

# Open and closed treatment of chest injuries: mortality, hospitalization, trauma indices and physiological data

## Abstract

**Background:** In more than half of cases of chest trauma, patients also have head injuries, abdominal injuries or polytrauma.

**Aim:** The aim of the present study was to compare open and closed treatment for chest injuries according to mortality, hospitalization, trauma indices and physiological data.

**Method:** Three hundred sixty-seven patients (293 males and 74 females) with an Anatomic Injury Scale (AIS) score of 2 or more for thoracic trauma were evaluated. The following aspects were evaluated associations between treatment (open and closed) for chest injury, discharge from hospital, hospitalization and death, Trauma indices Revised Trauma Score (RTS), Injury Severity Score (ISS) and TRISS, Blood pressure, diastolic pressure, respiratory rate and pulse.

**Results:** No significant associations were found between the type of treatment (open or closed procedure) and discharge from hospital, hospitalization or death ( $p = 0.3$ ). No significant associations were found between the type of treatment (open or closed procedure) and the trauma indices, blood pressure, pulse or respiratory rate.

**Conclusion:** No significant differences were found in the prognosis of cases of chest injuries submitted to open and closed procedures.

**Keywords:** treatment, chest injuries, mortality, hospitalization, trauma indices, physiological data

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## Introduction

In more than half of cases of chest trauma, patients also have head injuries, abdominal injuries or polytrauma. Chest trauma is found in 62.5% of patients sent to the operating room within 24 hours after admission to hospital.<sup>1</sup> Approximately one-third of patients hospitalized in trauma centers in the United States suffered serious chest injuries.<sup>2</sup>

The lungs occupy a large portion of the thoracic cage and are injured either directly or indirectly in most patients with chest injuries. A significant number of lung injuries are also associated with trauma to other thoracic structures.<sup>3,4</sup> Different degrees of severity of pulmonary laceration and hernia are examples of trauma to the pulmonary parenchyma.<sup>4,5</sup> Injuries of the pleural space (pneumothorax and hemothorax) are frequently associated complications. Rupture of the diaphragm, sternum fracture, sternoclavicular luxation, scapula fractures and an unstable thorax are manifestations of contusive trauma to the thoracic wall.<sup>3</sup> Two-thirds of patients with multiple injuries have internal chest injuries and severe chest trauma is associated with polytrauma in 70 to 90% of cases.<sup>1,6</sup>

The aim of the present study was to compare open and closed treatment for chest injuries according to mortality, hospitalization, trauma indices and physiological data.

## Method and patients

Three hundred sixty-six patients (292 males and 74 females) with an Anatomic Injury Scale (AIS) score of 2 or more for thoracic trauma were evaluated. All patients were treated at the São Jose do Rio Preto

Base Hospital in the state of São Paulo, Brazil within a one-year period.

## Type of study

A retrospective, quantitative, cohort study was conducted with the evaluation of epidemiological data and the evolution of all chest injury patients with AIS  $\geq 2$ .

## Inclusion criteria

All individuals with chest trauma with an AIS score  $\geq 2$ .

## Exclusion criteria

Patients who arrived dead to the service and for whom no resuscitation procedure was performed.

## Ethical considerations

This study received approval from the Human Research Ethics Committee of the São José do Rio Preto School of Medicine #.

## Development

Data were recorded on a standardized chart (attached) and entered in the Excel program. The following aspects were evaluated:

1- Associations between treatment (open and closed) for chest injury and:

- Discharge from hospital, hospitalization and death

- Trauma indices – Revised Trauma Score (RTS), Injury Severity Score (ISS) and TRISS

- Blood pressure, diastolic pressure, respiratory rate and pulse.
- 2- Systolic pressure upon arrival
- 3- Respiratory rate at first evaluation and types of trauma

## Results

Age ranged from 14 to 89 years (mean: 37.9±17.4 years). Mean age was 43.3±20.0 year for women and 36.4±16.4 years for men. No significant associations were found between the type of treatment (open or closed procedure) and discharge from hospital, hospitalization or death (p=0.3) (Table 1). No significant associations were found between the type of treatment (open or closed procedure) and the trauma indices, blood pressure, pulse or respiratory rate (Table 2).

**Table 1** Open and closed treatment for chest trauma according to discharge from hospital, hospitalization and death

| Trauma | Discharge | Hospitalization | Death | Total |
|--------|-----------|-----------------|-------|-------|
| Closed | 42        | 79              | 13    | 134   |
| Open   | 84        | 118             | 30    | 232   |
| Total  | 126       | 197             | 43    | 366   |

p = 0.306, chi-squared test

**Table 2** Open and closed treatment for chest trauma according to mortality, hospitalization, trauma indices and physiological data

| Association        | p     |
|--------------------|-------|
| Mortality          | < 0.4 |
| Hospitalization    | < 0.1 |
| RTS                | < 0.1 |
| ISS                | < 0.5 |
| TRISS              | < 0.4 |
| Blood pressure     | < 0.3 |
| Systolic pressure  | < 0.4 |
| Diastolic pressure | < 0.9 |
| Respiratory rate   | < 0.1 |
| Pulse              | < 0.3 |

## Discussion

In the present study, no significant differences were found between open and closed chest injury procedures in terms of hospitalization, mortality, trauma indices or physiological data (blood pressure and respiratory rate). These data shown that both types of treatment had the same prognosis. However, data on hospital costs and infection were not evaluated and may have influenced the results. No studies are found in the literature that perform evaluations specifically of the items addressed in the present investigation.

Mean systolic pressure was lower among victims of gunshot wounds, but no difference was found for other types of trauma. This

suggests the greater severity of such wounds, leading to a greater impact on the circulatory system. However, important internal injuries to blood vessels can occur with knife wounds.

Median respiratory rate differed among the types of trauma. However, several factors can influence these variations.

No differences in trauma indices were found between open and closed chest procedures. Other injury sites are normally found in cases of chest injury, which do not always occur in an isolated manner. The focal points of knife wounds are normally in the thorax, with greater severity related to vascular injuries. Mortality was influenced by the type of procedure used for the treatment of chest injuries, as less aggressive treatments had a lower mortality rate, with the lowest rate found for clinical treatment. However, a laparotomy was associated with mortality in more than 50% of cases. A previous study shows that surgical procedures can involve partial resections of the lung.<sup>8</sup> Other factors can affect the outcome of cases, such as soft tissue infection, osteomyelitis, pneumonia, urinary infection and thrombophilia.<sup>9,10</sup>

## Conclusion

No significant differences were found in the prognosis of cases of chest injuries submitted to open and closed procedures.

## Acknowledgments

None.

## Conflicts of interest

None.

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