



**2022 CWISummit
Scientific Session - Thursday**

Moderator: David S. Morris, MD, FACS
Recorder: Nicole L. Werner, MD, MS, FACS

Title:

Improved Chest Wall Trauma Taxonomy: An Interdisciplinary CWIS and ASER Collaboration

Presenting author:

Scott Steenburg, MD, FASER

Indiana University School of Medicine, Associate Professor of Radiology

If you were a baseball player, what would be your walk-up introduction song? Hey Mickey

Discussant:

Alexander Colonna, MD, MSCI, FACS

University of Utah, Associate Professor

Name one item still on your bucket list. Completing an IronMan race

Authors:

- Scott D. Steenburg, MD, FASER
- Joel A. Gross, MD
- Fredric M. Pieracci, MD, MPH, FACS
- Mari T. Nummela, MD
- Jonathan Nguyen, MD
- Krystal L. Archer-Arroyo, MD
- Clint W. Sliker, MD
- Adam J. Kaye, MD, MHA, FACS

Background: Chest wall injury taxonomy and nomenclature are important components of rib and costal cartilage injury classification, which can be used for treatment planning and communication between providers. Despite the common nature of chest wall injuries, lack of uniform consensus remains regarding injury description as seen on imaging. It is anticipated that a more unified approach would improve communication and improve patient management. Prior work by the Chest Wall Injury Society (CWIS) used Delphi analysis to develop a taxonomy, although this was limited by lack of consensus in critical areas, as well as limited to ribs only (Edwards JG, Clarke P, Pieracci FM, et al. Taxonomy of multiple rib fractures: Results of the chest wall injury society international consensus survey. J Trauma Acute Care Surg 2019;88(2):e40-e45). Input from radiologists who interpret imaging exams on these patients was solicited for feedback with the hopes of creating a more precise chest wall injury taxonomy. We hypothesize that an interdisciplinary collaboration between CWIS and ASER will improve upon existing chest wall injury nomenclature and help future research on this topic.

Methods: In March 2021, representatives of the CWIS contacted representatives of the American Society of Emergency Radiology (ASER) to gather feedback on the consensus recommendations from the radiologist perspective. A workgroup consisting of 3 chest wall surgeons and 5 emergency/trauma radiologists with extensive experience diagnosing and characterizing chest wall injuries was formed to discuss chest wall injury definitions and taxonomy. A series of online meetings were held throughout 2021.



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Results: After identifying several ambiguous, incomplete, or confusing definitions in the CWIS consensus survey, the workgroup better defined and improved the language of chest wall injury that was proposed by Edwards manuscript. Specifically, more precise definitions related to rib and costal cartilage fracture location, comminution, displacement, and flail segments were developed. Proposed changes include more accurate characterization of rib fracture displacement and consistent description of costal cartilage fractures.

Conclusion: From the radiologists' perspective, the 2019 consensus survey of the CWIS provides valuable insight into the important features of chest wall injuries, but it contains a number of ambiguous, incomplete, or confusing definitions. Further delineation and dissemination of chest wall injury taxonomy to the radiology community may improve image interpretation, reporting and communication of findings in patients with chest wall injuries. Next steps could include dissemination of the key issues identified in the Edwards paper with proposed modifications to be considered by the wider community of chest wall surgeons and emergency radiologists.

Notes:



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Title:

Incidence of Surgical Rib Fixation at International Chest Wall Injury Society Collaborative Centers and a Guide for Expected Number of Cases (CWIS-CC1)

Presenting author:

Evert A. Eriksson, MD, FACS, FCCM, FCCP
Medical University of South Carolina, Trauma Medical Director
Imagine you can instantly learn any language. Which would you choose? Wookie

Discussant:

W. Matthew Vassy, MD, FACS
Northeast Georgia Medical Center, Director of Trauma and Acute Care Surgery
What is a current trend that you just don't understand? Men's cropped pants

Authors:

Background: Surgical stabilization of rib fractures (SSRF) improves outcomes in certain patient populations. The Chest Wall Injury Society (CWIS) was formed to optimize operative and non-operative care of patients with chest wall injury. In 2021, CWIS began a new initiative to recognize centers who epitomize this mission and recognized them as CWIS Collaborative Centers (CWIS-CC). As the initial group of CWIS-CC, we sought to identify incidence of SSRF at our institutions and describe on which patient populations SSRF is performed.

Methods: A retrospective registry evaluation of all patients (age>15 years) treated at international trauma centers from 1/1/20 – 7/30/2021 was performed. Variables included: age, gender, mechanism of injury, injury severity score, abbreviated injury severity score (AIS), emergency department disposition, length of stay, presence of rib / sternal fractures, and surgical stabilization of rib / sternal fractures. Ethics / IRB approval was obtained at each center. Data was compiled in Excel and statistics were performed with SPSS. A classification and regression tree analysis (CART) was used to identify differences in the data.

Results: Data was collected from 7 international centers representing 23,005 patient encounters. Incidence of rib fractures at each center ranged from 14 – 25% and sternal fractures 1-4%. SSRF was performed at each center in 1-3% of all patients and sternal fixation in 0-1% of all patients. Patients with rib fractures had SSRF performed in 6-17% of patients. CART analysis of SSRF by AIS-Chest demonstrated a difference in management by age group. AIS-Chest 3 had a SSRF rate of 5.8, 10.9, 16.8% based on the age ranges (16-29; 80-110), (30-49; 70-79), and (50-69) respectively (p<0.001). AIS-Chest-4/5 demonstrated a SSRF rate of 10.3, 26.1, and 43.4% for age ranges (16-29; 80-99), (30-49), and (50-79) respectively (p<0.001).

Conclusion: Rib fractures are common after trauma. The disproportionate rate of SSRF in patients age 50-79 should be further investigated as these may represent underserved populations. Based



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on our historical rates of SSRF, the anticipated rate of SSRF can be calculated based on number of rib fractures, AIS-Chest, and age.

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Title:

International Assessment of Rib Fracture Fixation Guidelines

Presenting author:

Jordan Kirsch, DO

Washington University School of Medicine, Clinical Instructor

Name one item still on your bucket list. Long sailing trip in Caribbean

Discussant:

Shakira W. Burton, MD

Atrium Health - Carolinas Medical Center, General Surgery Resident

Name one item still on your bucket list. Sky-diving

Authors:

- Jeff Choi, MD, MSc
- Cecilia Benz, MD
- Avanti Badrinathan, MD
- Thomas Crown, DO
- Alyssa Toia, DO
- Ryan S. Shine, MD
- Mark A. Kryskow, DO
- SarahAnn S. Whitbeck, MBA, FACEHP, CHCP
- Thomas W. White, MD, FACS, CNSC

Background: Surgical Stabilization of Rib Fractures (SSRF) has become increasingly more common over the past decade, driven in part by a similarly growing body of literature. Less than 1% of patients with rib fractures undergo SSRF. We hypothesized that institutional clinical practice guidelines did not contain the information necessary to guide patient selection for SSRF and the pre, intra, and postoperative considerations to perform the procedure. Previous work has suggested that it takes 17 years for research to be translated into clinical care. Now nearly 19 years since Tanaka et al's landmark 2002 paper, we aimed to assess the adoption of the literature into evidence-based guidelines for SSRF.

Methods: A request for rib fracture fixation guidelines/protocols was distributed by email and social media by the Chest Wall Injury Society (CWIS). The request included both CWIS members and non-members with interest in rib fracture care. Clinical practice guidelines from 34 centers in 4 countries (Australia, Great Britain, New Zealand, and The United States) were uploaded. Each document was then reviewed by 2 independent abstractors and the contents were extracted for analysis.

Results: Of the 34 guidelines reviewed, 30 included indications and contraindications, 28 included preoperative, 8 intraoperative, and 6 postoperative/ follow-up care recommendations.

The overwhelming majority of submissions list at least one injury pattern criteria as an indication for SSRF (93%) with the most common patterns being "displaced" rib fractures (93%), flail chest (90%), presence of 3 or greater rib fractures (83%), and hemithorax volume loss (37%). 30% had adopted



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Title:

Interobserver agreement for the Chest Wall Injury Society taxonomy of rib fractures using CT images

Presenting author:

Suzanne F.M. van Wijck, MD

Erasmus MC

If you were a baseball player, what would be your walk-up introduction song? Spice Up Your Life - Spice Girls

Discussant:

Niloofer Dehghan, MD, FRCSC, FAAOS

The CORE Institute, Chair of trauma

Authors:

- Suzanne F.M. Van Wijck, MD
- Christian Curran, MD
- Angela Sauaia, MD, PhD
- Esther M.M. Van Lieshout, PhD MSc
- SarahAnn S. Whitbeck, MBA, FACEHP, CHCP
- John G. Edwards, MD PhD
- Fredric M. Pieracci, MD MPH
- Mathieu M.E. Wijffels, MD PhD

Background: In 2020, a universal nomenclature for rib fractures was proposed by the international Chest Wall Injury Society taxonomy collaboration. The purpose of this study is to validate this taxonomy. We hypothesized that there would be at least moderate agreement, regardless of the observers' background.

Methods: An international group of independent observers evaluated axial, coronal, and sagittal CT images on an online platform from 11 rib fractures for location (anterior, lateral, or posterior), type (simple, wedge, or complex), and displacement (undisplaced, offset, or displaced) of rib fractures. The multi-rater kappa and and Gwet's Agreement Coefficient AC1 were calculated to estimate agreement among the observers.

Results: A total of 90 observers participated, with 76 (84%) complete responses. Strong agreement was found for the classification of fracture location (κ 0.83; 95% CI 0.69-0.97 and AC1 0.84; 95% CI 0.81-0.88), moderate for fracture type (κ 0.46; 95% CI 0.32-0.59 and AC1 0.50; 95% CI 0.45-0.55), and fair for rib fracture displacement (κ 0.38; 95% CI 0.21-0.54 and AC1 0.38; 95% CI 0.34-0.42).

Conclusion: Agreement on rib fracture type and displacement was lower than expected. The 'wedge' type fracture could potentially be omitted. Evaluation of additional imaging techniques will be needed to increase agreement on the classification of rib fracture type and displacement as defined by the CWIS taxonomy.

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