



Case report

Unilateral fixation utilizing minimally invasive surgery (MIS) system for lumbosacral metastasis in a patient with stage 4 renal cell carcinoma

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ABSTRACT

Introduction and importance: To summarize the clinical manifestations and treatment of a patient with lumbar metastases from renal cell carcinoma who underwent unilateral fixation of lumbosacral spine utilizing minimally invasive surgery systems.

Case presentation: A 71-year-old woman presented to a local hospital with complaints of low back pain. Computed tomography (CT) at the hospital revealed metastases to the lung, occipital bone, right ribs and fifth lumbar vertebrae from a primary left renal cancer. A lumbar Magnetic resonance imaging (MRI) performed at local clinic revealed an enlarged metastatic tumor invading the right body, transverse process and pedicle of fifth lumbar vertebra. Transmyofascial insertion of pedicle screws and connection with rod utilizing minimally invasive surgery (MIS) systems were made on the left L4.5.S1 vertebrae under fluoroscopy. The operating time was 36 min, the intraoperative blood loss was 30 g and fluoroscopic time was 56 s. Postoperative course was uneventful. She could walk with a single cane on the twenty postoperative days but passed away of systemic metastasis approximately 10 months after the spinal fixation. An x-ray taken just before death showed no spinal instrumentation failure.

Discussion: Surgery for spinal metastasis from hypervascular tumor may result in profuse intraoperative bleeding that is difficult to control. It might be preferable to operate with MIS if patients with spinal metastases are candidate for either MIS or conventional methods. It has been reported that unilateral fixation could be as effective as bilateral fixation in up to two-segment lumbar spinal fusion.

Conclusion: Unilateral fixation utilizing MIS systems may be effective in cases whom placing an instrumentation on the side with tumor extending posteriorly may cause massive bleeding.

1. Introduction

Surgery for spinal metastasis from hypervascular tumor may result in profuse intraoperative bleeding that is difficult to control [1–3]. Spinal metastasis from renal cell carcinoma is one of the most frequently treated hypervascular spinal metastatic tumors in clinical practice [4].

Open surgery and complete vertebrectomy may not be necessary in patients with metastatic spine disease: the goal is surgical decompression and stabilization to relieve pain and improve neurological function [5].

Recent advances in instrumentation enable us to safely and effectively manage the spinal disorder [2,5,6]. Especially in patients with spinal metastases, the indications for spinal fixation have been increased with spinal instrumentation dedicated to minimally invasive procedures

[5,7–11].

We report the successful outcome of unilateral fixation with a minimally invasive surgery system in a patient with stage 4 renal cell carcinoma with metastasis to the fifth lumbar vertebra.

2. Case report

A 71-year-old woman who had no medical history presented to a local hospital (Okinawa Miyako hospital, Miyakojima city Japan) with complaints of low back pain. A lumbar magnetic resonance imaging (MRI) performed at the local clinic revealed an enlarged metastatic tumor invading the right body, transverse process and pedicle of fifth lumbar vertebra (Fig. 1). A whole-body plain and gadolinium enhanced computed tomography (CT) and chest X-ray performed to find the

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primary lesion showed left renal carcinoma and metastases of occipital bone, left lung, right eighth rib and lytic lesion of left spinal body, transverse process and pedicle of L5 vertebrae (Fig. 2). She was referred to our hospital for further treatments of left renal cancer and severe intractable back pain with difficulty standing. Physical examination revealed weakness of the right flexor hallucis longus and loss of Achilles tendon reflex. A spinal instability neoplastic score (SINS) of the patient totaled 9 points and was considered a spinal metastasis with potentially unstable. As conservative treatments were considered to be ineffective for severe low back pain and right gluteal region pain, spinal fixation was planned.

The spinal fixation with minimally invasive surgery (MIS) systems was scheduled only on the left side because the placement of rods on the right side could cause massive bleeding due to posterior extension of the hematogenous renal cell carcinoma. The operation was started under general anesthesia with the patient in the prone position. After midline posterior skin incision, the left side subcutaneous tissue and myofascia were dissected. Transmyofascial insertion of pedicle screws and connection with rods utilizing MIS systems were made on the left L4,5, S1 vertebrae under fluoroscopy (operated by H.S.) (Fig. 3A, B). The operating time was 36 min, the intraoperative blood loss was 30 g and fluoroscopic time was 56 s. Postoperative CT confirmed that the screws were properly placed. Postoperative course was uneventful. Two days after the operation, low back pain and right buttock and leg pain were alleviated, and sleep disorders due to severe pain also improved. The patient could walk stably with a walker while wearing a rigid corset on the third postoperative days and could walk with a single cane on the twenty postoperative days. She underwent four courses of chemotherapy after lumbar fixation which reduced the size of the enlarged primary tumor and lung metastases, but increased the size of the occipital bone and lumbar metastases. The left nephrectomy was undertaken 3 months after the lumbar fixation due to an enlarged primary tumor (58 × 57 mm). Although back and leg pain remained reduced and she was stable walking with a cane after the left nephrectomy, she passed away of systemic metastases approximately 10 months after the spinal fixation. An x-ray taken just before death showed no spinal instrumentation failure (Fig. 3C).

This work has been reported in line with the SCARE 2020 criteria [12].

3. Discussion

Patients with spinal metastases often experience intractable pain due to spinal instability. The main purpose of surgery for spinal metastases are adequate decompression of neural elements and provide vertebral column stability as well as the alleviation of pain. Jackson reported on the results of surgical treatments of 79 patients with spinal metastases from renal cell carcinoma, showing significant pain relief in 89%, neurological improvement in 65% and regain of gait in 50%, indicating the benefit of surgery [4]. A total of 9 points of spinal instability neoplastic score which has recently proved its utility, as in this case, is classified as potentially unstable and surgery is considered desirable [13].

Surgery for spinal metastasis from hypervascular tumor may result in profuse intraoperative bleeding that is difficult to control [14–16]. Renal cell carcinoma (RCC) is the fourth most common type of spinal metastatic tumor following lung, breast, and prostate [4]. About one third of patients with RCC are diagnosed with metastatic disease at presentation [17] and 25% of RCC recur locally or as metastatic disease even after nephrectomy [18]. Although there are reports of long overall survival in the setting isolated RCC spinal metastases [15,16], Goodwin reported the mean and median survival to be 6.75 and 7 months from the time of presentation for patients who initially present with multiple metastases accompanied with spinal metastases from RCC [19].

Spinal metastasis from renal cell carcinoma is often difficult to manage since the lesions tend to be large, highly destructive and hypervascularity [4,14,15,19]. In the case of spinal metastasis of renal cell carcinoma with multiple metastases, palliative surgery is considered to be indicated [4,14,15,19]. It has been reported that increased surgical site infection and mortality rate is associated with increased blood loss in spine surgery [20,21]. Furthermore massive allogeneic blood transfusion in patients with tumor may increase postoperative infection and tumor growth, possibly due to immunosuppression [20,22–24]. The reported odds ratio for surgical site infections due to postoperative blood transfusion in spinal surgery is 3.45–4.00 [20,22]. Amato reported in his meta-analysis that the risk of cancer recurrence increases by 40, 69, and 104% after 1–2, 3–4, and >5 units of packed red blood cells transfusion, respectively [23]. Based on these findings, it is important to avoid surgery leading to massive blood loss especially in patients with spinal metastases.

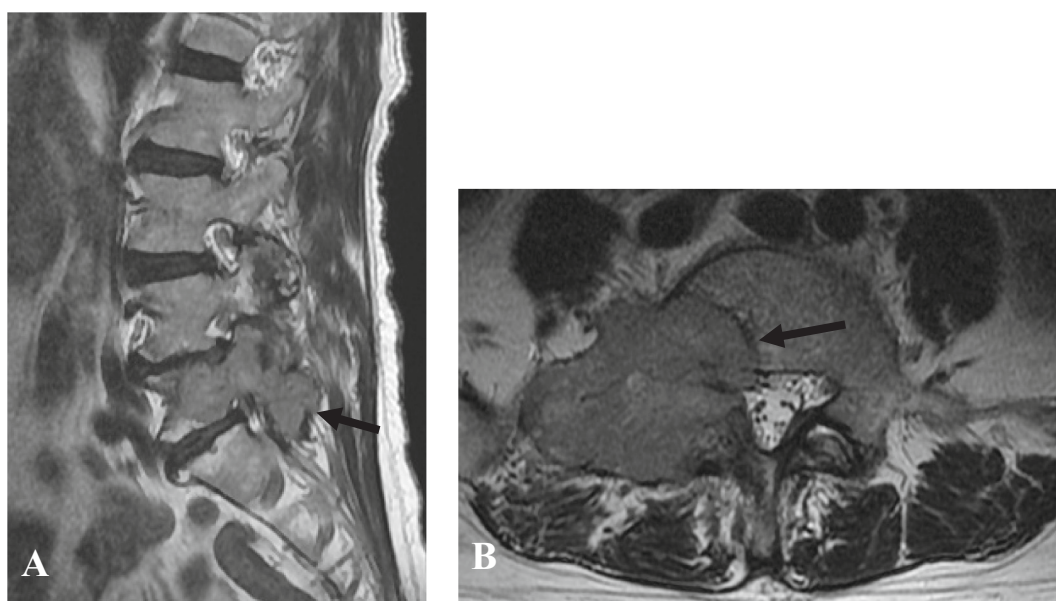


Fig. 1. (A) axial and (B) right parasagittal MRI images demonstrating an enlarged metastatic tumor invading the right body, transverse process and pedicle of fifth lumbar vertebra.

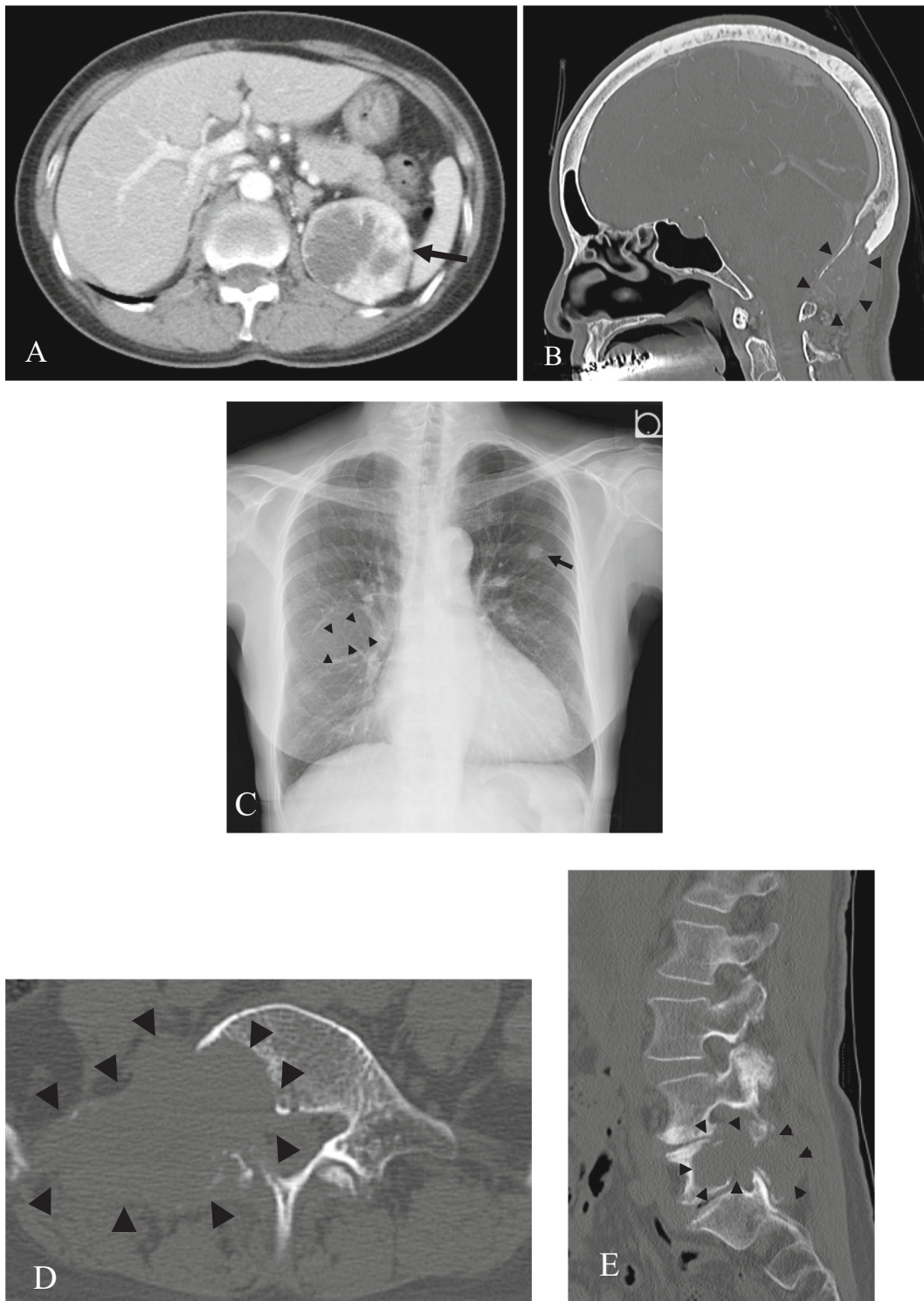


Fig. 2. (A) and (B) Gadtrium enhanced CT showing left renal cancer and occipital metastases. (C) and (D) Plain CT showing left lung metastasis and right eighth rib metastasis (arrow head). (E) and (F) axial and right parasagittal CT showing osteolytic metastases at the left spinal body, transverse process and pedicle of L5 vertebra.

In a meta-analysis, Chen reported that the average blood loss in open surgery for spinal metastases was 2180 ml, of which 12% was more than 5000 ml [1]. Hansen-Algenstaedt reported significant reduced blood loss and transfusion ratio in MIS compared with conventional open surgery for patients with spinal metastasis [25]. The reported mean intraoperative blood loss in MIS for spinal metastases ranges from 128 g to 280 g and the operating time ranges 132 min to 154 min [2,5,6].

Significant reduction of muscle injury and systemic inflammatory reactions by MIS compared with conventional open surgery during the acute postoperative periods have been reported [26–28]. Uei reported the advantage of PPS-based posterior stabilization with multidisciplinary adjuvant therapy for surgical stress and postoperative survival time compared with conventional posterior stabilization alone in patients with metastatic tumor [29]. Based on the above reports, it might

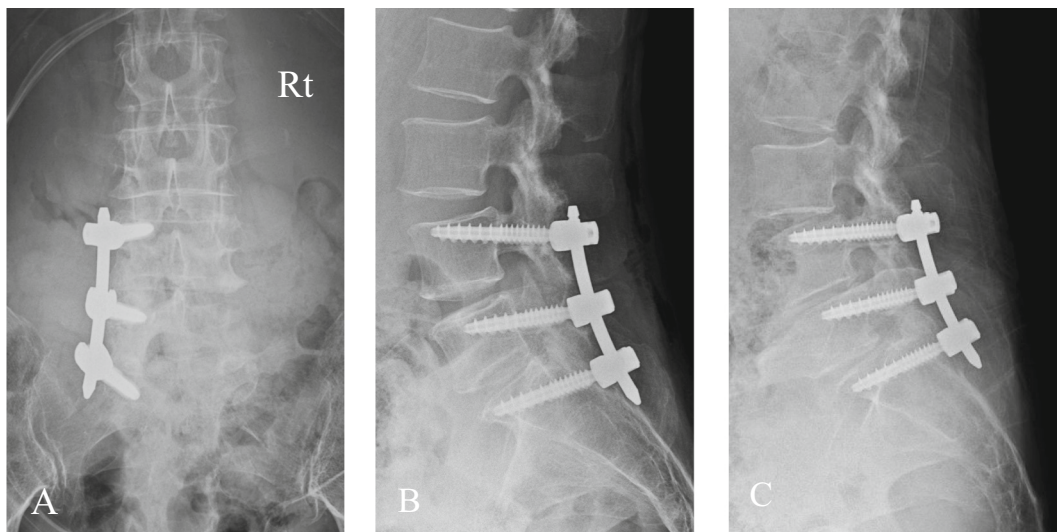


Fig. 3. (A) and (B) The plain AP and lateral lumbar X-ray showing minimally invasive fixation with transmyofascial insertion of pedicle screws and connection with rod utilizing MIS system on the left L4,5,S1 vertebrae. C. The x-ray taken just before death showing no spinal instrumentation failure.

be preferable to operate with MIS if patients with spinal metastases are candidate for either MIS or conventional methods.

Chen reported significant reduction of surgical time, blood loss, hospital length of stay in patients underwent unilateral fixation for lumbar spinal disorder compared with those underwent bilateral fixation despite the similar postoperative results measured by ODI, VAS and JOA score [30]. Some researchers mentioned that unilateral fixation could be used in two-segment lumbar spinal fusion [31,32].

4. Conclusion

Although bilateral spinal fixation is the standard surgical procedure for spinal metastasis, unilateral fixation utilizing MIS systems may be effective in cases whom placing an instrumentation on the side with tumor extending posteriorly as in this case may cause massive bleeding.

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Ethical approval

This paper as a case report, therefore does not require ethics approval.

Consent

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Registration of research studies

None.

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CRediT authorship contribution statement

Hisashi Serikyaku: operator, manuscript drafting, writing, literature search.

Shoichiro Higa: Colleague who assisted in the operation.

Tetsuya Yara: Colleague who assisted in the operation.

Takuma Oshiro: urologist for the kidney cancer treatment.

Declaration of competing interest

This work was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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