

Surgical Management of Rib Fractures Following Trauma

Akademisk avhandling

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av **Eva-Corina Caragounis**

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Avhandlingen baseras på följande delarbeten

- I. Mechanism of injury, injury patterns and associated injuries in patients operated for chest wall trauma. Caragounis E-C, Xiao Y och Granhed H. Accepted in Eur J Trauma Emerg Surg. 2019.
- II. Surgical treatment of multiple rib fractures and flail chest in trauma: a one-year follow-up study. Caragounis E-C, Fagevik Olsén M, Pazooki D and Granhed H. World J Emerg Surg. 2016 Jun 14; 11:27.
- III. CT-lung volume estimates in trauma patients undergoing stabilizing surgery for flail chest. Caragounis E-C, Fagevik Olsén M, Granhed H and Rossi Norrlund R. Injury. 2019 Jan; 50(1): 101–108. Epub 2018 Oct 16.
- IV. Prospective controlled study of surgical management of unstable thoracic cage injuries and chest wall deformity in trauma. Caragounis E-C, Fagevik Olsén M, Sandström L, Rossi Norrlund R, Strømmer L and Granhed H. Manuscript.

**SAHLGRENKA AKADEMIN
INSTITUTIONEN FÖR KLINISKA VETENSKAPER**



Surgical Management of Rib Fractures Following Trauma

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ABSTRACT

Background: Surgical management of chest wall injuries has received increasing attention in recent years. The aim of this thesis was to study the mechanism of injury (MOI) in relation to chest wall injury patterns and short- and long-term outcome of surgery in patients with multiple rib fractures and unstable thoracic cage injuries.

Methods: Paper I is a retrospective study (n=211) of the association of MOI and injury patterns in patients operated for acute chest wall injuries. Paper II is a prospective longitudinal study (n=54) of the long-term outcome of surgery in patients with multiple rib fractures and flail chest. Paper III is a cross-sectional study (n=37) of the use of CT-lung volume estimation as a marker for lung function in patients operated for flail chest. Paper IV is a prospective controlled study (n=139) of the short- and long-term outcome of surgery in patients with unstable thoracic cage injuries.

Results: The MOI differs according to age and is associated with different chest wall injury patterns. Lateral and posterior flail segments are the most commonly seen. Symptoms of pain, lung function and Quality of Life (QoL), improve during the first post-operative year. CT-lung volume estimates increase significantly from pre-operative values to post-operative values and there is a high correlation between post-operative CT-lung volume and lung function. Surgery for unstable thoracic cage injuries does not decrease the need for mechanical ventilation. However, surgically managed patients have a decreased incidence of pneumonia (17% vs. 36%, $p=0.013$) and less pain (29% vs. 57%, $p<0.05$) the first months' post trauma. Patients operated without thoracotomy have a better residual lung function and lung volume. A gradual improvement in patient symptoms was seen and after one year there was no difference in symptoms, function or QoL between surgically and conservatively managed patients.

Conclusions: The MOI influences rib fracture pattern and associated injuries. Lung volume estimated by CT can be used as a marker for lung function. Surgery for unstable thoracic cage injuries decreases the incidence of pneumonia and reduces pain. Patients continue to improve gradually and no difference can be seen between the surgically and conservatively managed patients one year post trauma.

Keywords: Mechanism of Injury; Rib Fracture; Flail chest; Surgery; Mechanical Ventilator; Lung Function; Pain; Quality of Life

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