



Metastatic Breast Carcinoma on Diffuse Spine Metastatic Process Using Augmented Exoskeleton Cement: Proposing a New Technique

Mahadewa Tjokorda GB*, Sudiarta IPG, Wisnu Wardhana DP, Maliawan Sri, Sudarsa Wayan

Neurosurgery Department and ²Oncology Department Udayana University - Sanglah Hospital.

*Correspondence: Tjokorda GB Mahadewa

Abstract

Metastatic breast cancer (MBC) to the cervicothoracic area of the spine is very rare cases. In this case report, we describe a case for this rare lesion. Case: a thirty-nine-year-old female with a history of weakness of the legs and pain in the upper back spine came to the hospital with history of breast biopsy with result of adenocarcinoma and positive long tract signs. On whole-spine MRI, it is shown the bone metastatic process on C5-7, T3, T5-7, T9-10 with bony destructions and extradural mass around T5-7 and T9-10. Two stages of surgery were planned for this patient. The first operation was addressed to cervical metastatic process through the posterior approach, in the form of a cervical fusion with laminectomy biopsy. The second step was via posterior approach for thoracic decompression and fusion. Since the Karnovsky score was 60 and single step surgery was chosen, led to cervicothoracic decompression fusion at single stage using augmented exoskeleton cement technique. During follow-up, the patient was neurologically improved on the both legs function significantly, though gait was still tolerable and recovery program was still ongoing in outpatient department. MBC treatment for long spine involved lesions can also be handled via a single posterior approach with good results especially for case with cervicothoracic metastatic process.

Keywords: *Metastatic breast cancer, Posterior approach, Cervicothoracic fusion, Exoskeleton.*

Introduction

Metastatic breast carcinoma is a disease that is difficult to be cured. The goal of treatment is to improve the quality of life. The most common deployment is to the spine and complaints by painful spine, nervous disorders to paralysis or disability to psychological disorders due to depression, frustration and insomnia [1].

Treatment of metastatic spine is very varied and tend to be debatable. Handling the case must necessarily be palliative and case-by-case individually. Considerations regarding surgical resection methods; anatomy of the spine; physical health conditions of patients and stabilization of spinal construction. [2] We reported a rare case, who was successfully treated via single stage posterior approach using connected

cervicothoracic instrumentation and augmented cement fusion.

Case Report

A thirty-one-year-old female with history of shoulder pain, neck stiffness and upper back ache, especially when she maintains erect position, since 6 months before admission. It has been followed by leg weakness, numbness, and spasticity. Magnetic resonance imaging (MRI) revealed C7, T3, T5-7, T9-10 bodies pathological fractures and pedicles destruction (Figure 1a). Canal stenosis on T5-7 and T9-10 due to extradural masses and cerebrospinal fluid (CSF) blockage. (Figures 1b and 1c). Further neurological examination revealed bilateral legs paralysis with motor power 3 of 5 manual muscle test (MMT) test and

paresthesia of the legs with Babinski reflexes bilaterally. History of left side breast biopsy by general surgeon with diagnosed invasive breast carcinoma 1.5-year prior the symptoms but no surgery or chemotherapy was done at Praya Hospital-West Lombok province. The patient was referred to our institution and was planned to underwent posterior decompression biopsy and stabilization prior chemotherapy by oncologist.



Figure 1a: Sagittal MRI T2WI of the cervicothoracic spine revealed bony destructions on C5-7, Th3, Th5-7 and Th9-10 with epidural mass on Th5-7 and Th9-10.

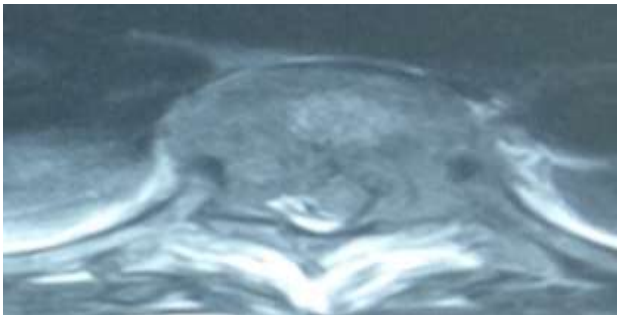


Figure 1b: Axial MRI T2WI of the thoracic spine revealed paravertebral mass and pathologic fracture on the left of the Th6 body, partially fulfilled the canal spinal with significant cord compression.



Figure 1c: MR-Myelogram showed the CSF blockage from Th5-7 and Th9-10 levels.

Cervicothoracolumbal midline skin incision was performed from C3 to L1. Meticulous

homeostasis was done after placing automatic retractor. We observed pathologic tissue along the multifidus muscle that showed highly vascularization. Lateral mass screws placement on C4, C5 consecutively, Th1, Th4, Th8, Th11 and Th12 pedicle screws. Alignment and stabilization was achieved by connecting cervical rods with thoracic rods using connector device (GS Medical ®) and assured rods and nuts in the final position. Laminectomy was done on C6-7, Th2-Th3, Th5-10 levels, biopsy of the epidural mass was done. Inadequate screw's anchored strength was encountered during screwing so authors decided to augment the final construction using Cemfix ® polymethyl methacrylate (PMMA) bone cement.³ (Figure 2).



Figure 2: Plain X-ray postoperative of the spine shows cervical fixation.

The patient has made a good recovery. Motor paralysis was improved remarkably and gait disturbances were reduced. On discharge, the patient was able to walk although a fair unstable and had minor difficulty to maintain her walking stability. Over the following six-months period there was complete resolution of all neurological deficits except for very mild gait disturbance. Control of plain X-ray after surgery revealed good realignment and sagittal balance of neck and upper back segments (Figures 3).



Figure 3: Thoracic fixation using lateral mass screws from C4-5; pedicle screws on Th1-2; Th4; Th8; Th11-12 with acceptable cervicothoracic alignment.

Pathology report revealed tumor tissue consist of proliferative neoplastic cells forming nested solid, hyper chromatic cells, irregular nuclei membrane and moderate nuclei pleomorphic. In some foci showed central necrosis (Figure 4).

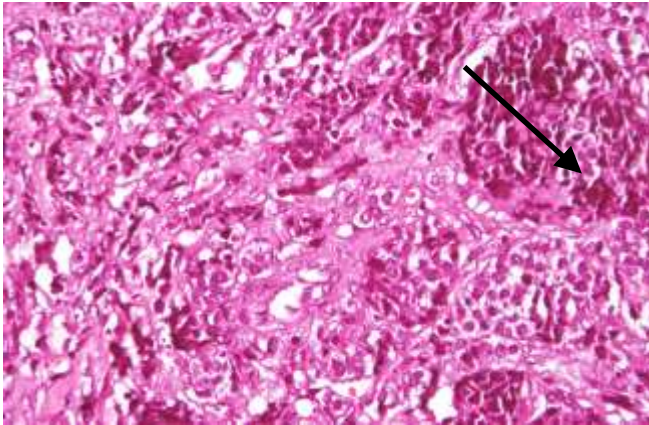


Figure 4: Microscopic image (H&E) revealed proliferative neoplastic cells forming nested solid, hyper chromatic cells, irregular nuclei membrane and moderate nuclei pleomorphic (arrow).

Discussion

The handling of a solitary tumor metastases in the spine, generally has been done by total vertebrectomy accompanied with or without interbody fusion implants and spinal stabilization as well. Meanwhile, in the case, it was a diffuse metastases or multiple, then the target was planned to get a palliative treatment including handling the pain with decompression laminectomy with biopsy as well as stabilization-fusion. The requirement for total tumor resection is not necessary in cases of multiple lesions. [2,3] Between the anterior and the posterior approach, each has advantages and disadvantages. One of the important advantages of the anterior approach is the ability to instantly eliminate the problem by eliminating the core problem of metastatic tumors, while weakness is generally high risk to injure vital organs and essential blood vessels, due to access that adjacent to these structures. [4]

Meanwhile, advantages of posterior approach are the ability to access more securely because no vital organs were exposed, able to stabilize spinal segments. It can even be an entire segment of the neck to the tail bone. The disadvantage is difficult to access and eliminate totally the lesion in the

anterior part. Selection of this approach to date, there is no data to be referred to as class I standard, that is debatable and depends also by the surgeon's working habits. [2,4]

In this rare case, the authors stated that the posterior approach alone could accommodate interests above with fairly good results. Authors added connecting rod to unify the cervical and thoracic segments. The strength of the screw's anchor effect or pull out screw strength, in the case of multiple metastases is an important issue. Some of the techniques offered by using a fenestrated screw that can be added by cement, or using larger screw's size, or inserting cement in the interbody space, all of which are difficult to be applied in this case. [3,5,6]

Extra cement inside the vertebral body is good for short segments but there are no reports of extensive tumor metastasis. [6] Perhaps the rational underlying besides improving strength of the pull out screw but also improve overall retention instrumentation.

Therefore, exoskeleton cement into new technique is safe to be used because cement is added to the neck of the screw, rod and around the surface of the lateral mass and no important structures exposed. Therefore, the authors used the addition of cement that is laid along the entry points and connecting the base of the screws and put it together with the rod around the fragile area.

The material that has been used is the same as the past, namely augmented cement of polymethyl methacrylate (PMMA). The analogy is reinforced concrete which had newly installed metal construction filled with concrete on the outside of the main frame. Assumption of the author that must be proven in vitro that exoskeleton construction is stronger than previous model but its indication is restricted for palliative treatment of advance stage of multilevel metastasis tumor to the spine.

The authors believe that this technique is a new concept, supposing make exoskeletons that is stronger than the spine of construction since it is analogous with

reinforced concrete. However, it is believed that due to the strength, it once can also

cause stiffness and adjacent level of disease in the long term (Figure 5).



Figure 5: Pre and post cement augmentation to the instrumentation constructions.

Conclusion

Metastatic breast carcinoma can be managed via the posterior approach only, with good results, especially if multilevel of

fragility was encountered, long segments of stabilization was mandatory and additional cement to create 'exoskeleton' structure was necessary.

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