Cervical transverse process fracture

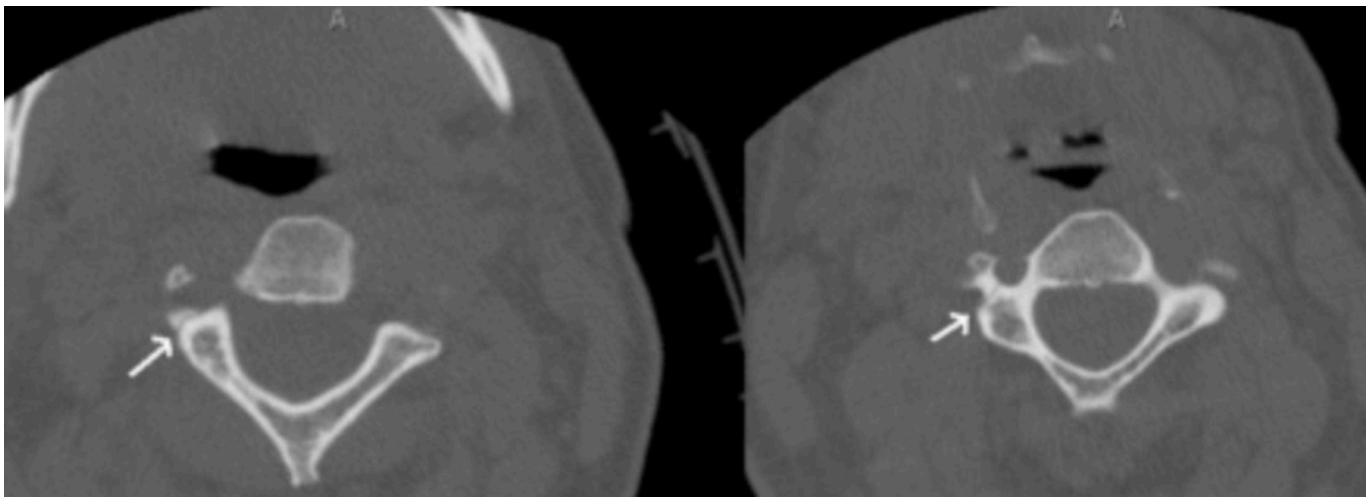
Cervical transverse process fractures have a strong association with other cervical spine fractures and blunt cerebrovascular injury [1)].

With the advent of whole body computed tomography of trauma patients, the radiologic diagnosis of transverse process fractures (TPF) has increased. Spine service (neurosurgical or orthopedic) consultation is frequently requested for patients with these fractures, stressing constraints on these practices.

When TPF are identified, diligence in searching for a spine injury or abdominal injuries should be exercised, as these associated injuries occur frequently [2)].

Isolated cervical transverse process fracture (TPF) of the subaxial cervical spine can be considered as clinically insignificant and do not require treatment [3)]

Clinicians should maintain high indices of suspicion for associated injuries in patients with isolated transverse process fractures especially after high-velocity mechanisms [4)].



1.- Fracture of the right transverse process of C2 involving the transverse foramen.

2.- Similar fracture passing through right transverse foramen of C3.

Vertebral artery angiography should be considered when patients with transverse process fractures extending into the transverse foramen develop signs and symptoms of vertebrobasilar disease [5)].

A case report demonstrates the severity of injury after minor trauma in the context of ankylosing spondylitis, the capacity for full recovery in oesophageal perforations in spinal trauma, and that clinical suspicion of such injuries allows early diagnosis, treatment and reduced complications [6)].

Case series

The Ronald Reagan UCLA Medical Center patient database was queried (years 2005-2016) using International Classification of Diseases, Ninth Revision, code 805: fracture of the vertebral column without mention of spinal cord injury.

A total of 129 patients with isolated transverse process fractures (ITPFs) were identified. Mean age was 38.1 years (range 15-92 years). Women were more likely to present with abdominal pain and associated kidney injury (P = 0.018 and P = 0.012, respectively). Motor vehicle accident (MVA) was the most common mechanism of injury (n = 81, 62.8%) and was associated with thoracic (P = 0.032) and lower extremity pain/injury (P = 0.005). Back pain was the most common presenting symptom (n = 71, 64.6%) and was associated with intraabdominal and lower extremity injuries (P = 0.032 and P = 0.016, respectively). Chest and neck pain were associated with vascular injuries (P < 0.001 and P = 0.001, respectively). Spine consult (neurosurgery or orthopedic surgery) was frequent (n = 94, 72.9%) and was more common after MVA versus fall (P = 0.018).

Several factors were identified as significant markers of associated injuries, including female sex, MVA, and presenting symptoms. Neck and chest pain were significantly associated with vascular injuries. Clinicians should maintain high indices of suspicion for associated injuries in patients with ITPFs, especially after high-velocity mechanisms [7)].

---

21 patients (2.4%) had 25 isolated TPFs of the subaxial cervical spine. The seventh vertebra was involved predominantly (76%). The initial treatment regimen was unrestricted movement in all patients. No associated adverse events were observed. A follow-up of 13 to 39 months was available in 14 patients. Follow-up showed a stable and intact subaxial cervical spine in all patients' radiographs, a patient satisfaction of 9.3 (SD 1.48), a Cybex measured range of motion in the sagittal plane of 109 degrees (SD 12.5, 95-129), the frontal plane of 70 (SD 17.8, 37-100) and the transverse plane of 144 (SD 12.5, 116-164), and a mean neck disability index score of 3.93 (SD 8.24).

The incidence of isolated TPFs of the subaxial cervical spine was 2.4%. Unrestricted movement resulted in satisfying functional, anatomic, and neurologic outcomes without associated adverse events. This study confirms that isolated TPFs of the subaxial cervical spine can be considered as clinically insignificant and do not require treatment [8)].

Patients for a retrospective, institutional review board-approved study were identified by reviewing the daily neurosurgical census from July 2004 to February 2007. Data were collected by chart review on all patients with TPF-grouped into isolated fractures (iTPF) and fractures with other associated spinal injuries (aTPF). Other parameters evaluated included fracture location, other spinal injuries, nonspinal injuries, mechanical stability, neurologic findings, pain, and treatment (surgical stabilization or decompression or bracing or both).

Eighty-four patients with one or more TPF were identified-47 with iTPF and 37 with aTPF. All iTPF and aTPF patients were found to be neurologically intact. No patients with iTPF required surgery or bracing for spinal stability, but 4 aTPF needed surgery and 18 aTPF required bracing with a total of 22 requiring neurosurgical intervention (p < 0.0001). However, none of these patients received treatment for the TPF. Twenty-five patients had associated abdominal injuries (16 of 46 iTPF, 9 of 37 aTPF, p = 0.3335).

iTPF are not associated with neurologic deficit or structural instability requiring spine service intervention. Therefore, conservative management without neurosurgical or orthopedic consultation is appropriate. When TPF are identified, diligence in searching for other spinal injuries or abdominal injuries should be exercised, as these associated injuries occur frequently [9)].

In a retrospective study of 216 patients with cervical fractures evaluated by plain films and computed tomography, Woodring et al., found that transverse process fractures were common. Transverse process fractures were present in 24% of patients with cervical fractures and accounted for 13.2% of all cervical fractures. Cervical radiculopathy and brachial plexus palsy were present in 10% of patients with transverse process fractures. In 78% of transverse process fractures, CT scanning showed that the fracture extended into the transverse foramen. Vertebral artery angiography, performed in eight patients with fractures involving the transverse foramen, showed dissection or occlusion of the vertebral artery in seven (88%) instances. Two of these seven patients had clinical evidence of vertebral-basilar artery stroke. Vertebral angiography should be considered when patients with transverse process fractures extending into the transverse foramen develop signs and symptoms of vertebrobasilar disease [10].

A 66 year old man fell backwards from the first rung of a ladder sustaining a cervical transverse process fracture of C6 vertebral body and a new diagnosis of ankylosing spondylitis. He was taken for surgical fixation, however his oesophagus was discovered entrapped within the fracture at the time of surgery. Despite the severity of the injury, with surgical reduction, fixation and oesophageal exclusion this patient made a full recovery.

This case demonstrates the severity of injury after minor trauma in the context of ankylosing spondylitis, the capacity for full recovery in oesophageal perforations in spinal trauma, and that clinical suspicion of such injuries allows early diagnosis, treatment and reduced complications [11].

A 40-year-old building and construction male worker who slipped and fell on an iron rod that resulted in penetrating wound on the right side of the anterior neck a week prior to presenting at our facility. He pulled out the iron rod immediately. Computer tomography angiography (CTA) done revealed C2-C4 transverse process fractures on the right side and a fracture at the right lamina of C3 and right common carotid artery dissection with stenosis. He was successfully treated with stenting via endovascular approach.

Richard et al., adopted the view that patient should never pull out objects that result in Penetrating neck injuries (PNI) because of complex neurovascular architecture of the neck. The mortality rate of the patient will have doubled if the iron rode penetrated the common carotid artery. The gold standard treatment option for carotid artery dissection and stenosis is endovascular approaches [12].

References

[1] Green NE, Swiontkowski MF. Skeletal Trauma in Children: Expert Consult - Print and Online, 4e. Saunders. ISBN:1416049002.

[2], [9] Bradley LH, Paullus WC, Howe J, Litofsky NS. Isolated transverse process fractures: spine service management not needed. J Trauma. 2008 Oct;65(4):832-6; discussion 836. doi: 10.1097/TA.0b013e318184d30e. PubMed PMID: 18849799.

[3], [8]

Schotanus M, van Middendorp JJ, Hosman AJ. Isolated transverse process fractures of the subaxial cervical spine: a clinically insignificant injury or not?: a prospective, longitudinal analysis in a consecutive high-energy blunt trauma population. Spine (Phila Pa 1976). 2010 Sep 1;35(19):E965-70. doi: 10.1097/BRS.0b013e3181c9464e. PubMed PMID: 20479701.
4) 7)
,
Bui TT, Nagasawa DT, Lagman C, Jacky Chen CH, Chung LK, Voth BL, Beckett JS, Tucker AM, Niu T, Gaonkar B, Yang I, Macyszyn L. Isolated Transverse Process Fractures and Markers of Associated Injuries: The Experience at University of California, Los Angeles. World Neurosurg. 2017 Aug;104:82-88. doi: 10.1016/j.wneu.2017.04.137. Epub 2017 Apr 28. PubMed PMID: 28461275.
5) 10)
,
Woodring JH, Lee C, Duncan V. Transverse process fractures of the cervical vertebrae: are they insignificant? J Trauma. 1993 Jun;34(6):797-802. PubMed PMID: 8315673.
6) 11)
,
Vonhoff CR, Scandrett K, Al-Khawaja D. Minor trauma in ankylosing spondylitis causing combined cervical spine fracture and oesophageal injury. World Neurosurg. 2018 Jul 30. pii: S1878-8750(18)31658-9. doi: 10.1016/j.wneu.2018.07.180. [Epub ahead of print] PubMed PMID: 30071342.
12)
Richard SA, Zhang CW, Wu C, Ting W, Xiaodong X. Traumatic Penetrating Neck Injury with Right Common Carotid Artery Dissection and Stenosis Effectively Managed with Stenting: A Case Report and Review of the Literature. Case Rep Vasc Med. 2018 Jun 10;2018:4602743. doi: 10.1155/2018/4602743. eCollection 2018. PubMed PMID: 29984035; PubMed Central PMCID: PMC6015681.