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ORIGINAL ARTICLE

A Case of Atlantoaxial Dislocation surgically Fixated with Laminar Craw Hooks, Spinous Plates, and Occipital Plate System

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ABSTRACT

Although cervical screw fixation is often demonstrated as biomechanical outstanding instrumentation for the case of upper cervical instability, only few reports have presented the complicated technique and high risk in the surgery. In this article, we show a case of atlantoaxial dislocation successfully fixated without any cervical screws.

Keywords: Atlantoaxial dislocation, Laminar craw hook, Occipital plate, Occipitocervical instability, Spinous plate.

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INTRODUCTION

Fixation surgery for spinal deformity with some instrumentation is an unusual surgery for general neurosurgeons in Japan. Most Japanese neurosurgeons are specialized in not spine but brain surgery. The reduction and fusion using screws and plates for occipitocervical region or atlantoaxial junction in particular should have a special working knowledge of anatomy as the anatomical complex formed by the important and fragile vascular and nervous tissue passing through these bony structures.[1,2] Most of such surgical complexity should depend on the screw technique which may be inserted into invisible depth of vertebral bone. In this article, a case of atlantoaxial dislocation successfully treated by fixation surgery without any cervical screws was demonstrated.

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PREOPERATIVE CASE REPORT

A 71-year-old female patient had experienced neck pain for several years. In 6 months, the additional symptoms of gait disturbance and dysesthesia on lower limbs appeared and deteriorated slowly. Her past history revealed no trauma, inflammation, and rheumatic disease. Physical examinations showed obvious spinal ataxia and sensory disturbance on lower limbs without any motor weakness. Radiography showed atlantodental subluxation without nonunion of odontoid process and additional finding of atlantooccipital vertical dissociations (Fig. 1). Computed tomography (CT) confirmed the findings on radiography and revealed no congenital anomaly (Fig. 2). Magnetic resonance imaging (MRI) showed that the cervical cord at cervicomedullary junction was severely compressed because of atlantoaxial dislocation (Fig. 3).

THERAPEUTIC STRATEGIES

(1) The posterior fixation is selected as there was no need for fixation of odontoid process. (2) Decompression of foramen magnum and laminectomy of C1 is necessary

Fig. 1: Preoperative lateral radiography showing atlantoaxial dislocation and, moreover, vertical dislocation of occipitoaxial joint

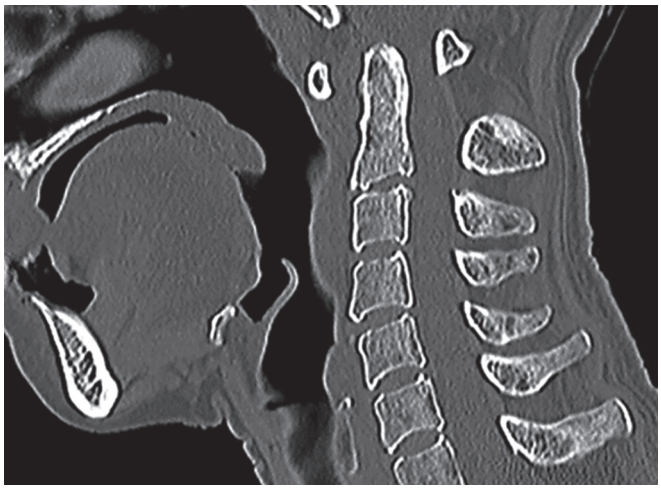


Fig. 2: Preoperative CT showing no congenital anomaly in C1 to C2 joint

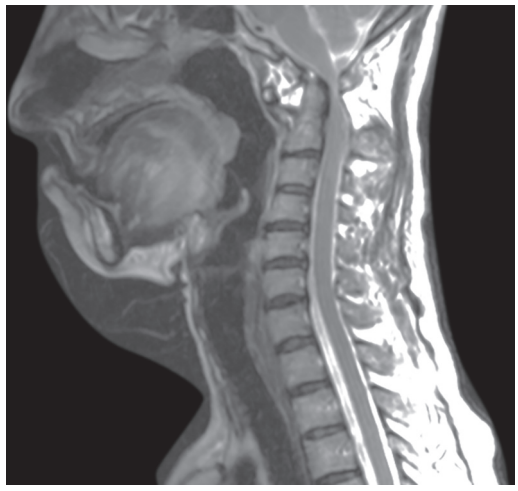


Fig. 3: Preoperative MRI (T2) showing severe compression of cord at the cerevicomedullary junction due to occipito-C1 to C2 subluxation

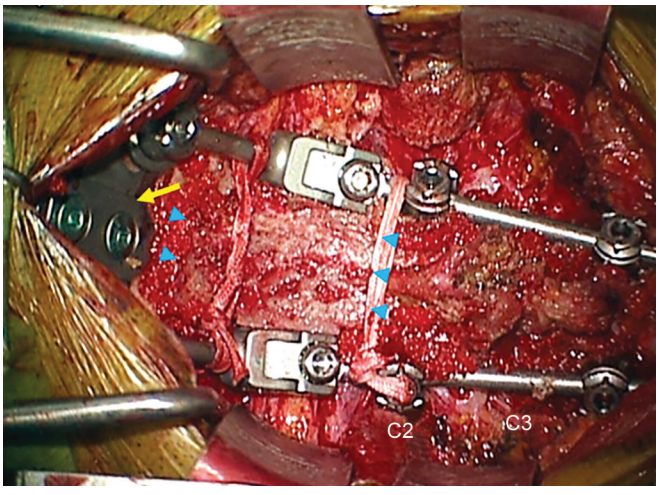


Fig. 4: Operative view showing iliac crest bone graft (blue arrows) placed between between the occipital bone to C2 posterior arc and spinous process

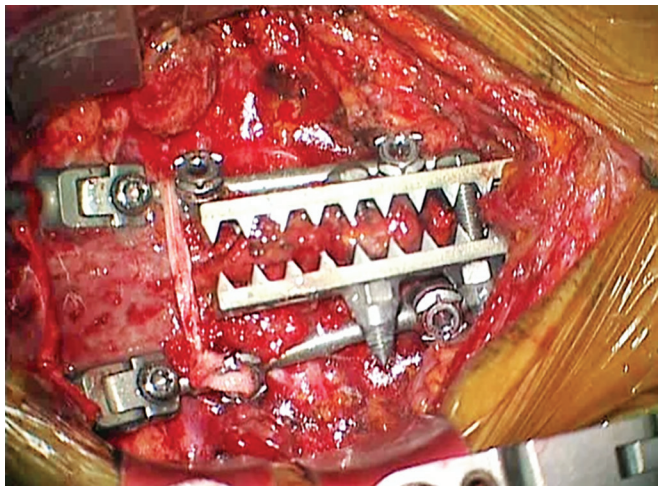


Fig. 5: Spinous process plate was fixed on the spinous processes of C2 to C5

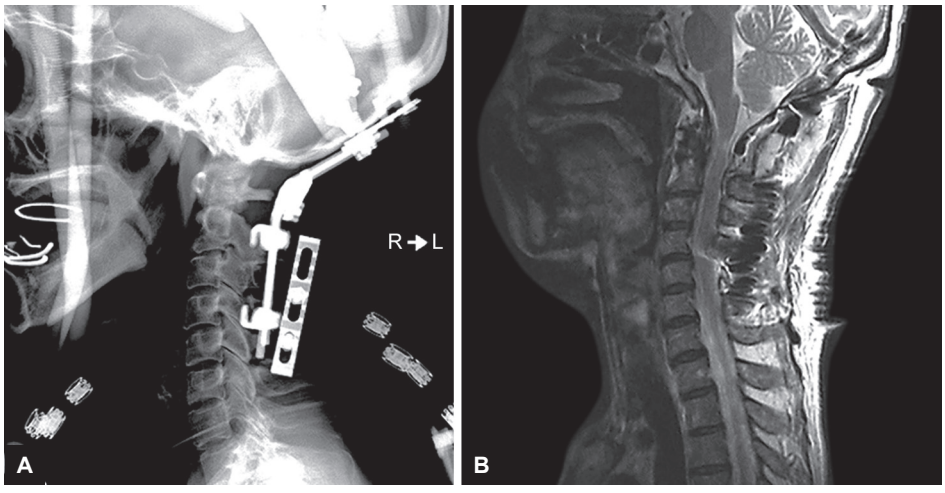
for neural decompression. (3) Instrumentation is applied for stabilization from C2 to occipital bone with iliac bone grafting. (4) Laminar hooks and spinous process plates are substituted for any cervical fixation screws for avoiding the complexity of screw technique. (5) For rigid fixation, halo vest was employed for short term immediately after anesthesia to 1 week after operation.

SURGICAL PROCEDURE

The patient was fixed with halo vest in supine position and then placed in prone position with Mayfield arm connected to halo ring with special adopter. A standard midline incision from inion to C4 spinous process and the posterior elements was exposed using a classic subperiosteal technique. Decompression of foramen magnum and laminectomy of C1 was performed and the grafting sites were decorticated using high-speed drill. Occipital plate and laminar hooks (C2, C4) were connected with longitudinal rods. Iliac bone plate was placed between the occipital bone to C2 posterior arc and spinous process (Fig. 4). Iliac cancellous bone fragments were also grafted between the laminae of C2 and C4 and then spinous process plate was fixed on the spinous processes of C2 to C5 (Fig. 5).

POSTOPERATIVE CASE REPORT

Postoperative radiography and MRI showed successful fixation and neural decompression (Fig. 6). Rehabilitation was started on postoperatively day 1 and preoperatively her symptoms were ameliorating gradually. Halo vest was removed and rehabilitation of walking alone was started on postoperative day 7. Satisfactory stabilization and neuronal decompression were maintained in these postoperative 5 years. No postoperative complication including instrumentation failure was observed.



Figs 6A and B: Postoperative radiography (right) and MRI (left) showing rigid fixation between the occipital bone to upper cervical bone and successful neural decompression

DISCUSSION

In Japanese medical history, spine surgery is considered a major one with orthopedic surgeons rather than neurosurgeons. Despite Japanese neurosurgeons nowadays performing many spinal surgeries, spinal surgery is an overwhelming minority compared with brain surgery in Japanese neurosurgeons. The modernistic fixation surgery of spine has tendencies to utilize indeed various instrumentations. Many Japanese neurosurgeons feel that fixation surgery with any screw technique is, in particular, complex and stressful as the screw should be inserted invisibly and safely.

These days cervical instrumentation of screws including transarticular, lateral mass, and pedicle screws has been widely applied as successful clinical results in biomechanically rigid fixation, which also carries a critical risk of neural and vascular complications.[3,4]

In this case, we substituted laminal craw hook and spinous plate for any cervical screws expect for screws in occipital plate; the screw technique for occipital bone should not be complex as neurosurgeons should be familiar with a working knowledge of anatomy of posterior fossa in cranium. The laminar craw hooks or the spinous plates individually might be insufficient in biomechanical best fixation, whereas their combined use is satisfied with immediate, rigid, and safe fixation. The occipital plate system might also play an important role to achieve this reliable fixation as rigid skeletal anchors.[5] Laminar screw fixation technique for not only C2 but also C3 to C7 has recently been described by Tanabe et al[3] as lower surgical risk would also be combined with laminar craw hook, spinous plate, and occipital plate in our next surgery.

In summary, we demonstrated the utilization of laminar craw hooks, spinous plates, and occipital plate system without any cervical screws for fixating atlantoaxial dislocation to avoid the complex screw technique and critical surgical complications.

CONCLUSION

We showed a case of atlantoaxial dislocation surgically fixed without any cervical screws. Laminar craw hooks, spinous plates, and occipital plate system contributed much to safety and rigid fixation surgery.

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