digital stimulation followed by manual evacuation, and suggested dietary modifications. The digital stimulation was particularly performed to enhance the internal innervation of the gastrointestinal tract. The internal innervation involving the Auerbach's plexus which is located in the colonic wall between the longitudinal and circular muscle layers. This stimulation enhance the peristaltic movement of the colonic wall and facilitate stool movement through the colon. (Benevento & Sipski, 2002) Furthermore, manual evacuation is carried out to expel feces. Diet modification with high residue foods, monitoring adequate fluid intake, rectal irrigation and manual evacuation were considered to offer. Other technique such as Valsalva maneuver and abdominal massage may also help. (National Institute for Health and Care Excellence [NICE], 2008) (Benevento & Sipski, 2002) However, the technique should be done carefully since the Valsalva maneuver might increase the blood pressure in patient with autonomic disfunction. (JUDSON et al., 1955)

People with metastatic spinal cord compression are risk of experiencing pressure ulcer due to impaired mobility and lack of sensation. The bladder and bowel function are also contributed to the incidence of pressure ulcers as well. This might be due to change of skin turgor, increased of digestive enzyme permeability to skin, and bacterial colonization from stool leading to skin infection. (Lachenbruch et al., 2016) The modified mattresses with pressure relieving feature are even unable to prevent pressure ulcers. (National Institute for Health and Care Excellence [NICE], 2008) Management of pressure ulcer can be non-operative wound care and surgery. The non-operative wound care including application of solutions, ointments, cream, dressing, and topical or mechanical debridement. Foam dressing is categorized as wet to dry dressing aim to keep the

wound moist and debride the superficial tissue mechanically. (Kruger et al., 2013) The application of ointment such as olive oil was given to this patient to prevent pressure ulcer in unaffected area.

The stabilization of spinal with TLSO brace was performed to overcome the axial spinal pain. (Wu & Fournery, 2004) Positioning also improve the respiratory function, prevent further and severe pressure ulcer, and help to enhance bowel emptying. Although the cord injury was completely distracted, the giving of NMES on quadriceps with passive ROM exercise were still applied to this patient to prevent joint contracture. If the muscle stretching become resistance the daily activity and assisted care will be more difficult. (Hamilton Health Sciences, 2011) Overall, the rehabilitation and supportive care are generally purposed to promote independence and quality of life. (National Institute for Health and Care Excellence [NICE], 2008) After TLSO brace installation and performed rehabilitative exercise, the patient was able to sit properly in upright position with reduced pain. The position also facilitated patient to perform the clearance of lung secretions by effective cough thus result in increased of saturation. However, the palliative treatment and exercise did not improve the numbness and weakness due to spinal metastatic cord compression process.

CONCLUSIONS

Tokuhashi dan Tomita score play role for determine prognosis and alternative treatment in patient with metastatic spinal cord compression. Palliative care is particularly beneficial for metastatic spinal disease with low survival rate prognosis. Multidisciplinary specialty approach is required to improve the quality of life and preserve dignity at the end stage of life.

REFERENCES

1. Aoude, A., & Amiot, L. P. (2014). A comparison of the modified Tokuhashi and Tomita scores in determining prognosis for patients afflicted with spinal metastasis. *Canadian Journal of Surgery*, 57(3), 188–193. <https://doi.org/10.1503/cjs.012013>
2. Benevento, B. T., & Sipski, M. L. (2002). Neurogenic bladder, neurogenic bowel, and sexual dysfunction in people with spinal cord injury. *Physical Therapy*, 82(6), 601–612. <https://doi.org/10.1093/ptj/82.6.601>
3. Burns, S. P. (2007). Acute Respiratory Infections in Persons with Spinal Cord Injury. *Physical Medicine and Rehabilitation Clinics of North America*, 18(2), 203–216. <https://doi.org/10.1016/j.pmr.2007.02.001>
4. Candido, P., Peria, F., Pinheiro, R., Costa, H., & Defino, H. (2021). Outcomes and survival of spinal metastasis with epidural compression. *Journal of Craniovertebral Junction and Spine*, 12(3), 287–293. https://doi.org/10.4103/jcvjs.jcvjs_33_21
5. Chan, Y. L. (2008). No 主観的健康感を中心とした在宅高齢者における健康関連指標に関する共分散構造分析 Title. *المجلة العراقية لرقية العلوم*, 76–79. <https://doi.org/10.1016/j.spinee.2008.06.331>
6. Delank, K. S., Wendtner, C., Eich, H. T., & Eysel, P. (2011). Behandlung von wirbelsäulenmetastasen. *Deutsches Arzteblatt*, 108(5), 71–80. <https://doi.org/10.3238/arztebl.2011.0071>
7. Deye, N., Lellouche, F., Maggiore, S. M., Taillé, S., Demoule, A., L'Her, E., Galia, F., Harf, A., Mancebo, J., & Brochard, L. (2013). The semi-seated position slightly reduces the effort to breathe during difficult weaning. *Intensive Care Medicine*, 39(1), 85–92. <https://doi.org/10.1007/s00134-012-2727-5>
8. Galeiras Vázquez, R., Rascado Sedes, P., Mourelo Fariña, M., Montoto Marqués, A., & Ferrero Velasco, M. E. (2013). Respiratory management in the patient with spinal cord injury. *BioMed Research International*, 2013. <https://doi.org/10.1155/2013/168757>
9. Guideline, C. P., & Providers, H. (2006). Bladder management for adults with spinal cord injury: a clinical practice guideline for health-care providers. In *The journal of spinal cord medicine* (Vol. 29, Issue 5).
10. Hamilton Health Sciences. (2011). Range of Motion - A guide for you after spinal cord injury.
11. JUDSON, W. E., HATCHER, J. D., & WILKINS, R. W. (1955). Blood pressure responses to the Valsalva maneuver in cardiac patients with and without congestive failure. *Circulation*, 11(6), 889–899. <https://doi.org/10.1161/01.CIR.11.6.889>
12. Klimo, P., Kestle, J. R., & Schmidt, M. H. (2003). Treatment of metastatic spinal epidural disease: a review of the literature. *Neurosurgical Focus*, 15(5), 1–9. <https://doi.org/10.3171/foc.2003.15.5.1>
13. Kruger, E. A., Pires, M., Ngann, Y., Sterling, M., & Rubayi, S. (2013). Comprehensive management of pressure ulcers in spinal cord injury: Current concepts and future trends. *Journal of Spinal Cord Medicine*, 36(6), 572–585. <https://doi.org/10.1179/2045772313Y.0000000093>
14. Lachenbruch, C., Ribble, D., Emmons, K., & VanGilder, C. (2016). Pressure ulcer risk in the incontinent patient analysis of incontinence and hospital-acquired pressure ulcers from the international pressure ulcer prevalence TM survey. *Journal of Wound, Ostomy and Continence Nursing*, 43(3), 235–241. <https://doi.org/10.1097/WON.0000000000000225>
15. Levaack, P., Graham, J., Collie, D., Grant, R., Kidd, J., Kunkler, I., Gibson, A., Hurman, D., McMillan, N., Rampling, R., Slider, L., Statham, P., & Summers, D. (2002). Don't wait for a sensory level - Listen to the symptoms: A prospective audit of the delays in diagnosis of malignant cord compression. *Clinical Oncology*, 14(6), 472–480. <https://doi.org/10.1053/clon.2002.0098>
16. Marchi Candido, P. B., Perria, F. M., da Costa, H. R., & Aparecido Defino, H. L. (2020). A Comparison of the Tomita and Tokuhashi scores in spinal metastasis. *Coluna / Columna*, 19(4), 297–301. <https://doi.org/10.1590/S1808-185120201904238102>
17. Nater, A., Martin, A. R., Sahgal, A., Choi, D., & Fehlings, M. G. (2017). Symptomatic spinal metastasis: A systematic literature review of the preoperative prognostic factors for survival, neurological, functional and quality of life in surgically treated patients and methodological recommendations for prognostic studies. *PLoS ONE*, 12(2), 1–27. <https://doi.org/10.1371/journal.pone.0171507>
18. National Institute for Health and Care Excellence [NICE]. (2008). Metastatic spinal cord compression: Diagnosis and management of patients at risk of or with metastatic spinal cord compression. Full guideline CG75 (Issue November).

19. Robson, P. (2014). The Multinational Association for Supportive Care in Cancer risk index: a multi national scoring system for identifying low risk febrile neutropenic cancer patients. 542–545. www.gov.uk/government/uploads/system/uploads/attachment_data/file/216121/dh_125889.pdf
20. Tokuhashi, Y., Ajiro, Y., & Umezawa, N. (2009). Outcome of treatment for spinal metastases using scoring system for preoperative evaluation of prognosis. *Spine*, 34(1), 69–73. <https://doi.org/10.1097/BRS.0b013e3181913f19>
21. Tokuhashi, Y., Matsuzaki, H., Oda, H., Oshima, M., & Ryu, J. (2005). A revised scoring system for preoperative evaluation of metastatic spine tumor prognosis. *Spine*, 30(19), 2186–2191. <https://doi.org/10.1097/01.brs.0000180401.06919.a5>
22. Tokuhashi, Y., Matsuzaki, H., Toriyama, S., Kawano, H., & Ohsaka, S. (1990). Tokuhashi Scoring System for Preoperative Evaluation 1990. In *Spine* (Vol. 15, Issue 11, pp. 1110–1113).
23. Tokuhashi, Y., Uei, H., Oshima, M., & Ajiro, Y. (2014). Scoring system for prediction of metastatic spine tumor prognosis. *World Journal of Orthopedics*, 5(3), 262–271. <https://doi.org/10.5312/wjo.v5.i3.262>
24. Tomita, K., Kawahara, N., Kobayashi, T., Yoshida, A., Murakami, H., & Akamaru, T. (2001). Surgical strategy for spinal metastases. *Spine*, 26(3), 298–306. <https://doi.org/10.1097/00007632-200102010-00016>
25. Williamson, T., Painter, B., Howell, E. P., & Goodwin, C. R. (2019). Top ten tips palliative care clinicians should know about spinal tumors. *Journal of Palliative Medicine*, 22(1), 84–89. <https://doi.org/10.1089/jpm.2018.0608>
26. Wu, A. S., & Fournay, D. R. (2004). Evolution of treatment for metastatic spine disease. *Neurosurgery Clinics of North America*, 15(4), 401–411. <https://doi.org/10.1016/j.nec.2004.04.004>