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Risk Factors of Fracture Instability and Non-union of Type II/III Odontoid Fracture

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Background: Odontoid fracture is the second most common fracture of the cervical spine and is often associated with severe pain and neurologic deficit. Fracture stability is an emerging concept that replaces bony union in X-ray in cases not treated by halo traction.

Research question: To evaluate fracture stability and bony union rates of Type II/III odontoid fractures and identify clinical and radiologic risk factors associated with this study.

Methods: The medical records and radiologic data of patients admitted for odontoid fracture at two centers from January 2006 to December 2023 were retrospectively reviewed. Patients with transverse atlas injury, chronic odontoid fracture, or an infectious or pathologic fracture were excluded. Thirty-seven patients were included. Age, sex, body mass density (BMD), and the Anderson and D'alozzo classification were evaluated as potential risk factors. Sagittal tilt (ST), Sagittal gap (SG), fracture line gap (FG), and coronal tilt (CoT) were measured as potential radiologic risk factors.

Results: Mean patient age was 61.1 years, and 26 of the 37 were men. Mean follow-up was 25.2 months. Osteoporosis accounted for 30%, and Type II fracture for 41%. The rate of fracture stability after conservative treatment was 30%. Fifteen patients underwent anterior odontoid screw fixation, and two of these patients failed to achieve osseous union. The union rate of Type II/III odontoid fracture at 12 months was 78.4%. Osteoporosis, Type II fracture, an SG > 2 mm, and ST > 5° were risk factors of fracture instability, and an age of > 70 years and osteoporosis were risk factors for non-union at 12 months.

Conclusions: Osteoporosis was found to be a significant risk factor for fracture instability and osseous union. Radiologic risk factors also contributed to fracture instability and an age of > 70 was associated with non-union.