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Case Report

Surgical treatment for cervical spine injury in nonagenarians: A report of three cases

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ABSTRACT

Among the elderly, even minor injuries can cause cervical spine fractures. With the increasing number of nonagenarians, the opportunities for treatment of cervical spine injuries in nonagenarians are getting to be more common. Conservative therapy is often chosen in nonagenarians with cervical spine injuries because of high risk associated with surgical treatment; however, we present herein the cases of three patients in nonagenarians who underwent surgical treatment for cervical spine injury. After a fall, three cases of nonagenarians who lived alone and independent were diagnosed with a Jefferson fracture and minor dislocated type II odontoid fracture, a C4 fracture with diffuse idiopathic skeletal hyperostosis, and a fracture-dislocation of C2, respectively. Their past medical history included several diseases, but we decided that spine surgery under general anesthesia was acceptable based on their pre-injury condition. We performed posterior fixation for all cases. As a result, while two patients developed postoperative minor complications, all cases showed favorable postoperative courses. They acquired independent or partially assisted walking and were transferred to the hospital for rehabilitation. If fundamental activity of daily living and general condition permit, posterior fixation seems to be a good choice even in nonagenarians.

Introduction

Due to the aging society, there were more than 2 million nonagenarians in Japan as of 2017, and this number will increase [1]. Among the elderly, even minor injuries can cause cervical spine fractures [2,3]. With the increasing number of nonagenarians, the opportunities for treatment of cervical spine injuries in nonagenarians are getting to be more common. Generally, nonagenarians are more likely to have osteoporosis and various comorbidities, which pose various risks to choose spine surgery under general anesthesia. Previous studies reported that postoperative mortality following elective spine surgery and complication rates are higher in nonagenarians compared with younger generations [4,5]. Therefore, conservative therapy is often chosen in nonagenarians with cervical spine injuries. There are few reports describing surgical treatment for cervical spine injury among nonagenarians. We present three nonagenarians with cervical spine injury who underwent surgical treatment.

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Case presentation

Case 1

A 90-year-old woman living alone fell down and bruised her head at her home. She was transported to our hospital with a complaint of neck pain. Her past medical history included hypertension and osteoporosis which required taking medicine. Her subsequent radiography and computed tomography (CT) findings showed a Jefferson fracture and minor dislocated type II odontoid fracture (Fig. 1.A–C). She was admitted on an emergency, then fixed with a hard collar. We carried out posterior fixation of C1–2 under general anesthesia 5 days after the injury to avoid decreasing in her activity of daily living (ADL) and cervical spinal cord injury due to instability at C1–2 level (Fig. 1.D). Postoperatively, the patient recovered uneventfully, and then transferred to the other hospital for rehabilitation three weeks after surgery. Three months after surgery, she was able to walk using T-cane. She remained independent 1-year later and confirmed the bone fusion was confirmed by CT (Fig. 1.E–F).

Case 2

A 90-year-old man living alone fell down at his home. His past medical history included hypertension, atrial fibrillation, and duodenal ulcer. He was referred to our hospital with severe neck pain, dysesthesia in the right C5 dermatome, and difficulty raising the right shoulder. Radiographs and CT imaging revealed the C4 fracture with diffuse idiopathic skeletal hyperostosis (Fig. 2.A–C). Magnetic resonance imaging (MRI) showed the spinal cord was compressed (Fig. 2.D). We performed laminectomy and posterior fixation of C2–5 to avoid paralysis due to progression of fracture dislocation (Fig. 2.E–F). The patient developed delirium postoperatively, but the symptoms gradually abated with medication and early ambulation. Three weeks after surgery, his right deltoid and biceps muscles had recovered to grade 3 of manual muscle testing score. He was stable and able to walk with a T-cane and then transferred to the other hospital for rehabilitation four weeks after surgery.

Case 3

A 94-year-old woman living alone fell down on the stairs and was taken to our hospital. Her past medical history included hypertension, asthma, and osteoporosis which required taking medicine. She complained of severe neck pain and exhibited dysesthesia and muscular weakness in both upper and lower limbs which was grade 3 of manual muscle testing score. The CT imaging revealed a fracture-dislocation of C2 (Fig. 3.A). We immediately performed manual reduction and fixation using a halo-vest (Fig. 3.B). She then underwent general care including respiratory and circulation status at the intensive care unit. We determined that prolonged halo-vest for nonagenarians would cause various complications and decrease in her ADL. We performed posterior fixation of O-T1 under general anesthesia 3 days after the injury (Fig. 3.C–D). After surgery she was able to perform rehabilitation immediately. She developed delirium, urinary tract infections, and a superficial surgical site infection, each of which could be managed with medication and restitching. She transferred to the other hospital for rehabilitation five weeks after surgery. One year later she was stable and able to walk on her own, and bone union of fracture location has been confirmed by radiographs (Fig. 3.E–F).

Discussion

Whether spine surgery should be performed for nonagenarians still remains controversial. Oichi et al. examined the mortality and

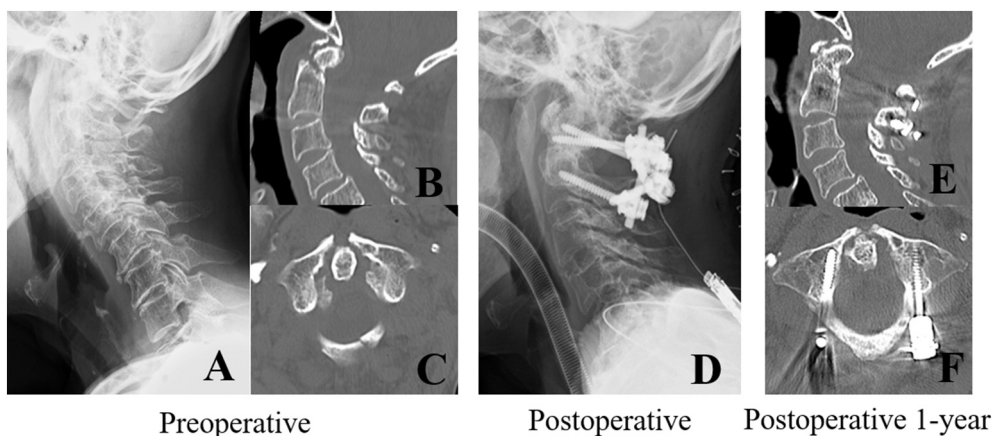


Fig. 1. Preoperative radiograph (A: lateral view) and CT imaging findings of the cervical spine (B: sagittal view C: axial view of C1) showing a Jefferson fracture and type II odontoid fracture. We performed posterior fixation of C1–2 (D: lateral view). The CT imaging of cervical spine at 1 year following surgery showing the bone union of fracture location (E: sagittal view F: axial view of C1).

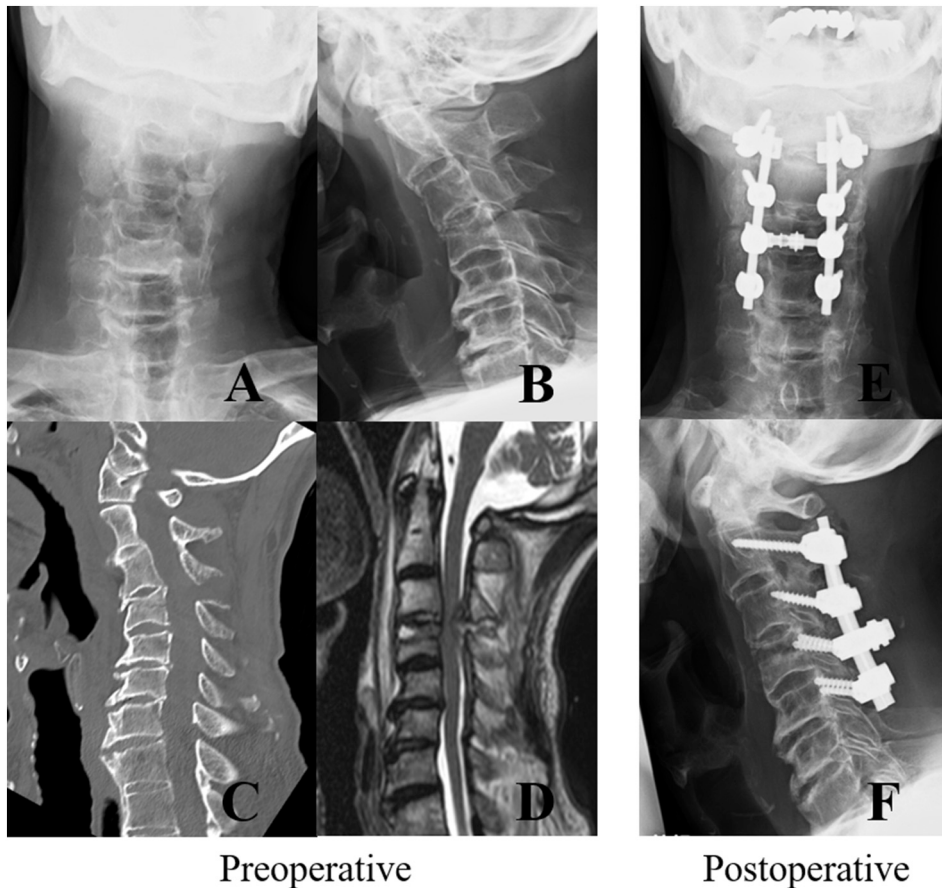


Fig. 2. Preoperative radiographs, CT imaging and MRI imaging of the cervical spine showing the C4 fracture with diffuse idiopathic skeletal hyperostosis and spinal cord compression (A: anterior-posterior view B: lateral view C: sagittal view D: T2-Weighted sagittal view) We performed laminectomy and posterior fixation of C2–5 (E: anterior-posterior view F: lateral view).

perioperative complication rate of elective spine surgery for nonagenarians in their retrospective study using a nationwide administration database [5]. They reported that nonagenarians had a significantly higher morbidity and mortality than younger counterparts. For the cases with cervical spine injury in nonagenarians, expected functional improvements following surgery should be considered in comparison to the risks. To date, only one case report with surgical treatment for cervical spine injury in nonagenarians has been published, which showed a favorable outcome following posterior fixation for a type II odontoid fracture [6]. In the present cases, if we choose conservative treatment, resting or continuous fixation with a halo-vest for long periods would be adopted. A systematic review of upper cervical spine injury in elderly patients revealed that halo-vest treatment had the highest rate of complications and mortality [7]. Therefore, in nonagenarians, prolonged use of halo-vest immobilization would easily lead to adverse events. In the pathologies affecting their ADL, like cervical spine injury, spine surgery for a nonagenarian could be acceptable with their understanding of surgical risks (Table 1).

Surgical approach can reduce surgical risks in nonagenarians. Osteoporotic bones cause mechanical failure following spinal fusion surgery with instruments. Generally, posterior surgery has been preferred as a spinal fusion surgery for elderly patients compared with anterior surgery because of its high rate of pseudarthrosis following as well as 5–27% [8–9]. In addition, potential risks of dyspnea and dysphagia following anterior fusion surgery require intensive care for a period of time [10], which could be unsuitable for nonagenarians with impaired swallowing function. Thus, posterior fusion surgery with recent development of various rigid anchors would be preferable for nonagenarians compared to anterior fusion surgery with potential risks of several complications.

Age has been reported as a common risk factor of several complications following spinal surgery [5]. However, regarding cervical spine injury, conservative treatment with prolonged bed rest or application of the halo vest also had potential risk [7]. We caution against using age alone to decide not to operate in the cases of nonagenarians with cervical spine fractures. If fundamental activity of daily living and general condition permit, posterior fixation seems to be a good choice.

This case series has several limitations. The number of cases in this study was quite small. Furthermore, this report is subject to selection bias because we self-select the cases. Future efforts, increasing the number of cases and such as comparative studies with conservative treatment, will be needed to confirm the validity of surgical treatment for cervical spine injury in nonagenarians.

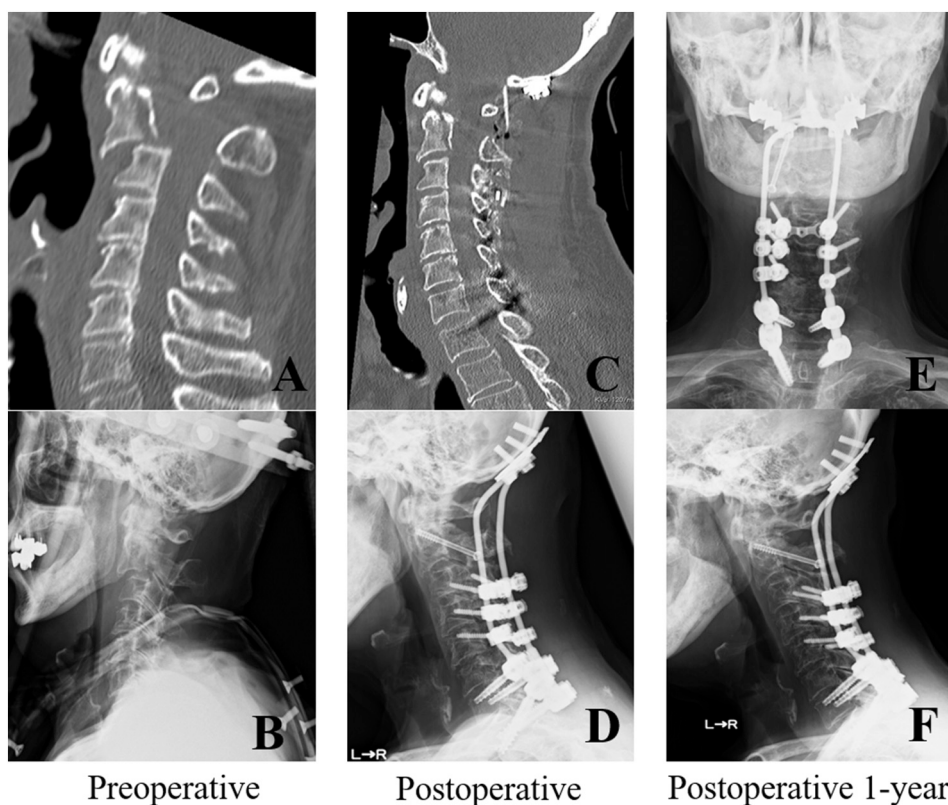


Fig. 3. Preoperative CT imaging of the cervical spine showing a fracture-dislocation of C2 (A: sagittal view). We performed fixation with a Halo-vest (B: lateral view). Posterior fixation of O-T1 was performed (C: sagittal view D: lateral view). Radiographs 1 year after surgery showing bone union of fracture location and no mechanical failure (E: anterior-posterior view F: lateral view).

Table 1
Summary of cases.

	Case 1	Case 2	Case 3
Age	90 years	90 years	94 years
Diagnosis of cervical injury	C1–2 fractures	C4 fracture with DISH	Fracture-dislocation of C2
ADL before injury	Independent, living alone	Independent, living alone	Independent, living alone
Past medical history	Hypertension, osteoporosis	Hypertension, atrial fibrillation, duodenal ulcer	Hypertension, asthma, osteoporosis
Pathology for surgical indications	C1–2 instability	C3–4 instability and spinal cord compression	C2–3 instability and spinal cord compression
Surgical treatment	Posterior fixation of C1–2	Posterior fixation of C2–5, laminectomy	Posterior fixation of O-T1

ADL, activity of daily living; DISH, diffuse idiopathic skeletal hyperostosis.

Conclusion

Although surgery for cervical spine injury in nonagenarians has been thought to be at various risks, our cases undergoing posterior fusion surgery showed favorable postoperative courses.

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Declaration of competing interest

None.

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A written and informed consent was taken from the patient for publication.

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