EDITORIAL
Management of Type II odontoid process fracture in octogenarians
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A Type II odontoid fracture is the most common spine fracture in patients older than 80 years, and the incidence is rising as the population ages.2,3,6 There is no agreement in the literature regarding the appropriate management of Type II odontoid fractures in geriatric patients.1–3,5 The controversy is due to specific aspects of this fracture in elderly patients. This combination of Type II odontoid fracture and older age leads to negative factors, such as osteoporosis, insufficient blood supply, diminished rehabilitation capacity, and other diseases and comorbidities. These factors increase the percentage of complications. Some of them are specific to conservative treatment, such as nonunion and instability with myelopathy, and others are due to increased morbidity caused by surgery.5 Unfortunately, death occurs in both groups, ranging from 11% to 38% in operatively treated patients to 15% to 51% in those treated nonoperatively.1–3,6

The treatment of a Type II odontoid fracture is usually influenced by a number of factors: 1) the type of fracture, 2) the fracture’s association with other fractures, 3) patient age, and 4) comorbidities.6 Spine surgeons need to review these factors and anticipate the risk of complications in each patient with a Type II odontoid fracture in order to select which patients should be treated conservatively with a Halo vest or cervical orthosis and which would preferably be treated with surgery, as well as the best surgical technique.3,5 Primary surgical treatment, however, seems to be the treatment of choice, especially in geriatric patients, as this may reduce mortality.1,3,5

In the study published by Graffeo et al. in this issue of the Journal of Neurosurgery: Spine,4 the authors present a single-center experience for treating Type II odontoid fractures in elderly patients older than 79 years. The patients were retrospectively reviewed from a prospective trauma database that was collected between 1998 and 2014. Primary end points were 30-day and 1-year mortality. The secondary end point was how Glasgow Coma Scale (GCS) score, Abbreviated Injury Scale (AIS) score, Injury Severity Score (ISS), additional cervical fracture, and cord injury are associated with mortality. A total of 111 patients were analyzed, of whom 94 were managed by nonoperative treatment and 17 underwent surgery. The most common nonoperative therapy was a hard cervical collar in 85% of the cases. The posterior approach employing a C1–2 segmental polyaxial screw and rod fixation technique was utilized in 15 of the 17 surgical patients. The mean follow-up was 22 months (range 0–129 months). Overall mortality was 13% in-hospital, 26% at 30 days, and 41% at 1 year. The difference between nonoperative and surgical mortality rates was not significant at any time point (12% vs 18%, p = 0.5; 27% vs 24%, p = 0.8; 41% vs 41%, p = 1.0, respectively). Kaplan-Meier analysis did not demonstrate a survival advantage for either management strategy. Spinal cord injury, GCS score, AIS score, and ISS were significantly associated with 30-day and 1-year mortality; however, Cox modeling was not significant for any variable.

Readers should note that many variables and possibilities played a role in establishing the best therapy for each patient. During this complex decision-making process, the following pathology and patient factors needed to be given special attention in the studies: 1) the elapsed time from fracture to treatment, 2) associated comorbidities, 3) neurological presentation, 4) medical conditions for surgery, 5) different radiological presentation of odontoid fractures, 6) surgeons’ preferences and experiences, 7) evidence-based analysis of the literature, and 8) patients’ expectations regarding the treatment.

The strengths of this paper include the controversial topic chosen, the prospectively collected data, and the clinical importance of the question. Additionally, the classifications used to measure the outcomes were defined at the time the study was designed, and the radiology images were reviewed by 2 independent evaluators blinded to the results of the study. The main message of this Class III evidence paper was the high incidence of overall mortality: 13% in-hospital, 26% at 30 days, and 41% at 1 year.

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The differences in mortality rates between the nonoperative and operative groups were not significant. While this may be true, the groups comprised different numbers of patients (94 nonoperative vs 17 operative), which limits statistical analysis and increases the risk of Type II error. In fact, the literature suggests that elderly patients with a Type II odontoid fracture who underwent surgery had a lower mortality rate than those who underwent nonoperative treatment. 1,3,5 Controversy remains in the literature as to whether the age-related increases in the number of comorbidities, surgical complications, and mortality in octogenarian patients reduces the advantages over nonsurgical management.

There is no perfect scientific study. The limitations of the study include the small number of patients, the asymmetrical distribution between the groups, and the absence of guidelines to render therapy uniform. These limitations may have affected the mode of treatment selected and consequently lowered the internal consistency of the study.

Fusion assessment was not addressed in the paper. The authors felt that it was not an important end point. While I can understand this point of view (since there are asymptomatic patients with stable fibrous nonunion), it is better to have this information in a study about spine fractures to clarify the incidence and long-term outcome of stable fracture nonunion.

The radiological features of Type II odontoid fractures were also not examined in the study. The radiographic classification of Type II odontoid fracture can be performed according to 1) degree of displacement or dislocation of the odontoid process, 2) fracture line anatomy (anterior oblique, posterior oblique, or horizontal), 3) gap fracture, 4) degree of atlantoaxial instability/subluxation across each Cl–2 facet joint, 5) presence of a comminuted fracture, and 6) surface contact area between the odontoid and the body of C-2. It would be useful if, in the future, a study were performed correlating the healing rates and the different features of Type II odontoid fractures with decision planning (conservative vs surgery) and its influence on quality of life.

Several useful treatment guidelines have been developed over the years to guide the treatment of patients with Type II odontoid fractures, but none of them are fully satisfactory. Some patients fare better than others, and it is difficult to identify the factors associated with better outcome and decreased mortality. A prospective randomized study could elucidate some of the controversy in the literature, providing homogeneous groups with a similar number of cases. Unfortunately, randomization may be limited in some diseases because of the higher incidence of comorbidities observed in older patients and the heterogeneity in other factors. This means that the decision-making process for Type II odontoid fractures in elderly patients needs to be individualized. In the present paper, a significant increase in age was observed among patients who were managed nonoperatively. Perhaps there was a surgeon’s inclination to adopt conservative treatment as a primary decision in older patients. There is nothing wrong with that; sometimes it is difficult to know whether we are doing too much or too little. The severity of the comorbidities can limit what we should do in favor of what we can do.

Guidelines and best evidence are always necessary to determine the diagnosis and therapies for all pathologies. In older patients, the therapeutic definition also requires more experienced surgeons, a shared decision with the patient and family, and an individualized evaluation. I would encourage the authors to publish the guidelines they adopted in deciding on conservative or surgical therapy and the types of external mobilization, or the reasons for recommending the anterior or posterior approach.

I congratulate the authors for providing more scientific evidence on this controversial topic. I would also suggest undertaking future assessments of this approach in a prospective fashion, including the evaluation of fusion rates, features of Type II odontoid fracture, and patients’ quality of life and satisfaction.

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References

Disclosures
The author reports no conflict of interest.

Response
Christopher S. Graffeo, MD, Avital Perry, MD, Ross C. Puffer, MD, Lucas P. Carlstrom, MD, PhD, Wendy Chang, MD, PhD, Grant W. Mallory, MD, and Michelle J. Clarke, MD
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We very much appreciate the editors of Journal of Neurosurgery: Spine for selecting our study for further discussion in this editorial, as well as Dr. Falavigna for his thoughtful commentary regarding our work and its posi-
tion within the larger discourse on treatment strategies for elderly patients after Type II odontoid fracture.

As he correctly highlights, in spite of our study design, the weaknesses of this study are not trivial and largely derive from the small, unequal patient groups. However, although the lack of guidelines to “render therapy uniform” do introduce a source of confounding that potentially limits the study’s internal consistency, we consider ours an important step toward building the evidence to invest future research and patient care with more robust guidelines.

We disagree with Dr. Falavigna’s statement, “The authors felt that [fusion] was not an important end point.” Rather, as we detailed in the Discussion, our belief is that even though preceding evidence suggests that fusion is unlikely a contributor to the primary end point of the present study—mortality among octogenarians—our group is actively engaged in a follow-up analysis that will focus explicitly on fusion, delayed myelopathy, and related morbidity. Whether the findings of this secondary analysis will alter practice recommendations remains to be seen; however, we agree wholeheartedly with Dr. Falavigna that there will be academic and clinical merit to those results.

As we outline in the Discussion, perhaps the most important finding of our work is that the survival benefit associated with surgery in patients older than 65 years dissipates beyond 80 years. Although well-selected individuals without major comorbidities or additional injuries may still present as appropriate candidates for instrumented fusion, we recommend a broadly conservative approach to all elderly patients with Type II odontoid fractures and a strong preference for hard collar immobilization. In keeping with Dr. Falavigna’s recommendation, we hope to expand upon this recommendation and eventually publish more rigorous guidelines resolving the ambiguity surrounding which octogenarian patients—if any—will definitively benefit from surgical intervention.

Above all, we are grateful for Dr. Falavigna’s praise, which is at once aware of the constraints on work such as ours, while also being appreciative of the measured insights we have been able to achieve. We thank him and the editors of Journal of Neurosurgery: Spine for their attentive analysis of our work.

References

