Peer Review File

Article information: https://dx.doi.org/10.21037/jtd-23-1117

Reviewer A

Thanks for submitting this manuscript to JTD. You conducted a meta-analysis on SSRF in non flail chest patients. I have several comments:
1) Was the Meta-Analysis registered on Prospero?

Response: *This systematic review and meta-analysis was registered under Research Registry (https://www.researchregistry.com/browse-the-registry#registryofsystematicreviewsmeta-analyses/registryofsystematicreviewsmeta-analysesdetails/62e09eb113e0be0021a6a1c0/) with a unique identifying number: reviewregistry1411. The original protocol was amended to include "skeletally mature" patients only and to define "Quality of Life" as part of secondary outcomes.*
Changes: *No changes in the text*

2) In my opinion, the discussion should be rewritten because you did not consider important and recent research that showed opposite results. For example, the most recent evidence is clear exposed in 2 recent prospective trials and therefore it's a little bit difficult nowadays to suggest surgical fixation in non flail chest patients. At least we don't know which subgroup of patients could benefit from surgery. (Beks RB, Reetz D, de Jong MB, Groenwold RHH, Hietbrink F, Edwards MJR, Leenen LPH, Houwert RM, Frölke JPM. 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. 2019 Aug;45(4):655-663. doi: 10.1007/s00068-018-1037-1. Epub 2018 Oct 19. PMID: 30341561; PMCID: PMC6689036.
Marasco SF, Balogh ZJ, Wullschleger ME, Hsu J, Patel B, Fitzgerald M, Martin K, Summerhayes R, Bailey M. Rib fixation in non-ventilator-dependent chest wall injuries: A prospective randomized trial. J Trauma Acute Care Surg. 2022 Jun 1;92(6):1047-1053. doi: 10.1097/TA.0000000000003549. Epub 2022 Jan 25. PMID: 35081599).

Response: *Thank you very much for your careful review and constructive suggestions with regard to our manuscript. The study by Beks et al is conducted in patients including flail type injury while our focus is on non-flail type injury. We do agree to include the paper of Marasco et al in the discussion.*
Changes: *We edited the discussion to include the findings of Marasco et al in Page 15, line 33-34 to Page 16, line 1-10.*

3) regarding the risk of bias assessment, it would be useful to add the "traffic light plot of the risk of bias".

Response*: We agree to include this.*

***Changes**: We added figure 9 in Page 29.*

Reviewer B

Thank you for submitting your highly interesting manuscript "Surgical Fixation of Multiple Rib Fractures in Asian Population: A Systematic Literature Review and Meta-Analysis". Presented is a review/meta-analysis of 12 systematic reviews and 11 meta-analyses on the clinical outcome of Asian patients with vs. without surgical rib stabilization. Surgical therapy for flail chest is largely uncontroversial. However, as you describe in your article, there is little consensus on surgical stabilization for non-flail rib fractures. This is, of course, true in the Western world as well- and the debate is still polemical in many points nowadays.

To the article: The abstract and introduction are coherently formulated. The methods including literature research and statistical data analysis are correctly performed and can be followed without doubt. The results please the traumatologic surgeon and confirm his own observations and data. The discussion including the described limitations is conclusive and points to still existing doubts regarding surgical indications for non-flail rib fractures. Here, a higher number of prospective studies is clearly missing - which are also unlikely to follow for ethical reasons. The table and all figures are clearly structured and underline the results. References are complete.
Two comments that should be addressed in the final manuscript:

1) the introduction refers to a comparison between Western and Asian populations (page 4, lines 132-135): the article does not answer this self-posed question and, in my opinion, also goes beyond the actual topic. A comparison between meta-analyses of both populations – regarding constitutional differences for example - would certainly be interesting for the future. However, in another manuscript… My recommendation would be to remove or reword the relevant text passage in the manuscript.

Response: We agree with the comment and we reword the paragraph.
Changes: See changes in Page 5, line 1-16.

2) analysis on mortality (page 11, lines 366-370) and discussion (page 14, lines 447-452): data on mortality in non-flail rib fractures should be critically evaluated. Untreated dislocated rib fractures and flail-chest injury undoubtedly contribute to a higher complication rate (especially pneumonia due to impaired respiratory mechanics, inadequate cough, etc.). However, mortality from thoracic trauma is largely determined by intra- (and extra-) thoracic concomitant injuries - not by the rib fractures per se. Our own study population shows a mortality of about 4-5%, mainly due to pericardial and/or cardiac (luxation) injuries in polytrauma patients. Reliable statements on mortality can therefore only be assessed by taking into account the severity of the trauma (e.g. ISS or AIS score).

***Response**: We agree with the comment and we try to gather data on severity of injury/trauma. However, the information was not reported in the included studies. We will incorporate this as a limitation in our study.*
***Changes**: See changes in Page 14, line 17-23.*

Reviewer C

Thank you for this well written and interesting manuscript. You were able to demonstrate the beneficial effects of SSRF known from western studies in the subgroup of Asian patients. This is a valuable contribution to the discussion of operative vs. conservative treatment of chest wall injuries going on in the scientific community.

***Response**: Thank you very much for your comment.*
***Changes**: No changes needed.*

Reviewer D

Thank you for your review of the literature to address the issue of rib fracture management in Asian populations. This work certainly reflects a large degree of work with regards to statistical analysis and the authors are to be commended.

A few comments:
1) First, it remains somewhat unclear from the written introduction why this research question is important and this should be further described. Yes, there are knowledge gaps in that most SSRF studies have been performed in Western populations, without specifically addressing Asian populations. But are there differences in Asian physiology such that one would suspect different outcomes from SSRF in this population? This seems basic, but important to clarify for the purposes of introducing the paper. If there is any research with regards to differences in fracture healing or other Orthopedic interventions in Asian populations, this would be essential to inform the audience of, in your introduction. It should additionally be clarified, whether the study is attempting to clarify differences in Asian physiology or Asian healthcare systems as this may represent separate research questions.
***Response**: We did a literature search and did not find studies which compared outcomes or physiologic characteristics between Western and Asian populations after orthopedic interventions. We are referring to differences in health system or practice patterns, which in our opinion may affect decisions in selecting appropriate treatment.*
***Changes**: We reworded this paragraph as a response to another reviewer. Please see changes in Page 5, line 1-16.*

2) Second, you have alluded to likely differences in management between Asian and Western healthcare systems for rib fractures. It would be very informative to know what specific

differences exist, as this would allow readers to assess and hypothesize whether or not these are truly significant or negligible confounding factors. The magnitude of differences in management, certainly affects the strength of the results and one's ability to conclude that the differences observed were truly due to the SSRF intervention alone. This is important especially important in light of the recent European Journal of Trauma RCT published this year (2023, Ruben J. Hoepelman 49:461-471) which failed to demonstrate improved outcomes with SSRF and raises questions about what differences in healthcare systems or procedural technique exist between the US and Europe, such that US studies have demonstrated benefits with SSRF, where a European study did not.

***Response**: We agree on the importance of the paper of Hoepelman as it provides contrasting evidence compared to previous studies. The fact that Asian studies are consistent in showing a benefit for SSRF while Western studies have mixed results warrants further investigation. Unfortunately, possible explanations for differences in Asian versus Western population in orthopedic interventions is not well studied and may be further explored in future systematic reviews.*
***Changes**: We included Hoepelman in the introduction section in Page 4, line 23-28.*

3) Third, the authors provided a statistical hypothesis and null hypothesis but failed to describe their own hypothesis and suspected study results. Did the authors expect the results or were they surprised by this at all?

***Response**: We avoid giving our own hypothesis and expectation on the study results as this may be interpreted as sources of bias in selecting and interpreting studies for the systematic review.*
***Changes**: We made no changes in the document related to this comment.*

Reviewer E

Any reason why this information would not be generalizable?

***Response**: The small sample size in some of the included studies and the non-randomized selection of subjects may be threats to the generalizability of our findings.*
***Changes**: We included a statement of limitation on generalizability in Page 14, Lines 25-27.*

Reviewer F

1. **The literature search of database is inconsistent in the Abstract and the main text. Please revise.**

Methods: The MEDLINE, Embase, and Cochrane Library databases were searched in this systematic literature review and meta-analysis to identify studies conducted in Asia that included patients with multiple non-flail rib fractures in at least one of their

32 ***##Literature search***

33

1 This systematic search of electronic databases [MEDLINE, Embase, Cochrane Central
2 Register of Controlled Trials (CENTRAL), and Cochrane Database of Systematic
3 Reviews] was performed in July 2022 by a medical writer (SP Abella). The search
4 strategy was conducted using the keywords multiple rib fracture and surgical fixation.

Response: **We have revised the manuscript (Page 2)**

2. Figure 5

References (5, 7) are not included in figure 5. Please check and revise.

2 Five studies that reported the risk of atelectasis were included in this meta-analysis
3 (14,18,5,7,30). One study described lower events of atelectasis in nonoperatively
4 treated patients (18), whereas four reported lower events of atelectasis in patients
5 following SSRF (14,5,7,30). The overall pooled analysis found a statistically significant
6 reduction in atelectasis in operatively treated patients with a risk ratio of [RR: 0.44 (95%
7 CI: 0.29 to 0.65), P<0.0001]. No heterogeneity (I^2=0%) was reported (*Figure 5*).

5. Senekjian L, Nirula R. Rib Fracture Fixation: Indications and Outcomes. Crit Care Clin 2017;33:153-65.

7. Pieracci FM, Leasia K, Bauman Z, et al. A multicenter, prospective, controlled clinical trial of surgical stabilization of rib fractures in patients with severe, nonflail fracture patterns (Chest Wall Injury Society NONFLAIL). J Trauma Acute Care Surg 2020;88:249-57.

Response: **We have revised the manuscript (Page 11)**

3. Figure 6

a. References (1,5,6,8,9) are not included in figure 6A. Please check and revise.

1. Lafferty PM, Anavian J, Will RE, et al. Operative treatment of chest wall injuries: indications, technique, and outcomes. J Bone Joint Surg Am 2011;93:97-110.

5. Senekjian L, Nirula R. Rib Fracture Fixation: Indications and Outcomes. Crit Care Clin 2017;33:153-65.

6. Li Y, Gao E, Yang Y, et al. Comparison of minimally invasive surgery for non-flail chest rib fractures: a prospective cohort study. J Thorac Dis 2020;12:3706-14.

8. Majercik S, Vijayakumar S, Olsen G, et al. Surgical stabilization of severe rib fractures decreases incidence of retained hemothorax and empyema. Am J Surg 2015;210:1112-6; discussion 1116-7.

9. Talbot BS, Gange CP Jr, Chaturvedi A, et al. Traumatic Rib Injury: Patterns, Imaging Pitfalls, Complications, and Treatment. Radiographics 2017;37:628-51.

Five studies assessed ICU LOS in this meta-analysis (18,5,6,9,31). Four of these demonstrated that operatively treated patients had a substantially lower mean of ICU stay (18,5,8,1). The pooled estimation found a significantly [MD: –4.(

***Response*: We have revised the manuscript (Page 11)**

b. (14,25-27,30,31) are 6 studies. Please check and revise.

16 **###Hospital length of stay**

17 Eight studies reported on HLOS (14,25-31). Seven of these studies showed a

18 significantly lower mean duration of hospital stay (14,25-27,30,31). The overall pooled

19 estimates showed that SSRF resulted in a significant reduction in hospital stay

***Response*: We have revised the manuscript (Page 11)**

4. Figure 8

Reference (27) is not included in figure 8. Please check and revise.

31 ###Risk of mortality

32 Nine studies reported mortality events (3,6,14,18,27,28-31). The pooled estimate

33 suggested no statistically significant difference in mortality between the SSRF and

1 nonoperative groups [RR: 0.94 (95% CI: 0.37 to 2.41), P=0.90]. Low heterogeneity

2 (I^2=17%) was found for this analysis (*Figure 8*).

3 27. Xiong M, Hu W, Lou Q, et al. Efficacy of nickel-titanium memory alloy in the

4 treatment of multiple rib fracture combined with sternal fracture. Exp Ther Med

5 2019;18:537-42.

***Response*: We have revised the manuscript (Page 12)**

5. Please cite **Figure 9** in the main text. Figures should be cited consecutively in the text and numbered in the order in which they are discussed.

***Response*: We have revised the manuscript (Page 10 and 26)**

6. Table 1

There are no letters "I, J" in the "Outcome†" column. Please check and revise.

†, the contribution of each study is shown with letters (A-J) indicative of each outcome type. A

C. respiratory complications; D. mortality; E. tracheotomy; F. length of hospital stay; G. lengt

***Response*: We have revised the manuscript (Page 24)**