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Spinal Injuries in the Sichuan Earthquake

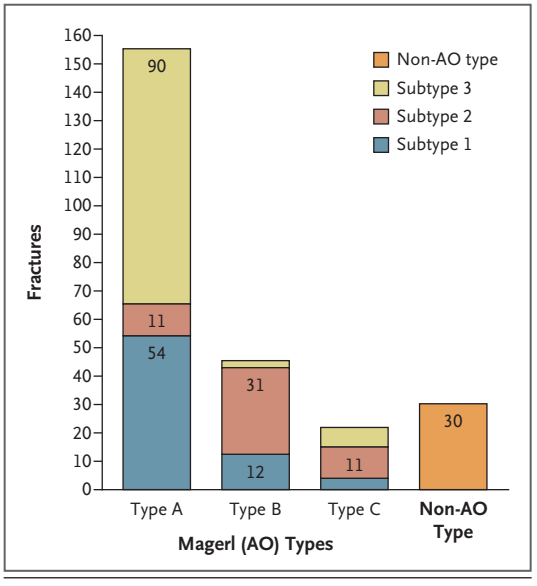
TO THE EDITOR: A magnitude 8.0 earthquake hit the densely populated region of Sichuan, China, on May 12, 2008, causing an estimated 374,643 injuries. By July 23, 2008, a total of 2728 wounded patients had been treated at the nearest major university hospital, which had 4300 beds and was located 92 km away from the epicenter, Wenchuan County.

A total of 13.0 to 15.2% of all patients with earthquake-related trauma who were admitted to the hospital had spinal injuries.[1,2] Multidetector-row computed tomography (CT) with multiplanar reformation is a fast and reliable method that can be used to determine the pattern and severity of spinal injury and the degree of spinal instability.[3] We retrospectively reviewed the multidetector-row CT scans of 223 patients with clinically worrisome spinal injuries after the Sichuan earthquake. Patients injured by earthquake-related motor vehicle accidents were excluded. The study was approved by the ethics committee of the West China School of Medicine, Sichuan University.

We used multidetector-row CT to focus on anatomical locations of the injury, injury types according to the Magerl (AO) classification (Fig. 1),[4] and the degree of narrowing of the spinal

Figure 1. Classifications of the 252 Major Injuries According to the Magerl (AO) Types.

Type A (compression injuries of the anterior column) is subdivided into A1 (impaction fractures), A2 (split fractures), and A3 (burst fractures). Type B (distraction injuries of the anterior and posterior column with transverse disruption) is subdivided into B1 (posterior disruptions that are predominantly ligamentous), B2 (posterior disruptions that are predominantly osseous), and B3 (anterior disruptions through the disk). Type C (anterior and posterior element injuries with superimposed rotation resulting from axial torque) is subdivided into C1 (type A injuries with rotation), C2 (type B injuries with rotation), and C3 (rotational-shear injuries). The 252 major injuries were mainly composed of type A injuries in 155 vertebrae and type B injuries in 45 vertebrae. Type A3 comprises 58.1% of type A. We detected non–AO-type fractures, including occipital condyle fractures in 2 vertebrae, fractures of the odontoid processes in 5 vertebrae, hangman's fractures (spondylolisthesis of the axis consisting of a bilateral fracture pattern through the pars interarticularis or pedicles) in 4 vertebrae, Jefferson fractures (a burst fracture of the atlas or C1, first described by Geoffrey Jefferson in 1920, with both anterior and posterior arches failing) in 1 vertebrae, lateral mass fractures in 4 vertebrae, teardrop fractures in 4 vertebrae, and posterior arch or laminar fractures in 10 vertebrae.



canal.[5] We also relied on clinical symptoms to determine the degree of impairment of neurologic function.

According to clinical records, 185 patients had sustained crush injuries and 38 had fallen; there were a total of 501 vertebral injuries in 198 patients. Among all spinal injuries, we identified 252 major injuries (50.3%) and 249 minor injuries (49.7%). Injuries in the lumbar spine were most common (277 injuries; 55.3% of all injuries), and injuries of the thoracic spine were the next most common (156 injuries; 31.1% of all injuries).

There were 282 injuries at the T12 to L3 levels. The 252 major injuries consisted mainly of Magerl type A injuries (Fig. 1) ($P<0.001$ according to the chi-square test for the comparison with each other type). A total of 43 vertebral injuries of type B (Fig. 1 through 4 in the Supplementary Appendix, available with the full text of this letter at NEJM.org) and 10 injuries of type C2 were associated with type A injuries. Of these 53 associated type A injuries, 39 were type A3. Of the major injuries, we detected narrowing of the spinal canal of 0 degrees (no constriction of the spinal canal) in 110 vertebrae, 1 degree (constriction of one third of the spinal canal) in 76 vertebrae, 2 degrees (constriction of two thirds of the spinal canal) in 50 vertebrae, and 3 degrees (constriction of all of the spinal canal) in 16 vertebrae (Fig. 5 in the Supplementary Appendix). Neurologic deficit occurred in 65 patients (29.1%). Neurologic function according to Frankel's classification was grade A (complete) in 14 patients, grade B (sensory only) in 8 patients, grade C (useless motor power without motor function) in 24 patients, and grade D (useful motor power without functional movement) in 19 patients. The incidence of neurologic deficit increased significantly from Magerl type A through type C: neurologic deficit was associated with 18.7% of type A lesions, 33.3% of type B lesions, and 59.1% of type C lesions ($P=0.001$ according to the chi-square test for all three comparisons); this was consistent with the finding of Magerl et al.[4]

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