

Study	Title	Journal	Volume	Issue
Schulte 2016	In patients with acute flail chest does surgical rib fixation improve outcomes in terms of morbidity and mortality?	Interactive cardiovascular and thoracic surgery	23	2
Short 1996	Evaluation of intrapleural analgesia in the management of blunt traumatic chest wall pain: a clinical trial	Am Surg	62	6
Britt 2015	Comparative evaluation of continuous intercostal nerve block or epidural analgesia on the rate of respiratory complications, intensive care unit, and hospital stay following traumatic rib fractures: a retrospective review	Local Reg Anesth	8	
Buyukkarabacak 2015	The Usefulness of Early Surgical Rib Stabilization in Flail Chest	Acta Chir Belg	115	6
Heidari 2019	Comparison of epidural block and apotel in controlling pain among patients with rib fracture	International Journal of Pharmaceutical Research	11	2
Gabram 1995	Clinical management of blunt trauma patients with unilateral rib fractures: a randomized trial	World J Surg	19	3
Liu 2018	Surgical versus conservative therapy for multiple rib fractures: a retrospective analysis	Ann Transl Med	6	22
Uchida 2017	Evaluation of efficacy and indications of surgical fixation for multiple rib fractures: a propensity-score matched analysis	Eur J Trauma Emerg Surg	43	4
Liu 2019	A Randomized Controlled Trial of Surgical Rib Fixation in Polytrauma Patients With Flail Chest	J Surg Res	242	
Riccardi 2019	Efficacy and tolerability of fixed association of oxycodone and naloxone in elderly patients with ribs fracture: An 18-month retrospective study	Emergency Care Journal	15	2
Hashemzadeh 2011	Comparison thoracic epidural and intercostal block to improve ventilation parameters and reduce pain in patients with multiple rib fractures	J Cardiovasc Thorac Res	3	3
Ullman 1989	The treatment of patients with multiple rib fractures using continuous thoracic epidural narcotic infusion	Reg Anesth	14	1
Jayle 2015	Flail chest in polytraumatized patients: surgical fixation using Stracos reduces ventilator time and hospital stay	Biomed Res Int	2015	
Majercik 2015	In-hospital outcomes and costs of surgical stabilization versus nonoperative management of severe rib fractures	Journal of Trauma and Acute Care Surgery	79	4
Malekpour 2017	Analgesic Choice in Management of Rib Fractures: Paravertebral Block or Epidural Analgesia?	Anesth Analg	124	6
Nirula 2006	Rib fracture stabilization in patients sustaining blunt chest injury	Am Surg	72	4
Khandelwal 2011	A prospective single center study to assess the impact of surgical stabilization in patients with rib fracture	Int J Surg	9	6
Girsowicz 2012	Does surgical stabilization improve outcomes in patients with isolated multiple distracted and painful non-flail rib fractures?	Interactive Cardiovascular and Thoracic Surgery	14	3
Xu 2015	Better short-term efficacy of treating severe flail chest with internal fixation surgery compared with conservative treatments	Eur J Med Res	20	1
Velasquez 2016	Operative versus Nonoperative Management of Multiple Rib Fractures	Am Surg	82	5
Agamohamdi 2018	A Comparison of Continuous Thoracic Epidural Analgesia with Bupivacaine and Dexmedetomidine for Pain Control in Patients with Multiple Rib Fractures	Anesth Pain Med	8	2
Actrn 2018	A comparison of two types of regional nerve block (erector spinae plane versus paravertebral) to treat the pain caused by rib fractures	<a href="http://www.who.int/trialsearch/Trial2.aspx?TrialID=ACTRN12618001786280">http://www.who.int/trialsearch/Trial2.aspx?TrialID=ACTRN12618001786280</a>		
Xu 2015	Better short-term efficacy of treating severe flail chest with internal fixation surgery compared with conservative treatments Surgery	European Journal of Medical Research	20	1
Fitzgerald 2018	Chest Wall Stabilization Leads to Shortened Chest Tube Stay Time in Rib Fracture Patients after Traumatic Chest Wall Injury	Am Surg	84	5
Juul 2019	Discharge opioid prescribing in rib fracture patients treated with ketamine: a post hoc analysis	Critical care medicine	47	1
Dehghan 2014	Flail chest injuries: a review of outcomes and treatment practices from the National Trauma Data Bank	J Trauma Acute Care Surg	76	2
Batomenkuimi 2019	Potential benefits of incentive spirometry following a rib fracture: a propensity score analysis	Cjem	21	4
Wei 2019	Implementation of a multi-modal pain regimen to decrease inpatient opioid exposure after injury	Am J Surg	218	6
Marasco 2013	Prospective randomized controlled trial of operative rib fixation in traumatic flail chest	Journal of American college of surgeons		on line
Yeh 2012	Epidural analgesia for blunt thoracic injury--which patients benefit most?	Injury	43	10
Kocher 2017	Chest wall stabilization in ventilator-dependent traumatic flail chest patients: who benefits?	Eur J Cardiothorac Surg	51	4
Said 2014	Surgical stabilization of flail chest: the impact on postoperative pulmonary function	Eur J Trauma Emerg Surg	40	4
Jensen 2017	Improved Outcomes Associated with the Liberal Use of Thoracic Epidural Analgesia in Patients with Rib Fractures	Pain Med	18	9
Leininger 2017	Rib Fracture Protocol Advancing the Care of the Elderly Patient	Crit Care Nurs Q	40	1
Yang 2014	Use of ketorolac is associated with decreased pneumonia following rib fractures	Am J Surg	207	4
Ge 2017	Thoracic paravertebral block versus intravenous patient-controlled analgesia for pain treatment in patients with multiple rib fractures	Journal of International Medical Research	45	6
Sadler 2019	Bedside Incentive Spirometry Predicts Risk of Pulmonary Complication in Patients with Rib Fractures	Am Surg	85	9
Osinowo 2004	Effect of intercostal nerve block with 0.5% bupivacaine on peak expiratory flow rate and arterial oxygen saturation in rib fractures	J Trauma	56	2
Majercik 2015	Surgical stabilization of severe rib fractures decreases incidence of retained hemothorax and empyema	Am J Surg	210	6
Truitt 2011	Continuous intercostal nerve blockade for rib fractures: ready for primetime?	J Trauma	71	6
Holcomb 2003	Morbidity from rib fractures increases after age 45	J Am Coll Surg	196	4
Olland 2019	Surgical stabilization for multiple rib fractures: whom the benefit? - a prospective observational study	J Thorac Dis	11	Suppl 2
Govindarajan 2002	Epidural buprenorphine in management of pain in multiple rib fractures	Acta Anaesthesiol Scand	46	6
Parris 2007	Epidural analgesia/anaesthesia versus systemic intravenous opioid analgesia in the management of blunt thoracic trauma	Emergency Medicine Journal	24	12
Mohta 2009	Prospective, randomized comparison of continuous thoracic epidural and thoracic paravertebral infusion in patients with unilateral multiple fractured ribs--a pilot study	J Trauma	66	4
Moore 1975	Operative stabilization of nonpenetrating chest injuries	J Thorac Cardiovasc Surg	70	4
Mullens 2019	A Statewide Assessment of Rib Fixation Patterns Reveals Missed Opportunities	J Surg Res	244	
Luchette 1994	Prospective evaluation of epidural versus intrapleural catheters for analgesia in chest wall trauma	J Trauma	36	6
Paris 1975	Surgical stabilization of traumatic flail chest	Thorax	30	5
Kasotakis 2016	Operative fixation of rib fractures after blunt trauma: a practice management guideline from the Eastern Association for the Surgery of Trauma	Journal of trauma and acute care surgery	82	3
Dittmann 1975	EPIDURAL ANALGESIA FOR TREATMENT OF MULTIPLE RIB FRACTURES	European Journal of Intensive Care Medicine	1	2
Howell 1963	THE FLAIL CHEST. AN ANALYSIS OF 100 PATIENTS	Am J Surg	106	
Shibahashi 2019	Effect of surgical rib fixation for rib fracture on mortality: A multicenter, propensity score matching analysis	J Trauma Acute Care Surg	87	3
Roberts 2014	The role of non-invasive ventilation in blunt chest trauma: systematic review and meta-analysis	European Journal of Trauma and Emergency Surgery	40	5
Tanaka 2002	Surgical Stabilization of Internal Pneumatic Stabilization? A Prospective Randomized Study of Management of Severe Flail Chest Patients	Journal of trauma injury infection and critical care	52	
Pieracci 2020	A Multicenter, Prospective, Controlled Clinical Trial of Surgical Stabilization of Rib Fractures in Patients with Severe, Non-flail Fracture Patterns	J Trauma Acute Care Surg	88	2
Pieracci 2016	A prospective, controlled clinical evaluation of surgical stabilization of severe rib fractures	J Trauma Acute Care Surg	80	2
Kieninger 2005	Epidural versus intravenous pain control in elderly patients with rib fractures	Am J Surg	189	3
Kelley 2019	Early Use of a Chest Trauma Protocol in Elderly Patients with Rib Fractures Improves Pulmonary Outcomes	Am Surg	85	3
Schuurmans 2017	Operative management versus non-operative management of rib fractures in flail chest injuries: a systematic review	Eur J Trauma Emerg Surg	43	2
Shi 2017	Effects of mechanism of injury and patient age on outcomes in geriatric rib fracture patients	Trauma Surg Acute Care Open	2	1
Slobogean 2013	Surgical fixation vs nonoperative management of flail chest: a meta-analysis	J Am Coll Surg	216	2
Galvagno 2016	Pain management for blunt thoracic trauma: A joint practice management guideline from the Eastern Association for the Surgery of Trauma and Trauma Anesthesiology Society	Journal of Trauma and Acute Care Surgery	81	5
Zhang 2015	Comparison of surgical fixation and nonsurgical management of flail chest and pulmonary contusion	Am J Emerg Med	33	7
Kugler 2019	Ketamine infusion for pain control in elderly patients with multiple rib fractures: Results of a randomized controlled trial	J Trauma Acute Care Surg	87	5
Gage 2014	The effect of epidural placement in patients after blunt thoracic trauma	J Trauma Acute Care Surg	76	1
Pyke 2017	Admission of elderly blunt thoracic trauma patients directly to the intensive care unit improves outcomes	J Surg Res	219	
Qiu 2016	Potential Benefits of Rib Fracture Fixation in Patients with Flail Chest and Multiple Non-flail Rib Fractures	Indian J Surg	78	6
Taylor 2016	Clinical Outcomes of Surgical Stabilization of Flail Chest Injury	J Am Acad Orthop Surg	24	8
OaóConnell 2018	Decreased risk of delirium with use of regional analgesia in geriatric trauma patients with multiple rib fractures	Annals of Surgery	268	3
Cataneo 2015	Surgical versus nonsurgical interventions for flail chest	Cochrane Database Syst Rev		7
Peek 2019	Comparison of analgesic interventions for traumatic rib fractures: a systematic review and meta-analysis	Eur J Trauma Emerg Surg	45	4
Mackersie 1991	Prospective evaluation of epidural and intravenous administration of fentanyl for pain control and restoration of ventilatory function following multiple rib fractures	J Trauma	31	4
Majeed 2018	Rib Fixation Versus Conservative Management Of Rib Fractures In Trauma Patients	J Ayub Med Coll Abbottabad	30	4
Lynch 2019	Comparative effectiveness analysis of two regional analgesia techniques for the pain management of isolated multiple rib fractures	J Pain Res	12	
Mackersie 1987	Continuous epidural fentanyl analgesia: ventilatory function improvement with routine use in treatment of blunt chest injury	J Trauma	27	11
Mouton 1997	Long-term follow-up of patients with operative stabilisation of a flail chest	Thorac Cardiovasc Surg	45	5

Muhm 2013	Severe trauma of the chest wall: surgical rib stabilisation versus non-operative treatment	Eur J Trauma Emerg Surg	39	3
Coughlin 2016	Management of rib fractures in traumatic flail chest A META-ANALYSIS OF RANDOMISED CONTROLLED TRIALS	Bone & Joint Journal	988	8
Majercik 2014	Long-term patient outcomes after surgical stabilization of rib fractures	Am J Surg	208	1
Marasco 2009	Pilot study of operative fixation of fractured ribs in patients with flail chest	ANZ J Surg	79	11
Chiumello 2013	Noninvasive ventilation in chest trauma: systematic review and meta-analysis	Intensive Care Medicine	39	7
Campbell 2009	Surgical stabilization of rib fractures using Inion OTS wraps—techniques and quality of life follow-up	J Trauma	67	3
Carrie 2018	Bundle of care for blunt chest trauma patients improves analgesia but increases rates of intensive care unit admission: A retrospective case-control study	Anaesth Crit Care Pain Med	37	3
Hernandez 2010	Noninvasive Ventilation Reduces Intubation in Chest Trauma-Related Hypoxemia A Randomized Clinical Trial	Chest	137	1
Flarity 2017	Guideline-Driven Care Improves Outcomes in Patients with Traumatic Rib Fractures	Am Surg	83	9
Kane 2018	Surgical Stabilization of Rib Fractures: A Single Institution Experience	J Am Coll Surg	226	6
Hernandez 2019	Impact of serratus plane block on pain scores and incentive spirometry volumes after chest trauma	Local Reg Anesth	12	
Haenel 1995	Extrapleural bupivacaine for amelioration of multiple rib fracture pain	J Trauma	38	1
Kasotakis 2017	Operative fixation of rib fractures after blunt trauma: A practice management guideline from the Eastern Association for the Surgery of Trauma	J Trauma Acute Care Surg	82	3
Gunduz 2005	A comparative study of continuous positive airway pressure (CPAP) and intermittent positive pressure ventilation (IPPV) in patients with flail chest	Emerg Med J	22	5
Jiang 2019	Comparison of the Effectiveness of Surgical Versus Nonsurgical Treatment for Multiple Rib Fractures Accompanied with Pulmonary Contusion	Ann Thorac Cardiovasc Surg	25	4
Rankin 1984	Management of fifty cases of chest injury with a regimen of epidural bupivacaine and morphine	Anaesth Intensive Care	12	4
Halub 2017	High-flow nasal cannula therapy for patients with blunt thoracic injury: A retrospective study	Canadian Journal of Respiratory Therapy	53	1
Granetny 2005	Surgical versus conservative treatment of flail chest. Evaluation of the pulmonary status	Interact Cardiovasc Thorac Surg	4	6
Karmakar 2003	Continuous thoracic paravertebral infusion of bupivacaine for pain management in patients with multiple fractured ribs	Chest	123	2
Fokin 2019	Outcome Analysis of Surgical Stabilization of Rib Fractures in Trauma Patients	J Orthop Trauma	33	1
Gerakopoulos 2019	Surgical Management of Multiple Rib Fractures Reduces the Hospital Length of Stay and the Mortality Rate in Major Trauma Patients: A Comparative Study in a UK Major Trauma Center	J Orthop Trauma	33	1
Wisner 1990	A stepwise logistic regression analysis of factors affecting morbidity and mortality after thoracic trauma: effect of epidural analgesia	J Trauma	30	7
Wu 2015	Which is better to multiple rib fractures, surgical treatment or conservative treatment?	Int J Clin Exp Med	8	5
Carver 2019	Ketamine infusion for pain control in adult patients with multiple rib fractures: Results of a randomized control trial	J Trauma Acute Care Surg	86	2
Dober 2014	Surgical rib fixation for flail chest deformity improves liberation from mechanical ventilation	J Crit Care	29	1
Carrier 2009	Effect of epidural analgesia in patients with traumatic rib fractures: a systematic review and meta-analysis of randomized controlled trials	Can J Anaesth	56	3
Gonzalez 2015	A pilot single-institution predictive model to guide rib fracture management in elderly patients	J Trauma Acute Care Surg	78	5
Wu 1999	Thoracic epidural analgesia versus intravenous patient-controlled analgesia for the treatment of rib fracture pain after motor vehicle crash	J Trauma	47	3
Wijffels 2018	Early results after operatively versus non-operatively treated flail chest: a retrospective study focusing on outcome and complications	Eur J Trauma Emerg Surg	46	3
deMoya 2011	Pain as an indication for rib fixation: a bi-institutional pilot study	J Trauma	71	6
DePalma 2016	Chest wall stabilization and reconstruction: short and long-term results 5 years after the introduction of a new titanium plates system	J Thorac Dis	8	3
DeFreest 2016	Open reduction and internal fixation of rib fractures in polytrauma patients with flail chest	Am J Surg	211	4
Xiong 2019	Efficacy of nickel-titanium memory alloy in the treatment of multiple rib fracture combined with sternal fracture	Exp Ther Med	18	1
Xia 2018	Thoracoscope combined with internal support system of chest wall in open reduction and internal fixation for multiple rib fractures	Exp Ther Med	16	6
Zaw 2015	Epidural Analgesia after Rib Fractures	Am Surg	81	10
Walters 2019	Surgical Stabilization Improves 30-day Mortality in Patients With Traumatic Flail Chest: A Comparative Case Series at a Major Trauma Center	J Orthop Trauma	33	1
Womack 2019	Safety, complications and clinical outcome after ultrasound-guided paravertebral catheter insertion for rib fracture analgesia: a single-centre retrospective observational study	Anaesthesia	74	5
Ahmed 1995	Management of flail chest injury: internal fixation versus endotracheal intubation and ventilation	J Thorac Cardiovasc Surg	110	6
Ahmed 2015	Acute pain services in flail chest—a prospective randomized trial of epidural versus parenteral analgesia in mechanically ventilated ICU patients	Egyptian Journal of Anaesthesia	31	4
Bottlang 2013	Surgical stabilization of flail chest injuries with MatrixRIB implants: a prospective observational study	Injury	44	2
Bowman 2020	Older Adults With Isolated Rib Fractures Do Not Require Routine Intensive Care Unit Admission	J Surg Res	245	
Akil 2019	Rib osteosynthesis is a safe and effective treatment and leads to a significant reduction of trauma associated pain	Eur J Trauma Emerg Surg	45	4
Athanasidi 2004	Management of 150 flail chest injuries: analysis of risk factors affecting outcome	Eur J Cardiothorac Surg	26	2
Barry 2018	Outcomes after rib fractures in geriatric blunt trauma patients	Am J Surg	215	6
Balci 2004	Open fixation in flail chest: review of 64 patients	Asian Cardiovasc Thorac Ann	12	1
Blecher 2008	Failed Emergency Department disposition to the ward of patients with thoracic injury	Injury	39	5
Coughlin 2016	Management of rib fractures in traumatic flail chest: A meta-analysis of randomised controlled trials	Bone and Joint Journal	98-B	8
Farquhar 2016	No benefit to surgical fixation of flail chest injuries compared with modern comprehensive management: results of a retrospective cohort study	Canadian journal of surgery. Journal canadien de chirurgie	59	5
Duggal 2013	Safety and efficacy of noninvasive ventilation in patients with blunt chest trauma: a systematic review	Critical Care	17	4
Duch 2015	Epidural analgesia in patients with traumatic rib fractures: a systematic review of randomised controlled trials	Acta Anaesthesiol Scand	59	6
McKendy 2017	Epidural analgesia for traumatic rib fractures is associated with worse outcomes: a matched analysis	J Surg Res	214	
Bulger 2004	Epidural analgesia improves outcome after multiple rib fractures	Surgery	136	2
Adhikary 2019	The effect of erector spinae plane block on respiratory and analgesic outcomes in multiple rib fractures: a retrospective cohort study	Anaesthesia	74	5
Bolliger 1990	Treatment of multiple rib fractures. Randomized controlled trial comparing ventilatory with nonventilatory management	Chest	97	4
Bulger 2000	Rib fractures in the elderly	J Trauma	48	6
Battle 2015	Predictors of mortality in patients with flail chest: a systematic review	Emerg Med J	32	12
Battle 2012	Risk factors that predict mortality in patients with blunt chest wall trauma: a systematic review and meta-analysis	Injury	43	1
Ali-Osman 2018	Geriatric (G60) trauma patients with severe rib fractures: Is muscle sparing minimally invasive thoracotomy rib fixation safe and does it improve post-operative pulmonary function?	Am J Surg	216	1
Allen 1985	Blunt chest trauma in the elderly	American Surgeon	51	12
Althausen 2011	Early surgical stabilization of flail chest with locked plate fixation	J Orthop Trauma	25	11
Beks 2019	Long-term follow-up after rib fixation for flail chest and multiple rib fractures	Eur J Trauma Emerg Surg	45	4
Beks 2019	Fixation of flail chest or multiple rib fractures: current evidence and how to proceed. A systematic review and meta-analysis	Eur J Trauma Emerg Surg	45	4
Beks 2019	Rib fixation versus non-operative treatment for flail chest and multiple rib fractures after blunt thoracic trauma: a multicenter cohort study	Eur J Trauma Emerg Surg	45	4
Bellone 2016	Factors Associated with ICU Admission following Blunt Chest Trauma	Can Respir J	2016	
Baker 2016	A retrospective observational study examining the effect of thoracic epidural and patient controlled analgesia on short-term outcomes in blunt thoracic trauma injuries	Medicine (United States)	95	2
Bakhos 2006	Vital capacity as a predictor of outcome in elderly patients with rib fractures	J Trauma	61	1
Zelenak 2002	Stabilisation of thoracic wall in patients with chest injury	Bratisl Lek Listy	103	5-Apr
Voggenreiter 1998	Operative chest wall stabilization in flail chest—outcomes of patients with or without pulmonary contusion	J Am Coll Surg	187	2
Wada 2015	Effectiveness of surgical rib fixation on prolonged mechanical ventilation in patients with traumatic rib fractures: A propensity score-matched analysis	J Crit Care	30	6
Sum 2019	Using an incentive spirometer reduces pulmonary complications in patients with traumatic rib fractures: a randomized controlled trial	Trials	20	1
Dehghan 2018	Operative Stabilization of Flail Chest Injuries Reduces Mortality to That of Stable Chest Wall Injuries	J Orthop Trauma	32	1
Walters 2018	Ketamine as an Analgesic Adjuvant in Adult Trauma Intensive Care Unit Patients With Rib Fracture	Ann Pharmacother	52	9
Fitzgerald 2017	Rib fracture fixation in the 65 years and older population: A paradigm shift in management strategy at a Level I trauma center	J Trauma Acute Care Surg	82	3
Zhang 2019	Surgical treatment of patients with severe non-flail chest rib fractures	World J Clin Cases	7	22