

Peer Review File

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Review Comments

Reviewer A

I enjoyed reading this well written and referenced manuscript. The authors novel approach in the use of hierarchical clustering appears to support the contention that this approach may be useful in sorting large datasets and can serve as a preprocessing step for data analysis, and serve as an aid developing clinically oriented hypotheses.

Thank you for your review and we appreciate that you share our optimism that this will be a useful tool towards generating the next frontier of anatomic based rib fracture inquiry.

Reviewer B

Interesting topic. Agree that 3 rib fractures are not 3 rib fractures. Location is key, what muscles or other bones are helping to stabilize these fractures are key to patients healing. Understanding fracture patterns can lead to understanding how these ribs heal and can lead to better treatment modalities.

Knowing what patterns evolve around tracheostomy is important because it can lead us maybe focusing earlier on, on respiratory and pain control on these patients OR lead to earlier trach. I have some suggestions and there are a couple typos to review.

The entanglement diagrams are very confusing, not sure how you can present differently, but I am also not sure they are needed.

Thank you for your review and we appreciate your interest in our work. With respect to the entanglement diagrams, we included these as supplementary content that could be available either as digital content or upon request by an interested researcher. As a way to measure the utility of our hierarchical clustering dendrograms, the tanglegram is a plot of the two dendrograms side-by-side with appropriate connections to demonstrate unique nodes. This diagram is included to visually display the quality of our dendrogram alignment as a function of entanglement (where 1 is fully entangled and functionally more random, and 0 less entangled and therefore better aligned). Insofar as demonstrating our choice of clustering (and that the clustering presents as a series of choices) we feel that the entanglement value is necessary and having access to the visual representation is important to a researcher who intends to follow this process.

The third paragraph of the Methods, second paragraph of the results, and supplementary appendix 2 were updated to better reflect this.

Rib fracture clustering analysis can demonstrate important clinical outcome associations in motor vehicle and motorcycle accident-injured patients.

Need to fix the wording here

Line 114 do you mean grading?

We did intend to use “graduating” here, in the context that the chest injuries need a better more granular (or graduated) way to be described. The use of “grading” here would inappropriately point the reader towards thinking that an expert consensus of injury grade had been arrived at. We would support the assertion that chest injury grading is flawed due to being in adequately graduated.

Line 164-165 using an assigned color does not make sense, looks like a typo

182 single6 is a typeo

Thank you for these observations, we have corrected the typographical errors.

Reviewer C

I appreciate the opportunity to review this interesting report. Based on a large database and using novel clustering methodology, the authors investigated the pattern of rib fractures after MCC or MVC and patients who most likely suffered tracheostomy subsequently. This study offered lots of interesting and meaningful information regarding rib injuries for thoracic surgeons, especially when they encountered MCC or MVC. However, there are some points that need to be clarified.

1. Key findings can be 'Rib fracture clustering analysis demonstrated important clinical outcome associations in motor vehicle and motorcycle accident injured patients.'

Thank you for your review and we appreciate that you share our enthusiasm for this work. We have revised the soft wording we originally used in the Key Findings with the above suggestion.

2. Line 107, 'well known' should be 'well-known'.

3. Line 507, pls retain the same digits after the decimal point.

Thank you for these observations, we have corrected the typographical and numerical consistency errors.

4. Compared with the probability of tracheostomy, I am more interested in the treatment strategy under different conditions (injured ribs? collisions?). Is there association between the injured ribs/collisions and the necessity of SSRF? The answer may help thoracic surgeons in clinical decisions making.

Thank you for these thoughtful questions. We agree that the intrigue being offered with a tool such as this could be to either evaluate a clinical question multiple ways. In a traditional ante-grade fashion, starting with whether an incident condition produces an outcome (i.e. does the treatment strategy for collisions result in tracheostomy?) - we may see if collisions yield fracture pattern yield tracheostomy. By contrast, this methodology also allows an inverted line of inquiry (i.e. what fractures associate with tracheostomy? And what produces those fracture patterns?) - if fractures yielded tracheostomy but were yielded by specific injury. Presumably with a deep enough data resource, one could find an association between treatment methodology, injury, and outcome consequence... but we do not yet have a suitably mature dataset for this. With respect to SSRF, we appreciate the implication that our tool may have on pattern characterization and possible selection for treatment; however, our current study used a heterogenous population that was approximately 2/3 non-operatively managed. We look forward to being able to better delineate these pattern associations and their role in operative decision making.