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Case Report

Rod Migration into the Posterior Fossa after Harms Operation : Case Report and Review of Literatures

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C1 lateral mass and C2 pedicle (C1LM-C2P) fixation is a relatively new technique for atlantoaxial stabilization. Complications from C1LM-C2P fixation have been rarely reported. The authors report unilateral rod migration into the posterior fossa as a rare complication after this posterior C1-C2 stabilization technique. A 23-year-old man suffered severe head trauma and cervical spine injury after vehicle accident. He was unconscious for 2 months and regained consciousness. He underwent C1LM-C2P fixation for stabilization of type II odontoid process fracture described by Harms. The patient recovered without a major complication. Twenty months after operation, brain computed tomogram performed at psychology department for disability evaluation showed rod migration into the right cerebellar hemisphere. The patient had mild occipital headache and dizziness only regarding the misplaced rod. He refused further operation for rod removal. To our knowledge, this complication is the first report regarding rod migration after Harms method. We should be kept in mind the possibility of rod migration, and C1LM-C2P fixation should be performed with meticulous technique and long-term follow-up.

KEY WORDS : Atlantoaxial fixation · Harms technique · Migration · Odontoid process fracture · Rod.

INTRODUCTION

Several methods have been introduced for surgical correction of atlantoaxial instability (AAI) irrespective of causes[14]. Among them, techniques using screw system are regarded to have higher fusion rate than posterior wiring or clamp system[14,17]. Harms and Melcher[9] technique of screw fixation with C1 lateral mass and C2 pedicle (C1LM-C2P) has been popularly used due to lower risk of vertebral artery (VA) injury since 2001. However, complications of this method have been less reported than those of transarticular screw fixation (TAF) because of short application period except common complications such as infection, malposition, nonunion, and vascular injury[16]. We present a rare complication of rod migration into the cerebellum that was found 20 months after Harms operation in a patient with atlantoaxial instability due to type II odontoid process fracture with pertinent literature reviews.

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CASE REPORT

A 23-year-old man was brought in to an emergency room for stuporous mentality following severe vehicle collision. Admission head computed tomogram (CT) showed traumatic subarachnoid hemorrhage and intraventricular hemorrhage, and cervical X-ray and CT scan revealed type II odontoid process fracture. (Fig. 1) The patient was admitted

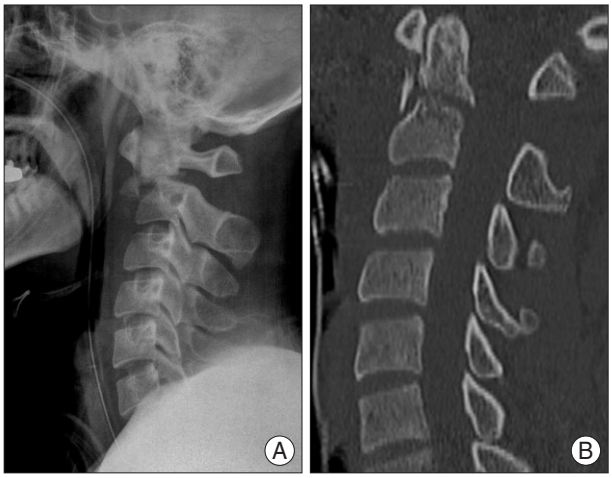

Fig. 1. Preoperative lateral cervical X-ray (A) and computed tomography (B) show type II odontoid process fracture and resultant atlantoaxial instability.

in intensive care unit (ICU) and he recovered consciousness 2 months later. C1LM-C2P (Vertex, Medtronic Sofamor Danek, TN, USA) fixation combined with sublaminar wiring was performed for odontoid process fracture (Fig. 2).

After atlantoaxial stabilization, his neck pain improved and he was discharged 3 weeks later. Follow-up cervical radiographics (Fig. 3) showed well-aligned instruments and solid bony fusion at 6 months postoperatively. After discharge, he was routinely followed up at the psychology department for impaired intelligence. On 20 months after operation, repeated brain CT scan (Fig. 4A) performed for disability evaluation showed rod migrated into the posterior fossa. Subsequent cervical X-ray (Fig. 4B, C) revealed migration of the rod into the cerebellum. The patient had mild occipital headache and dizziness only. We recommended surgical removal of rod device removal, but he refused operation.

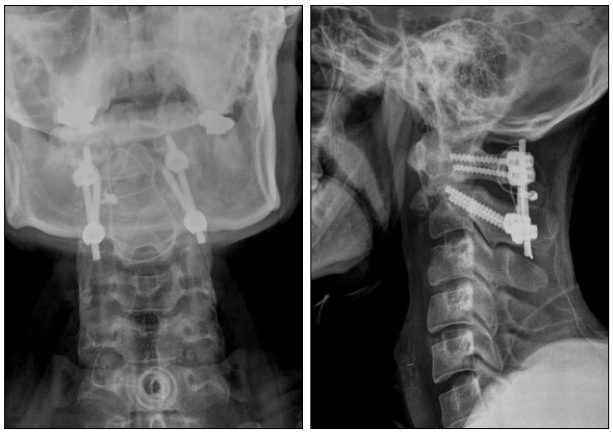

Fig. 2. According to Harms technique, C1 lateral mass and C2 pedicle screw fixation was performed with sublaminar wiring using cadaveric bone. Immediate postoperative X-rays revealing good reduction between C1 and C2.

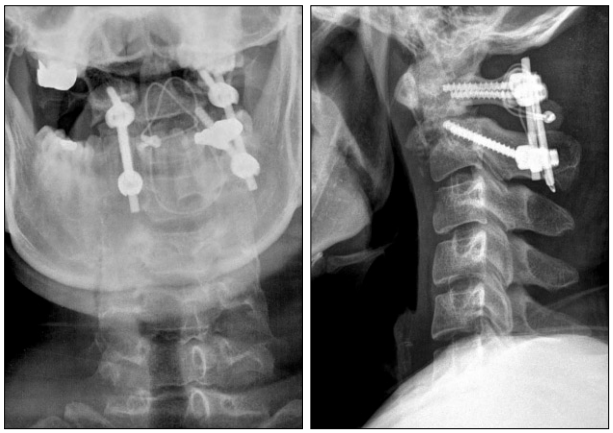

Fig. 3. Follow-up radiographics on 6 months postoperatively shows good atlantoaxial stabilization.

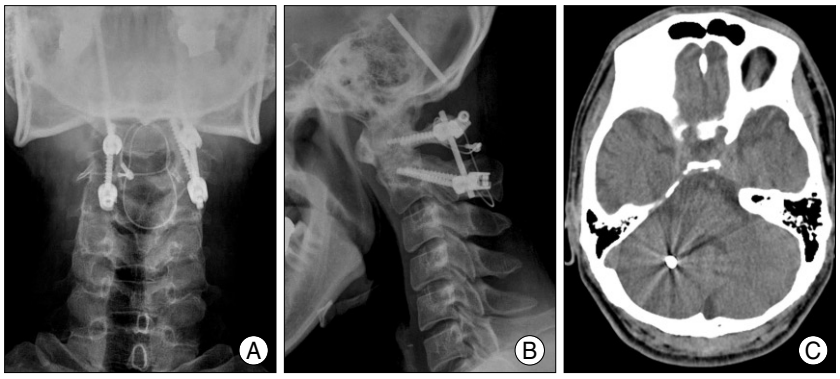

Fig. 4. On 20 months after surgical procedure, the patient complained of headache and dizziness. Head computed tomography scan (A) and cervical X-rays (B and C) show migrated rod into the cerebellum.

DISCUSSION

The first description of surgical treatment for AAI appeared in the literature using heavy silk thread in 1910[15]. Other posterior wiring techniques and clamp system were followed[14]. Grob and Magerl[7] presented TAF technique and demonstrated higher fusion rate by more rigid fixation than posterior wiring methods. In a recent decade, Harms technique using cervical polyaxial screw rod system has been widely adopted[2,9,11].

Harms method, C1LM-C2P fixation, has several advantages over TAF technique. First, individual placement of polyaxial screw in C1 and C2 allows direct manipulation of C1 and C2, enabling the following reduction and fixation[9]. Second, C1LM-C2P fixation has biomechanically superior or at least same stability when compared with TAF on the all dimensions of neck motion[3,12,13]. Third, the risk of VA injury is lower than TAF[2,9,14]. Additionally, Harms technique can be sufficiently applied when removal of posterior element of C1 or C2 is required for surgical decompression[2].

Regardless of specific methods and instruments, a variety of complications have been reported following cervical spine surgery. Amongst, the migration of screw into the gastrointestinal tract[4,5,19] or oral cavity extrusion[6] after anterior approach with screw and plate system were rarely reported. Abumi et al.[1] demonstrated the instrumentation-related complications in posterior cervical pedicle screw fixation including VA injury, radiculopathy caused by screw malposition, loosening of screw, and infection. A quite rare complication, rod migration to the cerebellum on 4 years later, was anecdotally reported in C4-C5 fusion surgery using Harrington instrumentation[20].

However, complication with regard to C1LM-C2P fixation has seldom been reported so far. Because of the relatively scanty data and lack of long-

term follow-up period, the exact incidence of complications has not been presented. Complications that related to the anatomical proximity were reported, such as hypoglossal nerve palsy[10] and occipital neuralgia[8,18]. But problem associated with hardware failure, such as shown in the present case, has not been demonstrated yet. Because rod-screw system is familiar to spine surgeon, surgeons do not typically design consecutive long-term surveillance if patients do not complain the specific symptom.

In the current case, we have no culprit that the migration of the rod was attributed to any operative technical errors. However, in authors' opinion, there may be two possible hypotheses of rod migration. First, the cervical polyaxial screw rod systems on both sides were not tight enough to hold a rod against neck motion in this patient. The loose rod on one side may have propelled in cephalad direction, and then eroded the occipital bone, and finally located into the posterior fossa. The other rod seemed not tightly fixed either, but still locked to screw head. Second, the cause of rod migration may be due to the fusion failure, such as nonunion or resorption of graft materials, using cadaveric bone. During 20 months, the rod loosening was gradually developed from continuous mechanical load, under nonunion state.

The patient did not have corresponding neurologic complaints because he suffered severe brain trauma and residual sequelae. If the rod migrated medially, the result could have been fatal.

CONCLUSION

The clinicians should be alert that failure of assembled instrumentation failure can occur without obvious causes. In addition, regardless of neurologic symptoms of patient long-term follow-up should be performed until at least 3 years by annual basis following identification of bony fusion.

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