INDEX THORACIC TRAUMA

Clinical outcomes of multiple rib fractures: does age matter?

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Purpose
To evaluate the clinical outcomes of multiple rib fracture due to blunt trauma in young patients, a 3-year retrospective study was conducted. Patients with >= 3 rib fractures were divided into two groups (group I: <45 years old and group II: >= 45 years old). Mortality, hospital stay, ventilatory support, chest tubes insertion and associated injuries were studied.

Results
Of the 902 patients admitted with blunt chest trauma, 240 (27 %) met the inclusion criteria and 72.5 % patients were < 45 years old. The most common causes of injury were motor vehicle crash (59 %) and fall (29 %). The Injury Severity Score (ISS) was higher in group I (16 +/- 9 vs. 13 +/- 6; p = 0.04). Hospital mortality was higher in group II (6 vs. 2 %; p = 0.18). Pneumothorax, haemothorax and ventilatory support were comparable. Patients in group II were more likely to undergo chest tubes insertion (26 vs. 14 %; p = 0.04), while group I had a significantly higher incidence of associated abdominal injuries (25 vs. 12 %; p = 0.03).

Conclusion
Old age presenting with rib fractures is associated with higher mortality in comparison to young age; however, this difference becomes statistically insignificant in the presence of multiple rib fracture.

Keywords
multiple rib fracture - blunt chest trauma - age - elderly trauma patients - solid-organ injury - adverse outcomes - mortality - morbidity – risk

Management of blunt tracheobronchial trauma in the pediatric age group.

Ballouhey Q, Fesseau R, Benouaich V, Lagarde S, Breinig S, Leobon B, Galinier P.

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Tracheobronchial rupture (TBR) due to blunt chest trauma is a rare but life-threatening injury in the pediatric age group. The aim of this study was to propose a treatment strategy including bronchoscopy, surgery and extracorporeal membrane oxygenation (ECMO) to optimize the emergency management of these patients.
We reviewed a series of 27 patients with post-traumatic TBR treated since 1996 in our pediatric trauma center.
Seven cases had persistent and large volume air leaks. Flexible bronchoscopy was performed in cases of persistent or large volume air leaks. It permitted accurate visualization of the rupture and its extent. It allowed for a clear-cut positioning of the endotracheal tube. Five were managed operatively. Four cases were considered to be life-threatening because of the combination of severe respiratory distress with hemodynamic instability. One of them had severe tracheal laceration and died. Another one had bilateral bronchi disconnection. Based on clinical and endoscopic findings, surgical repair was performed using extracorporeal membrane oxygenation as a ventilatory support. It provided quick relief from the injury, which was previously expected to result in a fatal issue.
Prompt diagnosis and accurate management of surviving patients admitted to emergency rooms are necessary. Bronchoscopy remains a critical diagnosis step. Surgery is warranted for large tracheobronchial tears and ECMO could be beneficial as supportive therapy for selected cases.

Keywords
tracheobronchial trauma - children - bronchoscopy - ecmo - extracorporeal membrane-oxygenation - respiratory-distress-syndrome - tracheal rupture - chest trauma - life-support - transection - children - injuries - bronchus - surgery

Age and traumatic chest injury: a 3-year observational study.

El-Menyar A, Latifi R, AbdulRahman H, Zarour A, Tuma M, Parchani A, Peralta R, Al Thani H.

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A quarter of trauma-related deaths are attributable to traumatic chest injury (TCI).
To outline the pattern and outcome of TCI in a rapidly developing country among different age groups.
We conducted a retrospective observational study for patients who sustained TCI and admitted between January 2008 and December 2010 to the Level I trauma center at Hamad General Hospital in Qatar. Patients were classified and analyzed in four age groups (group 1 a parts per thousand currency sign18, group 2 between 19-44, group 3 45-59, and group 4 > 60 years). Multivariate regression analysis was performed for predictors of mortality.
Of 5,118 cases admitted to the Section of Trauma Surgery, 1,355 (26.5 %) had TCI (12, 67, 16, and 5 % in groups 1-4, respectively), which was due to blunt trauma in 96 % of cases. The overall mean age was 33 +/- A 15 years and males comprised 94 % of cases. Children (a parts per thousand currency sign18 years of age) had more traffic-related injury, intubation, high Injury Severity Score (ISS) (19 +/- A 12), and associated head and liver injuries in comparison to the other groups. The overall mortality rate was 13 % (24, 11, 12, and 16 % in groups 1-4, respectively). The death rate was higher in pedestrians, followed by motor vehicle crashes (MVCs) and fall-related injuries (24 vs. 13 vs. 7 %, respectively, p = 0.001). The highest mortality occurred within the first day (n = 115, 65 %). In comparison to old age, children were more likely to die early (on the first day) and the adult group died mostly within the first week of hospitalization. Independent predictors for mortality included associated head injury [odds ratio (OR) 2.3, 95 % confidence interval (CI) 1.48-3.62), ISS (OR 1.11, 95 % CI 1.09-1.13), and age (OR 0.37, 95 % CI 0.22-0.62).
TCI is an alarming problem in Qatar, with a bimodal mortality curve. The highest mortality peak occurred in children, followed by old age. However, young males are the most exposed population. Regulatory efforts and strict enforcement of traffic laws would likely reduce morbidity and mortality.

Keywords
Trauma - chest injury - Qatar - age - mortality - road traffic crashes - blunt - country - pattern - trends

Occult hemopneumothorax following chest trauma does not need a chest tube.

Mahmood I, Tawfeek Z, Khoschnau S, Nabir S, Almadani A, Al Thani H, Maull K, Latifi R.

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Background
The increasing use of thoracic computed tomography (CT) in trauma patients has led to the recognition of intrapleural blood and air that are not initially evident on admission plain chest X-ray, defining the presence of occult hemopneumothorax. The clinical significance of occult hemopneumothorax, specifically the role of the tube thoracostomy, is not clearly defined.

Objective
To identify those patients with occult hemopneumothorax who can be safely managed without chest tube insertion.

Design
Prospective observational study.

Methods
During the recent 24 month period ending July 2010, comprehensive data on trauma patients with occult hemopneumothorax were recorded to determine whether tube thoracostomy was needed and, if not, to define the consequences of nondrainage. Pneumothorax and hemothorax were quantified by computed tomography (CT) measurement. Data included demographics, injury mechanism and severity, chest injuries, need for mechanical ventilation, indications for tube thoracostomy, hospital length of stay, complications and outcome.

Results
There were 73 patients with hemopenumothorax identified on CT scan in our trauma registry. Tube thoracostomy was successfully avoided in 60 patients (83 %). Indications for chest tube placement in 13 (17 %) of patients included X-ray evidence of hemothorax progression (10), respiratory compromise with oxygen desaturation (2). Mechanical ventilation was required in 19 patients, five of them required chest tube insertion, and six developed ventilator associated pneumonia, while there were no cases of empyema. There was one death due to severe head injury.

Conclusions
Occult hemopneumothorax can be successfully managed without tube thoracostomy in most cases. Patients with a high ISS score, need for mechanical ventilation, and CT-detected blood collection measuring[1.5 cm increased the likelihood of need for tube thoracostomy. The size of the pneumothorax did not appear to be significant in determining the need for tube thoracostomy.

Keywords

occult hemothorax - occult pneumothorax - chest trauma - chest tube - computed-tomography - pleural effusions - management - hemothorax – thoracostomy

Severe trauma of the chest wall: surgical rib stabilisation versus non-operative treatment.

Muhm M, Harter J, Weiss C, Winkler H.

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Serial rib fractures and flail chest injury can be treated by positive-pressure ventilation. Operative techniques reduce intensive care unit (ICU) stay, overall costs, mortality and morbidity, as well as pain. The aim of this study was to evaluate the benefit of surgical rib stabilisation in comparison to non-operative treatment in patients with severe trauma of the chest wall.
From 2006 to 2011, the data of 44 patients with flail chest and serial rib fractures were collected retrospectively. A surgical group and an intensive care group with only intensive care therapy were formed. Rib and sternal fractures, flail chest, injury severity, thoracic injuries, mechanical ventilation, time in the ICU, overall hospital stay and mortality were evaluated.
No postoperative surgical complications had been observed. The time under mechanical ventilation in the surgical group was 10.6 +/- A 10.2 days, whereas in the non-surgical group, it was 13.7 +/- A 13.7 days. Mechanical ventilation time after surgery was 6.9 +/- A 6.5 days. Time in the ICU for the surgical group was 16.4 +/- A 13.6 days, compared to the non-surgical group with 20.1 +/- A 16.2 days. Postoperative time in the ICU was 11.7 +/- A 10.3 days. The mortality in the surgical group was 10 % and in the non-surgical group it was 17 %.
Operative rib stabilisation with plates is a safe therapy option for severe trauma of the chest wall. Provided that the duration of preoperative mechanical ventilation and time spent in the ICU is minimised due to early operation, our data suggest that the stabilisation of serial rib fractures and flail chest may lead to a reduced time of mechanical ventilation, time in the ICU and mortality.

Keywords
surgical rib stabilisation - flail chest - serial rib fracture - thoracic injury - mechanical ventilation - hospital stay - internal pneumatic stabilization - long-term disability - flail chest - operative stabilization - pulmonary contusion - management - injuries - ventilation - fixation

Recovery after stabilising surgery for 'flail chest'.

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There is a lack of knowledge on respiratory and physical function, mobility and pain following stabilising surgery for 'flail chest'. The purpose of this study was, therefore, to evaluate pain, respiratory function, range of motion and physical function/activity 3 and 6 months after stabilising surgery in patients with 'flail chest' due to trauma.
Twenty-four patients diagnosed with 'flail chest' were, 3 and 6 months after the trauma, measured with regard to remaining pain, lung volume, breathing movements, and range of motion in the rib cage and thoracic spine. Physical function and level of physical activity were also estimated.
Approximately 50 % of the patients had remaining pain after 3 months and 35 % had remaining pain after 6 months. Vital capacity was significantly decreased after 3 and 6 months compared to predicted values: > 83 % after 3 months and > 86 % after 6 months. There were no significant differences between the injured versus non-injured side in breathing movements, nor between the values of the range of motion between the two test occasions. The results of physical function showed mild to moderate disability 3 months after surgery and some or mild disability at 6 months. The patients were active, performing moderate exercise 1-2 h/week or light physical activities more than 4 h/week at 3 and 6 months.
Patients who had undergone stabilising surgery due to 'flail chest' showed decreased range of motion 3 and 6 months after surgery. Despite decreased range of motion and remaining pain, the breathing movements are synchronic.

Keywords
flail chest - range of motion - rib cage - ribs - spirometry - movement measuring instrument - visual analog scale - breathing movements - variability - reliability - validity - rmmi

The role of non-invasive ventilation in blunt chest trauma: systematic review and meta-analysis.

Roberts S, Skinner D, Biccard B, Rodseth R N.

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Purpose
Respiratory support is the mainstay for the management of patients with pulmonary contusion following blunt chest trauma. In patients not requiring immediate intubation and ventilation, the optimal respiratory management strategy is not clear. This systematic review and meta-analysis aimed to determine the efficacy of non-invasive ventilation (NIV), as compared to traditional respiratory support strategies (i.e., high-flow facemask oxygen or pre-emptive intubation and ventilation), in adult patients with blunt chest trauma.

Methods
We conducted a systematic review and meta-analysis of randomized controlled trials (RCTs) comparing NIV to traditional forms of respiratory support (i.e., facemask oxygen or intubation and ventilation) in an adult trauma population. For each eligible trial, we extracted the outcomes of all-cause mortality, length of intensive care unit (ICU) stay, length of hospital stay, and pneumonia.

Results
We identified 643 citations, selected 17 for full-text evaluation, and identified three eligible RCTs. Patients receiving NIV had a non-significant reduction in the risk of death (OR 0.55; 95 % CI 0.18-1.70; I-2 = 0 %), but significant reductions in length of ICU stay (mean difference -2.45 days; 95 % CI -4.27 to -0.63; I-2 = 66 %), length of hospital stay (mean difference -4.60 days; 95 % CI -8.81 to -0.39; I-2 = 85 %), and risk of pneumonia (OR 0.20; 95 % CI 0.09-0.47; I-2 = 0 %).

Conclusion
This meta-analysis suggests that NIV is superior to both high-flow facemask oxygen or pre-emptive intubation and ventilation in patients with blunt chest trauma who have no contraindication to NIV.

Keywords
blunt chest trauma - non-invasive ventilation - thorax injury - artificial ventilation - positive pressure ventilation - positive-pressure ventilation - respiratory-distress syndrome - randomized clinical-trial - independent risk-factors - flail chest - pulmonary contusion - mechanical ventilation - airway pressure - thoracic trauma - blast injury

Surgical stabilization of flail chest: the impact on postoperative pulmonary function.

Said S M, Goussous N, Zielinski M D, Schiller H J, Kim B D.

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Flail chest results in significant morbidity. Controversies continue regarding the optimal management of flail chest. No clear guidelines exist for surgical stabilization. Our aim was to examine the association of bedside spirometry values with operative stabilization of flail chest.
IRB approval was obtained to identify patients with flail chest who underwent surgical stabilization between August 2009 and May 2011. At our institution, all rib fracture patients underwent routine measurement of their forced vital capacity (FVC) using bedside spirometry. Formal pulmonary function tests were also obtained postoperatively and at three months in patients undergoing stabilization. Both the Synthes and Acute Innovations plating systems were utilized. Data is presented as median (range) or (percentage).
Twenty patients (13 male: 65 %) with median age of 60 years (30-83) had a median of four ribs (2-9) in the flail segment. The median Injury Severity Score was 17 (9-41) and the median Trauma and Injury Severity Score was 0.96 (0.04-0.99). Preoperative pneumonia was identified in four patients (20 %) and intubation was required in seven (35 %). Median time from injury to stabilization was four days (1-33). The median number of plates inserted was five (3-11). Postoperative median FVC (1.8 L, range 1.3-4 L) improved significantly as compared to preoperative median value (1 L, range 0.5-2.1 L) ($p = 0.003$). This improvement continued during the follow-up period at three months (0.9 L, range 0.1-3.0) ($p = 0.006$). There were three deaths (15 %), none of which were related to the procedure. Subsequent tracheostomy was required in three patients (15 %). The mean hospital stay and ventilator days after stabilization were nine days and three days, respectively. Mean follow-up was 5.6 +/- A 4.6 months.
Operative stabilization of flail chest improved pulmonary function compared with preoperative results. This improvement was sustained at three months follow-up.

Keywords
flail chest - rib stabilization - pulmonary function - rib fracture - operative stabilization - fixation - management - wall - contusion - injury