Original Article

Thoracic Complications in Patients with Traumatic Fractures in Thoracic Spine Needing Surgical Fusion

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Abstract

Background: Thoracic spine fractures and their operation have many undesirable problems and complications including pneumothorax, hemothorax, chylothorax, trachea and esophagus injuries, mediastinum hematoma, rib and sternum fractures and injuries of major vessels. This study surveys the incidence of the above mentioned complications.

Methods: 50 hospitalized patients in the trauma ward of Tabriz Imam Hospital from 2005 to 2010 were studied retrospectively. These patients had Thoracic spine fractures needing stabilization and fusion.

Results: 78% of the patients were male and 22% female with the mean age of 34. The most common cause of trauma was motor vehicle accidents (56%). Rib fracture was reported in 18% of the patients, pneumothorax in 10 % and lung contusion in 12%. No cases of chylothorax, major vessels and trachea and esophagus injuries or complications related to the operation were reported.

Conclusion: Patients with thoracic spine fractures considering the extended injuries associated with primary trauma and complications related to operation in thoracic region need the cooperation of diverse specialists.


Keywords: Spine Fractures ● Trauma ● Thoracic Complications

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Introduction

This article studies thoracic spine fractures, preoperative, intraoperative and postoperative complication in patients with thoracic spine fractures undergone posterior spinal instrumentation. The thoracic spine consists of 12 vertebral bodies aligned with a prominent kyphotic curvature. Rib cage along with the muscles in the back protect this part of the spine and restrict the motion of the thoracic spinal column, especially extension. The rib cage also adds stiffness to the spine, and experimental data have demonstrated a four fold increase in the compression tolerance of the spinal column with an intact rib cage. The rigidity of the midportion of the thoracic spine poses higher risk of fracture to midthoracic levels. The upper thoracic and T10 levels are the most infrequently injured levels of the thoracic spine because they are protected by the adjacent flexible cervical and thoracolumbar junctions. Multiplicity of the complications due to accompanying trauma that requires multidisciplinary approach, morbidity and mortality resulted from complications and the effect of complications on the outcome are of great importance in appropriate management of these patients.

Methods

56 patients with thoracic spine fractures were admitted in Tabriz Imam Hospital within 5 years from 2004 to 2009 and underwent operation due to instability. 6 patients were excluded from the survey because their files were unavailable or incomplete. The remaining 50 patients were studied retrospectively. Only patients with thoracic spine fractures needing operation for stabilization were included. From these 50 patients, 39 (78%) were male and 11 (22%) were female. The mean age of patients was 34 and the mean hospitalization days were 13 days. The cause of trauma was motor vehicle accidents in 28 patients, fall in 20 patients and 2 people had crush injuries. 74 percent of the cases did not have head trauma, 24% had a mild head trauma and 2% had moderate head trauma. 2 cases had space occupying lesions in head which in one case it was an epidural hematoma and in the second one it was brain contusion. There were limb and pelvic traumas in 10 cases and severe abdomen trauma in one case that did not require surgical operation. Considering the neurological deficits, 36 patients (72%) had complete lesions under the injury level and 13 patients had incomplete injuries. One vertebral body fracture had occurred in T1, two in T4, 2 in T5, 2 in T9 and 3 in T10. There were 2 fractures in T11 and 38 in T12. In 18 cases (36%), there were multiple fractures from which 12 cases were in another vertebra, 3 cases in 2 vertebrae, 2 cases in 3 vertebrae and in one case there was a 5 vertebral body fracture. Fracture types reported were as following: 16 cases of compression fracture, 6 cases of fracture–dislocation and 28 cases of burst fractures. Spinal cord injury was seen in 32 cases (64%) in MRI before surgery or during operation. In 42 cases pedicular screws or sublaminar hooks and in 8 cases Harrington rods were used. In any dubious cases, further investigation such as thorax, abdomen and pelvic CT scans with oral and IV contrasts were obtained. Patients were operated with posterior fixation method preferably by pedicle screw and sublaminar hooks and if unavailable, Harrington rods were used. Posterior short segment fixation was the method of choice and fusion was done using autograft or Nova Bone after instrumentation.

Results

Within 5 years, 56 cases of unstable thoracic spine fracture were operated in this center, from which 50 patients were studied because 6 cases had incomplete medical records. From these 50 patients, 39 (78%) were male and 11 (22%) were female. The mean age of patients was 34 and the mean hospitalization days were 13 days. The cause of trauma was motor vehicle accidents in 28 patients, fall in 20 patients and 2 people had crush injuries in 2 people. The causes of trauma in women were accident in 7 cases (64%) and fall in 4 cases (36%). The trauma causes in men were accident in 28 cases (72%), fall (13%) and crush injuries (5%). 74 percent of the cases did not have head trauma, 24% had a mild head trauma and 2% had moderate head trauma. 2 cases had space occupying lesions in head which in one case it was an epidural hematoma and in the second one it was brain contusion. There were limb and pelvic traumas in 10 cases and severe abdomen trauma in one case that did not require surgical operation. Considering the neurological deficits, 36 patients (72%) had complete lesions under the injury level and 13 patients had incomplete injuries. One vertebral body fracture had occurred in T1, two in T4, 2 in T5, 2 in T9 and 3 in T10. There were 2 fractures in T11 and 38 in T12. In 18 cases (36%), there were multiple fractures from which 12 cases were in another vertebra, 3 cases in 2 vertebrae, 2 cases in 3 vertebrae and in one case there was a 5 vertebral body fracture. Fracture types reported were as following: 16 cases of compression fracture, 6 cases of fracture–dislocation and 28 cases of burst fractures. Spinal cord injury was seen in 32 cases (64%) in MRI before surgery or during operation. In 42 cases pedicular screws or sublaminar hooks and in 8 cases Harrington rods were used. In the term of
general complications, in one case lower extremity DVT was seen and pulmonary infection was reported in 2 cases. One patient needed intubation after surgery who was extubated later. Considering the thoracic complications, 9 cases (18%) had rib fractures in CXR reports from which one case had multiple and bilateral fractures. In 5 cases (10%) pneumothorax was reported from which 4 cases were unilateral and half of these cases needed chest tube. One case had a bilateral pneumothorax needing unilateral chest tube. Hemothorax was reported in 14 cases (28%) from which 7 cases were unilateral and only one of them needed chest tube. In 7 cases, there were bilateral Hemothorax from which 3 cases did not need chest tubes. Combination of pneumothorax and hemothorax also was seen.

Fig 1- Etiology of trauma among patients

Table 1 - Summary of thoracic complications in 50 patients

<table>
<thead>
<tr>
<th>Thoracic Complication</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trachea injury</td>
<td>0</td>
</tr>
<tr>
<td>Esophagus injury</td>
<td>0</td>
</tr>
<tr>
<td>Pneumothorax</td>
<td></td>
</tr>
<tr>
<td>Unilateral</td>
<td>1</td>
</tr>
<tr>
<td>Bilateral</td>
<td>4</td>
</tr>
<tr>
<td>Hemothorax</td>
<td></td>
</tr>
<tr>
<td>Unilateral</td>
<td>7</td>
</tr>
<tr>
<td>Bilateral</td>
<td>7</td>
</tr>
<tr>
<td>Lung contusion</td>
<td></td>
</tr>
<tr>
<td>Unilateral</td>
<td>5</td>
</tr>
<tr>
<td>Bilateral</td>
<td>1</td>
</tr>
<tr>
<td>Hematoma of mediastinum</td>
<td>0</td>
</tr>
<tr>
<td>Rib fracture</td>
<td>9</td>
</tr>
<tr>
<td>Injury of great vessels</td>
<td>0</td>
</tr>
</tbody>
</table>

There was a case of bilateral pneumothorax with right sided hemothorax and a chest tube in right side. There was also another case with bilateral hemothorax and right sided pneumothorax in which bilateral chest tube was used. Lung contusion was reported in 6 cases (12%) from which one case was bilateral. Lung contusion was associated with rib fractures in 50%, pneumothorax in 33% and Hemothorax in 50% of cases. In one case of lung contusion there was no association with rib fracture, pneumothorax or hemothorax. There were no cases of chylothorax, major vessels or trachea and esophagus injuries. After surgery, there were no reported cases with neurological state deterioration, insertion of screw into the spinal canal, CSF leak or operation-related pneumothorax or hemothorax. Infection of operation field was seen in one patient who was treated with antibiotics, irrigation and debridement. In one case cotton gauze was left in operation field.

Discussion

Among our patients, 78% were male and 22% female. Like the similar studies, the most common cause of trauma leading to spinal fractures was motor vehicle accidents and fall and crush injuries were next common causes. Head injuries and extremity fractures commonly accompany vertebral fractures. In most of our cases, there were no significant head traumas. In cases of falling, this was probably because of using limbs to protect head during trauma. 2 cases had intracranial mass lesion from which none needed surgical intervention. There were limb and pelvis trauma in 20% of the cases and significant abdomen injury occurred only in one case that did not need operation. The low number of the abdominal injuries may be related to the fact that the main trauma had affected thoracic region whereas it is more likely to have abdominal injuries in lumbar spine fractures. Neurological injury may be due to main trauma or surgery. Neurological deterioration during or after surgery is a serious complication that accompanies approximately 1% of operations for treatment of spine injury. Neurological signs and symptoms were seen in 72% of our cases. Injury was complete in 46% of patients and others had incomplete cord injury. The four major types of injuries are compression, burst, seat – belt type, and fracture dislocation. In our study, 56% of the thoracic spine fractures were burst type, 32% compression type and 12% were fracture – dislocation. No case of seat – belt type spinal injury was reported. As Magerl and colleagues showed, upper thoracic and T10
levels are the most infrequently injured levels of thoracic spine because they are protected by the adjacent flexible cervical and thoracolumbar junctions. In their article, T12 fractures were the most common fractured vertebra (38% of all thoracic spine fractures)\(^3\). In our study, the most common fractured vertebra was T12 (76% of cases) and upper thoracic levels (T1 – T6) constitute 10 percent of the fractures. Multiple fractures in vertebral bodies were reported in 36% of the patients (18 persons) from which 2/3 were in two vertebrae, and in the rest of the cases fractures were present in 3, 4 or 5 vertebrae. Majority of the patients were operated using pedicular screws or sublaminar hooks (84%) and others by Harrington rods. Certain complications, including deep venous thrombosis and pulmonary embolism may be seen in all inpatients. DVT was only reported in one case which is an acceptable result and is due to the routine usage of pneumatic trousers, anticoagulant prophylaxis, good physiotherapy and encouraging patients to move their lower extremities and doing surgery as soon as possible. Infection can occur after spinal surgery, especially after a long surgical procedure for a complicated instrumentation placement. Infection of the operation field occurred only in one patient. Also, a gauze was left in another patient. In thoracic spine fractures many concomitant thoracic complication have been reported. One of them is fracture of sternum that occurred in 10 patients in a Series of 721 patients with vertebral fractures\(^4\). We had no case of sternum fractures. Rare cases of chylothorax have been reported and as expected, were not seen in our cases\(^5,6\). Respiratory problems are also seen following thoracic spine fractures. Blunt trauma can cause rib fracture that it makes respiration difficult due to its pain. Lung contusion is another consequent of blunt trauma of the chest. Hemothorax can be seen as a surgical complication or following trauma itself and cause respiratory problems. In 18% of our case, rib fractures were reported in CXR from which one case had multiple and bilateral fractures. Pneumothorax was reported in 10% of the cases from which 80% were unilateral and 20% were bilateral. 60 percent of pneumothorax cases needed chest tube. Hemothorax was seen in 28% of the patients from which 50% were unilateral and 50% bilateral. 35% of these cases needed chest tube. 2 cases had simultaneous hemothorax and pneumothorax. Lung contusion was reported in 12% of the cases (6 patients) and it was bilateral in one case. Lung contusion was mostly seen concomitant to rib fracture and hemothorax and in 33% it was associated with pneumothorax. Vascular injury is an uncommon, but not rare complication of spinal injury and surgery. For instance, there are reports of thoracic aorta aneurism following traspedicular stabilization of thoracic vertebrae (T5 – T7) and distal descending aorta aneurism following T11 fracture\(^7,8\). Some cases of mediastinal hematoma have been reported following spinal fractures which have been diagnosed by radiography or CT scan. There were no cases of major vessels injury in our cases. There are also reports about esophagus entrapment, obstruction and perforation following thoracic vertebral fracture or pedicle screw implementation\(^10,11,12\). Transpedicular fixation is also associated with numerous complications such as GI problems, thoracic injury and septic complications, as well as incorrect implementation of the screws. We did not see any case of esophagus injury. Considering the thoracic injuries of the surgery, there were no reported cases of complication such as postoperative hemothorax and pneumothorax or major vessels injury due to screw implantation.

**Conclusion**

Patients admitted to the hospital with thoracic spine fracture are a special entity which needs cooperation of specialists, considering the complications associated with the primary trauma like rib fracture, hemothorax, pneumothorax, lung contusion, great vessels and trachea and esophagus injury, and also surgery associated injuries that involve thoracic region such as pneumothorax and hemothorax and vessel injury. If these patients are admitted in trauma, general surgery or neurosurgery wards, they should be examined for the associated injuries. Significant neurological deficits such as paraplegia, sphincter dysfunction or pain and sensory dysfunction below the level of injury are seen in most patients. Therefore, high clinical suspicion is required. Among these complications cardiopulmonary complications, if present, need special attention because they have high morbidity and mortality.
References