

Ipsilateral multiple costovertebral joint dislocation: Case report and review of literature

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Abstract

Isolated costovertebral joint dislocation without vertebral body fracture is a rare occurrence. We present a case report of a 26 year old male who sustained road traffic accident and sustained multiple ipsilateral costovertebral joint dislocations (D8-D12) without vertebral body fractures. The patient had concomitant ipsilateral (right side) clavicle fracture with right sided hemopneumothorax, lung contusion and pleural effusion. Intercostal drain was put which was removed at 7 days. Patient was managed non operatively on Taylor's brace for management of costovertebral dislocation. The patient demonstrated painless and complete movements at the spine at three weeks follow up. He resumed his professional activity including vocational sports activity at 2 months follow up and was doing well at last follow up.

Keywords: Costovertebral, Hemopneumothorax.

Introduction

Injuries involving costovertebral joints are a rare occurrence. Dislocation of costovertebral joint is a strong indicator of thoracic spine injury.¹ Costovertebral dislocation is usually associated with vertebral body fractures but can be easily missed in isolation on routine radiographs. We present a case report of a 26 year old male who sustained road traffic accident and sustained multiple ipsilateral costovertebral joint dislocations (D8-D12) without vertebral body fractures.

Case Report

A 26 year old male while driving a motor bike sustained injury when he hit a stationary four wheeler. Following the injury patient had a temporary loss of consciousness and was brought to the emergency department of our hospital. Emergency resuscitation and primary survey was followed by secondary survey which revealed tenderness in right clavicular region along with tenderness in right paraspinal region over lower dorsal region. On examination in the prone position, patient had a scoliotic curvature with convexity towards right side. Hemodynamically patient was stable with respiratory rate of 21/minute, BP of 112/78mmHg, afebrile with normal bowel sounds. Anteroposterior chest radiograph revealed fracture of right clavicle with suspicion of multiple rib dislocations indicated by asymmetry of costovertebral articulations and widening

of rib interspace involving right lower ribs along with hemopneumothorax.

Non contrast CT scan of chest and spine was done which revealed right sided hemopneumothorax, lung contusions with laceration involving right middle and lower lobes² (Fig. 2), fracture of middle third of right clavicle, fracture of 3rd and 7th right rib at costovertebral articulations, undisplaced fracture of posterior aspect of 5th, 6th and 7th right ribs, anterior dislocation of 8th to 12th right ribs at costocentral and costotransverse articulations, fracture of right transverse process involving D4 to D8 vertebrae and mild dorsal dextroscoliosis (Fig. 3 &4).

MRI spine revealed edema in interspinous ligaments and in paraspinal muscles involving dorsolumbar spine with no evidence of spinal cord injury. Intercostal drainage tube was inserted for management of hemopneumothorax which was removed at 7 days. Patient was mobilized on Taylor's brace after removal of intercostals drainage. Patient was discharged 10 days following trauma. At the time of discharge patient was asymptomatic with normal vital signs including respiratory rate. Patient was followed up at three weeks, six weeks, three months and six months following discharge. Taylor's brace was removed at three weeks from the date of discharge and patient regained his professional activity (sedentary office work) at three weeks. He resumed his vocational sports activities at two months following discharge and is doing well at the last follow up. Forward flexion,

sideways flexion, extension and rotations at the spine were full and painless at the time of removal of Taylor’s brace (Fig. 5). Imaging at three weeks follow up revealed resolution of hemopneumothorax along with dislocation at multiple costovertebral joints (right side) (Fig. 6) Patient was doing well and continuing all his activities at last follow up done at 6 months.



Fig. 1: Chest X-ray (AP view) demonstrating right clavicle fracture, asymmetry of costovertebral articulations and right sided pneumothorax

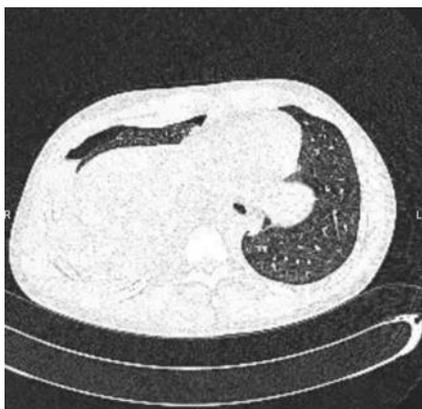


Fig. 2: Axial section demonstrating pneumothorax

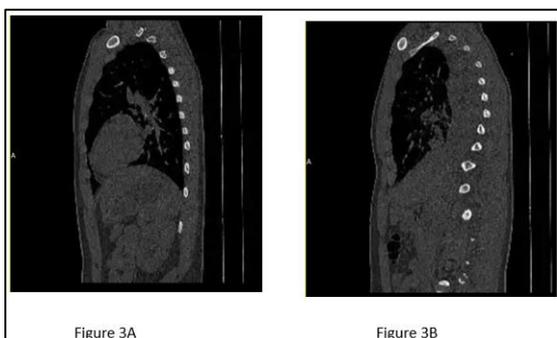


Fig. 3: Parasagittal section of left(A) and right(B) side comparing the normal anatomy and dislocation of multiple costovertebral joints

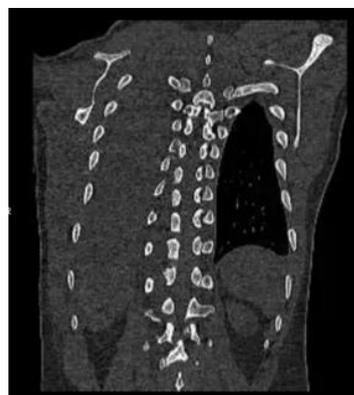


Fig. 4: Coronal section revealing multiple costovertebral dislocation



Fig. 5: Clinical Photographs demonstrating complete movements at spine at three weeks follow up



Fig. 6: Follow up X ray at three weeks showing resolution of pneumothorax

Discussion

Although costovertebral dislocation is a very rare entity and can be easily missed on routine radiographs, yet it is imperative to screen this condition in a traumatic situation presenting with chest pain as its occurrence is strongly associated with thoracic spine injury.¹ O'Brien presented a case series of five patients of costovertebral dislocation, all of which were associated with thoracic spine injury.¹ The severity of the injury can be judged from the fact that 2/5 patients (40%) expired during hospitalization. Four out of five patients reported by O'Brien et al had paraplegia while the fifth had no

neurological involvement. On the other hand our case did not have any vertebral fractures or neurological deficits.

Dislocation of first costovertebral joint is a well described entity. There are numerous reports on costovertebral joint dislocation in cases of neurofibromatosis and scoliosis patients.²⁻⁵ Kishen et al⁶ reported post traumatic thoracic scoliosis with rib head dislocation in a case report however in this case the dislocation and trauma were chronologically separated by 32 years.

Costovertebral joint consists of costocentral and costotransverse joints both are diarthrodial in nature. For dislocation take place, both joints have to be disrupted which requires a considerable amount of energy. Both the joints impart contact point to the rib cage and its disruption can cause decreased stability of the rib joint which is validated by various studies. From anatomic perspective, bilateral costovertebral joints, its associated ligaments and adjacent rib is considered as a functional spine unit. The term “rib cage” includes thoracic vertebra, ribs, sternum and associated ligaments.

El Khoury et al,⁷ in a review article on trauma to the thoracic spine mentioned that biomechanically rib cage is a part of structure of spine in providing strength during trauma. They reported costovertebral disruption could decrease the ability of the thoracic spine to resist physiologic pressure and loads. Oda et al,⁸ did biomechanical study of thoracic spine on eight canine rib cage-thoracic spine complexes. They performed resection of bilateral seventh costovertebral joints and stability of thoracic spine on loading tests. The observation was increase in range of motion at thoracic spine after resection hence concluded that costovertebral joint is important in providing stability to the thoracic spine.

Berg et al,⁹ advocated for modification of Dennis three column theory to four column theory with the fourth column provided by sterna – rib complex. Watkins et al,¹⁰ did multidirectional flexibility tests on ten human cadavers. They reported that sternum and rib cage provides 31-40% stability across range of motion of the thoracic spine. The stabilizing effect of rib cage is greater in lateral bending and axial rotation than in flexion-extension.⁸ Punjabi and White¹¹ also advocated stabilizing role of costovertebral joints in their experimental studies.

As above mentioned studies have established the sanctity of costovertebral joint in stabilization of rib cage it becomes essential to screen for these injury in any patient presenting with chest trauma. However the rarity of its occurrence usually leads this entity to be

neglected and often missed. O'Brien¹ reported five consecutive cases of costovertebral joint injuries that were retrospectively analyzed by two musculoskeletal fellowship trained radiologist. Of the 8 radiographs (chest and abdomen) done on 5 patients, the injury was reported in 3 films (38%) while the injury was documented in 4/5 CT scans (80%). When both X rays and CT scans were retrospectively analysed, the radiologists were able to report the injury in 100% cases (5/5). The X ray features suggestive of costovertebral injuries are asymmetric rib interspace narrowing above and widening below the level of injury while the CT feature is naked transverse process

Despite establishing the importance of costovertebral joints, the authors went for a non operative management and have achieved satisfactory results as the patient resumed his daily activities including vocational sports activity at two months follow up.

The above mentioned cadaveric and animal studies have performed bilateral costovertebral resection as opposed to unilateral costovertebral dislocations in our case. Also surgical destabilization of spinal motion segment is often mandatory to correct spinal deformity and patients do well after deformity correction. There is no study in literature which addresses the instability caused by unilateral disruption of costovertebral joints. Besides, the percentage of individual contribution of facet joint, costovertebral joints, and ligament is largely unknown. Chapman et al¹² developed and validated a radiographic rib fracture scoring system based on variable anatomic factors such as location of fracture, number of ribs involved, displacement of fractures, whether the fractures are unilateral or bilateral. Higher rib score is associated with pneumonia, respiratory failure and tracheostomy. Even such an exhaustive scoring system does not account for any costovertebral dislocations.

The costovertebral injuries including dislocations usually occur in concurrence with thoracic spine injury however as per the authors this is the first reported case of multiple ipsilateral costovertebral dislocation (D8-D12) without spinal injury, vertebral body fracture or neurological deterioration.

The authors wish to create awareness amongst readers regarding the pattern of injury and reinforce the importance of clinical examination along with radiological investigations including CT scan for diagnosing costovertebral injuries. We hope in future a more refined rib score for trauma scenario is defined which also incorporates costovertebral dislocations so that its relevance is not lost in training of young surgeons due to its rarity.

Source of Funding

None.

Conflict of Interest

None.

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