Malunion and nonunion of spinous process of the cervicodorsal junction: a case report

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Introduction

Spinous process fractures represent relatively rare injuries in traumatized patients, most often involving the cervicodorsal area. However, nonunion may be present due to consequent displacement of the fragments.
Clinical information

A 39-year-old man was a front passenger of a car which crashed head-on into a wall at approximately 50 kmph. He was wearing a three-point belt and was not ejected from the car. The vehicle was not equipped with air bags. He was led to the emergency the same day with a complaint of pain in his upper back. Physical examination revealed tenderness over his upper thoracic spine. No abrasion or bruising was present on the neck or the chest. Detailed neurological examination revealed no abnormality. Lateral films of the thoracic spine obtained in the emergency section were inadequate. Computed Tomography (CT) studies were performed and confirmed fractures of the spinous process of C7 to T1 and of the posterior arch of the first right rib. His hospital course was uneventful, and he was discharged four days after the admission. He received pain killers and a Minerva jacket was applied for one week. We then lost the patient from follow-up. The patient came back within the framework of a medical expertise 5 years later. Because he complained of dorsal pain with a palpable crepitus and paravertebral muscle spasm, a cervicodorsal CT examination was performed. Malunion of C7, which heals on T1, nonunion of the spinous process of T1 and C6-C7 osteoarthritis were identified on CT (Figure 1). To better show the superior and inferior alignment of the fracture fragments, sagittal computer-generated reconstruction of the fractured vertebral segments were also obtained (Figure 2).

Discussion

Spinous process fractures represent avulsion injuries at the attachment of the interspinous, supraspinous and nuchal ligaments, most often reported at C7 and T1 level [1] [3] [6] [7] [10] [14] [16]. They have been reported secondary to trauma [12] [13] [14] [2] [3] [8] [9] [16], surgery, neoplasm or stress fracture [4] [5] [15] [17] [18]. The latter has been referred to as a clay-shovelers’ fracture because, historically, it has represented an occupational risk in those workers [6]. In the case reported here, the mechanism of injury most likely represented avulsion stress, associated with abrupt flexion and hyperextension of the cervical spine. The conventional assessment of the cervico-thoracic posterior elements can reveal, on the AP view, a double spinous process sign [2] [3] and, on the lateral view, a fracture line and a spinolaminar breach [11]. The latter indicates a complex spinous process fracture with extension into the lamina and
spinal canal. However this radiographic assessment is often limited, and cases of clinically suspected spinous process fracture often require CT evaluation, as in our case, to confirm diagnosis. Because it may prove impossible to image the obliquely oriented spinous process in a single axial CT plane, sagittal reconstruction may provide additional information regarding vertebral segment alignment and permit assessment of interspinous distances, enhancing detection of distraction injuries associated with ligament tears. Nonunion of spinous process’s fracture seems to be the rule in so far as the displacement between the bone fragments is important [9]. In our case, the consequent displacement permits the development of a spinous process malunion of C7 on T1 and a nonunion of the spinous process of T1. The latter caused an impingement with the adjacent spinous process which was clinically most responsible of the pain. This is to our knowledge the first report of such a spinous process malunion. Although isolated spinous process fractures are considered to be mechanically stable and are rarely associated with neurologic injury, spinous fractures at several levels may induce late development of arthritis; failure to recognize and properly treat this injury may thus result in chronic pain and limitation of motion that are intense enough to warrant surgical interference.

**Conclusion**

Few cases of spinous process nonunion have been described, and, to our knowledge, this is the first reported case of malunion of spinous process. Rigid bony union should not be the main goal of treatment as nonunion can be totally symptom-free. However persistent pain must be investigated in order to exclude complication such as instability or malunion.

**Declarations**

**Acknowledgement**

The authors thank R. Stern, MD, for helping to correct the manuscript.

**Conflict of interest**

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

**References**


ISSN : 2334-1009