Peer Review File

Article information: https://dx.doi.org/10.21037/jtd-23-857

Reviewer A

I have some questions regarding this manuscript prior to publications

Comment 1:
The title suggest, a look at process that allow patients to undergo surgical stabilisation of rib fractures within 24 hours of admission.
The Methodology section does not mention about the process at all.
Reply 1: We have changed the terminology. "processes" has been changed to "factors" or "variables" as we assess individual variables that might impact the timing to surgical stabilization of rib fractures (SSRF).
Changes in text: Manuscript title [page 1]; Introduction of abstract [page 2].

Comment 2:
One hurdle around centres that perform SSRF is access to theatres.
Was there a dedicated theatre room, if yes then was it available 24x7? If the resources were not utilised, how did the authors justify the same to administrators?
Reply 2: OR access is relatively constant because of a single 24-7 urgent/emergent OR which is however shared with multiple other services (EGS, urology etc. except for orthopedics). However, as staff has become more familiar with the operation, a possible subtle shift to quicker patient assessment and access to the OR instead of a novel service.
Changes in text: Discussion, page 10, first paragraph, lines 212-215.

Comment 3:
Line 65 of the Methodology section mentions indication for SSRF was poorly controlled pain despite of loco regional anaesthesia, however there is no data with regards the timing to insertion of these blocks or the time to evaluate the effect of the same from the time of injury. **Reply 3:** This is a valid point. We agree that for patients who are admitted to the OR within 24 hours, adequate pain control will take >24 hours. The specific indication for surgery was not documented. This was added to the Discussion.
Changes in text: Discussion, page 11, first paragraph, lines 251-255.

Question 4:
Result section suggest lower ISS patients being operated upon in the less than 24 hour group
If they are an isolated chest wall injury then it is difficult to understand the rationale behind early operation. Did all these patients have poor pain control in spite of multimodal pain relief? Were they ventilator dependent?
Reply 4: We believe that the lower ISS in the <24h group is likely due to their associated extra-thoracic injuries and not their lower number of rib fractures. Due to their associated injuries such as the significantly higher rate of pelvic and spine fractures, they were likely operated on later. Due to

our center being a high volume frontrunner in SSRF, we belief in the benefit of early surgery, thus allowing patients with less severe extra-thoracic injuries being operated on their thoracic injuries early. This was added to the Discussion. The choice to perform early SSRF is not based on ventilator dependency but rather the severity of the thoracic injuries. We added the rate of ventilator requirement.
Changes in text: Discussion, page 9, lines 183-196.

Question 5:
Line 103, suggest patient were referred from other centres for SSRF specifically, however there is no mention of time to injury with regards to admission at the peripheral centre or duration to transfer. Were beds readily available at the authors centre everyday of the week? Especially when there is mention of stabilising patients prior to transfer. Is there not a pre existing bias if the authors had already made their decision to operate and proceed to the procedure within 24 hours of arriving to their institute? Similarly, if patient has been injured on the weekend at a peripheral centre and was not referred till Monday, arriving at the authors hospital on Tuesday, it will make Wednesday the busiest day for SSRF!
Reply 5: We have added that time to admission at peripheral center or duration to transfer were not known. Indeed, beds for referral are always available if our hospital is not full. We are a central referral hospital for many outback hospitals and even out-of-state hospitals when it concerns thoracic trauma. We have elaborated on an explanation for this finding in the Discussion.
Changes in text: Discussion, page 11, lines 237-241.

Question 6
There is no data in the Results section about ventilated versus non ventilated patient This might support the authors rationale for early stabilisation in the ventilated group.
Reply 6: We added the rate of patients requiring ventilation. But, early SSRF at our institution is not indicated by ventilation requirement. Patients who are ventilated are likely more severely injured and more often instable, not allowing for early SSRF. If the ventilation requirement is due to the thoracic injuries, this might allow for early SSRF and is thus more dependent on the specifics of the injury than the ventilation requirement. Inability to wean due to thoracic injuries could be an indication for late SSRF, but was not assessed in this study.
Changes in text: Results, page 7, line 143-144.

Question 7:
I agree with the authors concluding statements that combined procedure with different sub specialists leading to a single visit to operation theatre is the way forward.
In the results table, with regards to timing of the operation some pelvic fractures (8%) and spinal fractures (22%) underwent SSRF in the early fixation group. Majority, 25 and 47% respectively underwent SSRF in a delayed timing. There is no mention about the rationale for the same. Was it surgeon preference or the complexity of the pelvic/spinal injury which made it difficult for positioning of the patient as majority of the fracture location is in lateral position?
Reply 7: We added that this exact rationale was not known, but indeed belief it was due to the complexity of the fractures rather than surgeon preference.
Changes in text: Discussion, page 9, lines 179-186.

I am willing to review the manuscript if the authors are comfortable to answer my queries.

Reviewer B

Comment 1:
1.The title of the paper implies an analysis of the process for early SSRF but in fact the authors are describing 2 different patient groups, those operated early vs those operated late/less severely injured vs more severely injured. As early SSRF has received increasing attention in recent years with several studies implying improved outcome there is a potential bias in including data from >10 years ago. Perhaps the authors should do a comparison including patients from the last 5 years. Patients operated late seem to be more severely injured. The authors have pointed this out as a potential reason for differences in outcome. However, the question remains in this study as the hypothesis seems to be that it is better to be operated within 24hrs. Perhaps it is better for severely injured patients to be operated late. A subgroup analysis of severely injured patients operated early vs late, alternatively a regression model according to different ISS or preferably NISS groups could add valuable information concerning whether injury severity is the main reason for late operation or if the time of inclusion (2010 vs 2019 for example) is the reason.
Reply 1: This is an interesting point. We have added this possible confounding effect of study year as a limitation in the Discussion. We believe that further analyses to investigate for example the effect of study year and the effect of the individual SSRF indications on timing provide a new research question and manuscript at this stage. We hope the reviewer agrees with the adjusted and expanded Discussion.
Changes in text: Discussion, page 12, lines 251-255

Comment 2:
2.The authors describe a standardized operative technique. Please clarify if all studied patients tolerated per-operative single-lung ventilation and if there was a difference in percentage between those operated early vs late? Also was the increased incidence of facial fractures in the late group due to difficulties in changing an ET to a double-lumen tube pre-operatively <24hrs? Also, the problem with pelvic fractures and early operation, were these lateral compression fractures/ acetabular fractures – was there a fear of placing the patient in a lateral position? These questions need to be analyzed if the process of early SSRF is to be studied.
Reply 2: Yes all patients tolerated single-lung ventilation. We were not able to distill whether the presence of facial fractures provided difficulties preoperatively. This data was not collected in our database. We do not use double lumen tubes but bronchial blockers. The variable pelvic/spine fracture has been elaborated on in the Discussion section. This is indeed likely due to the complexity of the fracture and inability to position the patient. We have recently shown that early SSRF is feasible in patients with operative pelvic fractures and added this to the Discussion as well.
Changes in text: Discussion, page 9, lines 177-186.

Comment 3:

3.The authors present several lung comorbidities but data on anti-coagulants that could affect the timing of surgery is missing.
Reply 3: This is a valid point and we do not have the rate of patients using anticoagulants for this population. This missing value was added to the Discussion.
Changes in text: Discussion, page 11, lines 248-255.

Comment 4:
4.Is the association between admission on a Wednesday and early surgery something that can be generalized, or is this an organization issue at the study institution?
Reply 4: We believe this interesting finding is institution specific due to local patterns in additional urgent case volume. We do not believe that it is generalizable. There was no difference between the days as for deciding to perform SSRF or to actually perform SSRF (Table 1).
No changes were made to the text.

Comment 5:
5.According to the criteria for SSRF at the study institution, “poorly controlled rib pain despite optimal medical management...” was an indication for operative management. This is difficult to assess within 24 hrs.
Reply 5: We agree with this comment. This is however one of our general indications for SSRF. We have elaborated on this possible confounding effect in the Discussion. We do believe that it is unlikely that a large part of patients was included solely on having poorly controlled rib pain without having displaced fractures or a flail segment or pulmonary derangement. In addition, we have developed a robust early locoregional analgesia protocol, involving administration of loco regional, as well as ketamine and lidocaine infusions, within four hours of presentation. This may involve starting the therapy in the emergency department.
Changes in text: Discussion, page 11-12, lines 248-255.

Reviewer C

The authors have performed an excellent review of their institutional outcomes. The ability to perform interventions within 24 hours may be nearly impossible at some institutions and the ability to accomplish this in nearly 50% of your patients is indeed a significant accomplishment to be commended. As the authors note, differences do not necessarily imply causality so thoughts behind the differences are likely the most important component of this paper. A few points are worth mention.

Comment 1:
1) To a trauma audience, it is almost certainly expected that injury severity would be a significant factor. However, there is some nuance that may warrant further explanation.
The paper comments on the delayed need for pelvic surgery interventions as a significant factor affecting timing and that incidence of additional procedures was low overall. We would appreciate a thought as to "why" as this affects generalizability to other institutions. Interestingly, abdominal

surgeries did not reach significance and additionally, did not seem to make up a large proportion of surgical interventions at all. This is interesting as it seems to either reflect a very different, less severely injured population than seen at other institutions, or reflects an aspect of the exclusion criteria of your institution such that major abdominal trauma and open abdomens precluded consideration for rib fixation outside a certain window. Otherwise, one might expect more major MVC blunt trauma to have both combined rib and operative abdominal trauma, with open abdomen/damage control procedures perhaps contributing to a delay in rib fixation. This may be worth commenting on, in order to improve generalizability of your results to other institutions. This ISS score of 21 in the delayed group, suggests these patients did likely have significant poly trauma so it is peculiar that abdominal surgery was not much of a factor. If this is due to institutional policy, in light of research demonstrating worse outcomes with delayed repair, as mentioned, this should be described. Additionally, it would be helpful to know what your institution's exclusion criteria is with regards to rib fixation when considering the factors described in your study.

Reply 1: We have added some thoughts on why additional procedures might have led to SSRF being performed later. As Table 1 demonstrates, there was a high rate of patients with solid organ injuries but indeed a low rate of patients requiring a laparotomy. We agree that these patients preclude early SSRF. This is however our typical rate (around 5%) given that the majority of blunt abdominal injuries at our institution are managed either non operatively or with endovascular embolization. We included our exclusion criteria.

Changes in text: Methods, page 5, line 103-106. Discussion, page 9, lines 183-195.

Comment 2:

2) It would be interesting to know the range of time to surgery in the delayed group as a patient who gets surgery at 48 hrs may have very different obstacles to surgery, than a patient who gets surgery at 5-7 days (i.e. due to inability to liberate from the ventilator). In fact the number of ventilated patients in each group is not described, although there is some possible ability to extrapolate severity from Ribscore, BPC18.

Reply 2: we agree this would be an interesting point and believe it would make up a valid future research question. This study focuses specifically on what factors allow a patient to go to the OR <24 hours as this is a multifactorial problem in many hospitals. When undergoing surgery after 24 hours, there is plentiful research on the effect on outcomes but not so much on what obstacles lead to later surgery. This is often difficult as data is collected retrospectively and the specific reason to perform late SSRF is not documented: thus not allowing to provide insight whether this is the surgeon’s preference, due to associated injuries or due to failure of conservative therapy. We would be happy to collaborate on such new research question.

No changes were made in text.

Comment 3:

3) The authors should be commended on overcoming the first significant obstacle in improving a pathway to surgery for a specific patient population: the surgeon. You have demonstrated improved ability accomplish early surgery over time, with all surgeons in the group performing rib fixation surgery.

We would be curious to know what factors perhaps contributed to this change: whether this was due entirely to internal interest from each member of the group, specific recruitment goals to develop a

cohesive group that could facilitate rib plating at any time, or if the department provided additional training or motivation to "buy in" to rib plating and to do so in such a consistent and early manner.
Reply 3: We believe it is a combination of all of the excellent points that you have made; targeted recruitment, a passionate and relentless champion who is willing to stay late or come in early to do the cases, and anectdocal “buy in” from other team members (e.g. anesthesia) who see the beneficial effects of SSRF. Also, as trauma has become less operative, we have noted that residents and fellows are particularly interested in SSRF as it is an operative way to improve outcomes in the trauma patient. This is elaborated on in the Discussion.
Changes in text: Discussion, page 10-11, lines 210-231.

Comment 4:
4) Similarly, we would appreciate a comment on how your institution's operating room accessibility has allowed for this as some institutions may have limited OR time to be able to accomplish rib plating. Your paper seems to imply that operating rooms are available whenever needed for these procedures and that surgical staff education and surgeon decision to operate were greater factors. For institutions attempting to emulate these early interventions, OR unavailability may be the most significant remaining obstacle, and may often be outside the surgeon or group's control.
Reply 4: We do indeed have a 24-7 urgent emergency room which is shared with other services. Access to our urgent OR is determined by a Priority or “P” system. A case may be booked as P1 (emergent), P2 (in the OR within 4 hours), P3 (within 12 hours), P4 (within 24 hours). The senior author was able to successfully lobby for SSRF to move from a P4 to a P3 case, which allowed for earlier and more consistent OR access. This change happened prior to the time period of this study, and so should not have affected the results, but is a great development forward.
Changes in text: Discussion, page 10-11, lines 210

Overall, you have done an excellent job providing institutional data on significant factors affecting the efficiency of early rib intervention. Would recommend publication with minor revisions to elaborate on some of the factors as described above.

Reviewer D

Comment 1
I find it interesting that patients with higher ISS scores were in the late group. Is there any information in your data set that can tease out what type of injuries were associated with delayed fixation other than pelvic fractures?
Reply 1: this is indeed an interesting finding. We hypothesize that the higher ISS was also associated with for example non-collected injuries and more severe injuries of for example pelvic, spine, and solid organ injuries. We only have the rate of pelvic, spine, solid organ, and long bone fractures but do not have insight into the severity. So we elaborated on this finding in the Discussion.
Changes in text: Discussion, page 9, lines 177-186 & page 11-12, lines 248-255.