

Rib Plating in Octogenarians and Nonagenarians: How The Evidence Adds Up

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I do not have any relevant financial relationship(s) with any commercial interest that pertains to the content of my presentation.

Our mission

Above all else, we are committed to the care and improvement of human life.



“Elderly” vs “Very Elderly”

- “Elderly” is generally defined as age 65+ while “very elderly” is 80+
- According to World Health Organization (WHO) and the Center for Disease Control (CDC):
 - By 2030, 1/6 people worldwide will be over 60 years
 - By 2050, world population of people over 60 years will double to 2.1 billion
 - **Between 2020 and 2050 the number of people over 80 years will triple to 426 million**

Common Comorbidities and Concerns in the Very Elderly



“Age-Related Diseases and Clinical and Public Health Implications for the 85 Years Old and Over Population”

Jaul E, Barron J. Age-Related Diseases and Clinical and Public Health Implications for the 85 Years Old and Over Population. *Front Public Health.* 2017;5:335. Published 2017 Dec 11. doi:10.3389/fpubh.2017.00335

- Chronic conditions: COPD, DM, Dementia, and CVS disease – complicates medical management of elderly population
- Frailty is common; vulnerable to disability, hospitalizations, and poor surgical outcomes
- Hospitalizations - very common in elderly ages 85+ ; often associated with functional decline
- A decrease in functional reserve is often seen in the elderly population which results in increased vulnerability

“Morbidity, Mortality, Associated Injuries, and Management of Traumatic Rib Fractures”

Lin FC, Li RY, Tung YW, Jeng KC, Tsai SC. Morbidity, mortality, associated injuries, and management of traumatic rib fractures. *J Chin Med Assoc.* 2016;79(6):329-334. doi:10.1016/j.jcma.2016.01.006

- Rib fractures in **Blunt Chest Trauma** account for **12%** of all trauma admissions; **old age** is significantly associated with rib fractures in thoracic traumas
- Elderly patients- shown to have poor outcomes following rib fractures which most likely relate to their **comorbidities** and **reduced function**
- Significant **morbidity and mortality** associated with rib fractures, especially in the elderly population

Rib Fractures in the Very Elderly

“Helping Elderly Patients With Rib Fractures Avoid Serious Respiratory Complications”

“Helping Elderly Patients with Rib Fractures Avoid Serious Respiratory Complications.” *Mayo Clinic*, Mayo Foundation for Medical Education and Research, 3 May 2019, www.mayoclinic.org/medical-professionals/trauma/news/helping-elderly-patients-with-rib-fractures-avoid-serious-respiratory-complications/mac-20460753.

- Mortality and thoracic morbidity **doubles** in geriatric patients with rib fracture compared with younger patients
- **Factors** contributing to rib fracture risk in older adults: **polypharmacy, chronic** health conditions, **frailty**, dehydration
- **Brian D. Kim, M.D.**, a trauma surgeon at Mayo Clinic in Rochester, Minnesota – “one simple rib fracture in a 90-year-old may put the individual at as much risk as would 8 rib fractures in a 40-year-old”

Rib Fracture Management



“Rib Fracture Management in Older Adults: A Scoping Review”

Qureshi I, Kharel R, Mujahid N, Neupane I. Rib Fracture Management in Older Adults: A Scoping Review. *Brown Hospital Medicine*. 2023;2(3).
[doi:10.56305/001c.82211](https://doi.org/10.56305/001c.82211)

Review of **current management** of multiple rib fractures due to a lack of **current guidelines** in literature

Online databases (**PubMed and MEDLINE**) identified **57** publications (**2000-2022**) on the management of multiple rib fractures

Up to **94%** of rib fracture patients also have **additional** injuries with **>50%** requiring **immediate surgery** or admission to the **(ICU) level of care**.

Trauma centers nationally have shown **better outcomes** when **rib fracture protocols** were geared towards **geriatric age groups** and involved a comprehensive and interdisciplinary team approach

“Comprehensive approach to the management of the patient with multiple rib fractures: a review and introduction of a bundled rib fracture management protocol”

Witt CE, Bulger EM. Comprehensive approach to the management of the patient with multiple rib fractures: a review and introduction of a bundled rib fracture management protocol. *Trauma Surg Acute Care Open*. 2017;2(1):e000064. Published 2017 Jan 5. doi:10.1136/tsaco-2016-000064

- **Elderly - poorer outcomes following rib fractures, related to comorbidities, reduced physiological reserve, and greater difficulty assessing and managing hemodynamics.**
- **No published practice management guidelines** relating to surgical stabilization of elderly patients with severe rib fractures
- Studies reported **successful institutional use of the surgical stabilization** with encouraging outcomes in multiple rib fractures without flail; however, prospective studies are needed.

Conservative Management vs. Rib Plating



“Rib Plating as an Effective Approach to Managing Traumatic Rib Injuries: A Review of the Literature”

Adereti C, Fabien J, Adereti J, Pierre-Louis M, Chacon D, Adereti V. Rib Plating as an Effective Approach to Managing Traumatic Rib Injuries: A Review of the Literature. *Cureus*. 2022;14(9):e29664. Published 2022 Sep 27. doi:10.7759/cureus.29664

- Current treatment of rib fractures favors **conservative management** (pain control, positive pressure ventilation, pulmonary hygiene)
- Studies have shown conservative management has been **less effective** than surgical stabilization in patients in **both short and long-term**.
- Conservative management can lead to **gradual displacement** during recovery which may result in **deformity and respiratory deterioration**

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Operational Considerations

“Perioperative Care in Older Adults”

Baquero GA, Rich MW. Perioperative care in older adults. *J Geriatr Cardiol.* 2015;12(5):465-469. doi:10.11909/j.issn.1671-5411.2015.05.018

- Aging is associated **with loss of functional reserve** in all organ systems (vascular stiffening, decreased pulmonary reserve, and decreased renal and hepatic functions) - increased **perioperative mortality and morbidity**
- Considerations in operating on patients in these populations focus on their **multiple comorbidities, polypharmacy, and limitations in function** as these increase risk for perioperative complications
- Factors eg **comorbidities** and **function** are the primary determinants of perioperative risk rather than age - which is why age alone should not be considered an exclusion criterion for surgery

Operational Considerations



“Surgery For the Very Old: Are Nonagenarians Different?”

Tanner I. Kim, M.D.,* Anand Brahmandam, M.B.B.S.,* Laura Skrip, PH.D., M.P.H.,† Timur Sarac, M.D.,‡ Alan Dardik, M.D.,* Cassius Iyad Ochoa Char, M.D.*

- Studied the differences in **surgical trends, demographics, and outcomes** between octogenarians and nonagenarians
- Used the **ACS-NSQIP database** (2007–2012) to derive outcomes of octogenarian and nonagenarians undergoing nonemergent vascular, orthopedic, and general surgery procedures.
- **Nonagenarians** are a rapidly growing group of **surgical patients** with significantly **higher perioperative mortality and longer postoperative hospital stay**. The impact of surgery on the quality of life of nonagenarians needs to be studied to justify the increasing healthcare costs.

Benefits of Rib Plating on Postoperative Outcomes in Elderly 65+



“Surgical Stabilization of Rib Fractures Improves Outcomes in the Geriatric Patient Population”

Christie DB, Nowack TE, Nonnemacher CJ, Montgomery A, Ashley DW. Surgical Stabilization of Rib Fractures Improves Outcomes in the Geriatric Patient Population. *Am Surg.* 2022;88(4):658-662. doi:10.1177/00031348211060432

“Rib Plating Outcomes in Elderly Trauma Patients with Multiple Rib Fractures: A Community Hospital Experience”

Wasfie T, Sowa M, White H, et al. Rib Plating Outcomes in Elderly Trauma Patients with Multiple Rib Fractures: A Community Hospital Experience. *Am Surg.* 2023;89(8):3519-3521. doi:10.1177/00031348231161713

“Geriatric Chest Wall Injury: Is It Time For A New Sense Of Urgency?”

Christie DB 3rd, Nowack T, Drahos A, Ashley DW. Geriatric chest wall injury: is it time for a new sense of urgency?. *J Thorac Dis.* 2019;11(Suppl 8):S1029-S1033. doi:10.21037/jtd.2018.12.16

Benefits of Rib Plating on Postoperative Outcomes in Elderly 65+ cont...



“Rib Fracture Fixation In The 65 Years And Older Population: A Paradigm Shift in Management Strategy At A Level I Trauma Center”

Fitzgerald MT, Ashley DW, Abukhdeir H, Christie DB 3rd. 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.* 2017;82(3):524-527. doi:10.1097/TA.0000000000001330

“Successful Surgical Fixation Using Bioabsorbable Plates for Frail Chest in a Severe Osteoporotic Octogenarian”

Waseda R, Matsumoto I, Tatsuzawa Y, Iwasaki A. Successful Surgical Fixation Using Bio-Absorbable Plates for Frail Chest in a Severe Osteoporotic Octogenarian. *Ann Thorac Cardiovasc Surg.* 2019;25(6):336-339. doi:10.5761/atcs.cr.17-00223

Benefits of Rib Plating on Postoperative Outcomes in Elderly 65+

When comparing the benefits of surgical management vs. conservative management in elderly patients with rib ;

- **Decreased ICU/hospital length of stay**
- **Decreased ventilation requirements**
- **Decreased pulmonary complications**
- **Decreased long-term pain medication requirements**
- **Decreased mortality rate**

But What About The Very Elderly Octogenarians and Nonagenarians?

Rib Plating and Postoperative Outcomes in **Very** Elderly

“Surgical Stabilization of Rib Fractures In Octogenarians and Beyond - What Are The Outcomes?”

Pieracci FM, Leasia K, Hernandez MC, et al. Surgical stabilization of rib fractures in octogenarians and beyond-what are the outcomes?. *J Trauma Acute Care Surg.* 2021;90(6):1014-1021. doi:10.1097/TA.0000000000003140

- Authors hypothesized that **SSRF is associated with decreased mortality** in trauma patients **80 years or older**.
 - Multicenter **retrospective cohort** study involving 8 centers.
 - SSRF from **2015 to 2020** matched to controls by study center, age, injury severity score, and presence of intracranial hemorrhage.
 - Patients with **Chest AIS<3, Head AIS>2, death within 24 hours**, and desire for no escalation of care were excluded.
 - A subgroup analysis compared **early** (0-2 days postinjury) to **late** (3-7 days postinjury) SSRF

Rib Plating and Postoperative Outcomes in **Very** Elderly

“Surgical Stabilization of Rib Fractures In Octogenarians and Beyond - What Are The Outcomes?”

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- Multivariable regression demonstrated a **decreased risk of mortality** for the SSRF group, as compared with the nonoperative group (RR, 0.41; 95% confidence interval, 0.24–0.69; $p < 0.01$).
- Conclusions:
 - SSRF may be considered a viable treatment option in **octogenarian/nonagenarians**.
 - Of note: SSRF was associated with **decreased mortality** despite the fact that patients selected for SSRF were significantly more injured than those who were managed nonoperatively

Future Focus

- Future focus needs to be on evaluating the risks vs benefits of surgical stabilization via rib plating for rib fractures in specifically octogenarians and nonagenarians.

Questions?

Resources

1. Adereti C, Fabien J, Adereti J, Pierre-Louis M, Chacon D, Adereti V. Rib Plating as an Effective Approach to Managing Traumatic Rib Injuries: A Review of the Literature. *Cureus*. 2022;14(9):e29664. Published 2022 Sep 27. doi:10.7759/cureus.29664
2. "Ageing and Health." *World Health Organization*, World Health Organization, 1 Oct. 2022, www.who.int/news-room/factsheets/detail/ageing-and-health
3. Baquero GA, Rich MW. Perioperative care in older adults. *J Geriatr Cardiol*. 2015;12(5):465-469. doi:10.11909/j.issn.1671-5411.2015.05.018
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11. Qureshi I, Kharel R, Mujahid N, Neupane I. Rib Fracture Management in Older Adults: A Scoping Review. *Brown Hospital Medicine*. 2023;2(3). doi:10.56305/001c.82211
12. Tanner I. Kim, M.D.,* Anand Brahmandam, M.B.B.S.,* Laura Skrip, PH.D., M.P.H.,† Timur Sarac, M.D.,‡ Alan Dardik, M.D.,* Cassius Iyad Ochoa Char, M.D.*
13. Waseda R, Matsumoto I, Tatsuzawa Y, Iwasaki A. Successful Surgical Fixation Using Bio-Absorbable Plates for Frail Chest in a Severe Osteoporotic Octogenarian. *Ann Thorac Cardiovasc Surg*. 2019;25(6):336-339. doi:10.5761/atcs.cr.17-00223
14. Wasfie T, Sowa M, White H, et al. Rib Plating Outcomes in Elderly Trauma Patients with Multiple Rib Fractures: A Community Hospital Experience. *Am Surg*. 2023;89(8):3519-3521. doi:10.1177/00031348231161713
15. Witt CE, Bulger EM. Comprehensive approach to the management of the patient with multiple rib fractures: a review and introduction of a bundled rib fracture management protocol. *Trauma Surg Acute Care Open*. 2017;2(1):e000064. Published 2017 Jan 5. doi:10.1136/tsaco-2016-000064