



The Forgotten Frailty Fracture: A Single Centre Experience in Managing Rib Fractures in Older Patients

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Abstract

Introduction: With almost 25% of the UK population being 65 or older by 2,038 there has been a greater focus on management of frailty fractures. Despite this there is little guidance on the management of rib fractures in this cohort of patients. Consequently, there rages on a debate regarding the treatment of these patients, especially in respect to the use of Open Reduction and Internal Fixation (ORIF).

Method: We aimed to assess the difference in treatment choice and outcomes (length of stay, 30 day mortality) comparing patients under 65 with those 65 or over. We retrospectively analyzed all cases of patients admitted with isolated >2 rib fractures over a 24 month period (November 2016 to October 2018). Statistical analysis was carried out using t test and Kaplan-Meier Survival Curve to compare outcomes.

Results: Over the 24 month period 329 patients were identified and followed up for 30 days. In the overall cohort, it was found patients who underwent ORIF were younger ($p=0.01$) but had more fractures ($p=0.01$). Older patients had a longer length of stay ($p=0.01$) and had an increased mortality at 30 days ($p=0.01$).

Conclusion: In the case of rib fractures it appears there is a great disparity between their treatment and the treatment of other frailty fractures such as neck of femur. This is due to a lack of guidelines/pathways regarding both choice of operative versus non-operative management and perioperative care. We feel there is an emerging role for the wider use of open reduction and internal fixation for older patients and also feel there needs to be a greater multidisciplinary approach to their care.

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Received Date: 21 Jan 2021

Accepted Date: 16 Feb 2021

Published Date: 18 Feb 2021

Citation:

Walji HD, Martin-Ucar AE. The Forgotten Frailty Fracture: A Single Centre Experience in Managing Rib Fractures in Older Patients. *World J Surg Surgical Res.* 2021; 4: 1286.

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Keywords: Rib fractures; Open reduction and Internal fixation; Frailty

Highlights

The United Kingdom has an aging population with an increasing number of older and frailer patients suffering rib fractures. In our single centre study, it was found older patients were more likely to have longer lengths of inpatient stay, increased 30 day mortality and less likely to undergo open reduction and internal fixation of rib fractures. There is a clear need for robust guidelines in the management of rib fractures, especially with reference to older frail patients. Further multi-centre, large scale and randomized research needs to be done with respect to the use of open reduction and internal fixation.

Introduction

In the UK, over 500,000 patients each year are admitted to hospitals with frailty fractures [1]. With an estimated 24.2% of the UK population being 65 years or older by 2038 it is likely that this figure will only increase [2]. Common frailty fractures include hip, vertebral, wrist, pelvis and ribs. The centralization of trauma services in the UK means cardiothoracic units are playing a bigger part in the front-line trauma service. Despite this expanding role there are still no clear guidelines on the perioperative and long-term management of older patients suffering with rib fractures. Furthermore, the complexity of frailty and by the very nature of trauma to the thorax, there is a very high incidence of morbidity and mortality. Older patients are more likely to suffer with severe pain, respiratory compromise, thromboembolic events and a global decrease in functional state after suffering rib fractures. Alongside the basic medical management of these patients there rages on a debate regarding the use of open reduction and internal fixation. This paper looks at the practice in a specialist trauma centre regarding the management and outcomes of different populations of patients suffering with rib fractures.

Method

This case series is a retrospective analysis of patients admitted with rib fractures at a specialist trauma centre in the United Kingdom. Patients aged 18 years old or greater who were directly admitted to the thoracic ward with >2 rib fractures were included in this review. All patients requiring level 2 or 3 support were excluded and any patients who were suffering with other major traumatic injuries (such as a hip fracture) or under joint care between specialities were also excluded from this review. The admissions over a 24 month period (November 2016 to October 2018) were analyzed looking at primary and secondary points including patient survival, length of stay, choice of operative or non-operative management and co-morbidities were all recorded. All patients were followed up for 30 days. The primary outcome of morality was compared using a Kaplan-Meier Survival Curve with secondary outcomes compared using a t test.

Results

Over 1000 patients were seen in the emergency department suffering with rib fractures, many of which also had other severe or life threatening injuries. We identified 329 consecutive patients [229 male and 100 female, median age of 67 (range 22 to 98) years] admitted under thoracic surgery. Open Reduction and Internal Fixation (ORIF) was performed in 71 patients compared to non-operative management in 258 (Table 1). In our first two years of practice with open reduction and internal fixation for blunt thoracic trauma we found that patients treated surgically were younger ($p=0.01$) but with more fractures than the non-operative cohort ($p=0.01$). The length of hospital stay was not statistically different between the two groups ($p=0.08$). A subset of this patient group was reviewed (patients 65 years or older) to look into the outcomes of older patients and the use of open reduction and internal fixation (Table 2). As seen in Figure 1, we found that older patients had a statistically longer length of stay ($P=0.01$), especially when treated non-surgically. There was also a noted decreased survival at 30 days ($P=0.01$). In Figure 2 it can be seen that patients 65 or over have a 10 fold increase in 30 day mortality, though only contributing to just over 50% of admissions.

Discussion

The very nature of the thorax and the structures which lay within it suggests trauma to the area can start a soliloquy of events resulting in either severe morbidity or mortality. Underlying lung injuries can quickly result in respiratory failure. Severe pain can cause immobility and subsequent pneumonia or venous thromboembolic events. As can be seen by our results each patient stays almost a week, with more than 1 in 20 dying within 30 days. On a typical 32 bedded cardiothoracic ward at any given time 10% will be used by thoracic patients suffering with isolated or predominant thoracic trauma. Furthermore, this figure does not take into account the polytrauma patients who are admitted to level 2 or 3 cares, under joint care or sent to a polytrauma/enhanced care ward. Of this second group of patients which we have not examined, it is very conceivable that a portion of these will also suffer with severe morbidity or mortality due to their rib fractures. The use of surgical fixation in rib fracture management is a topic of much discussion and debate. With no clear guidelines, robust randomized control trials or general consensus it falls to the individual clinician/department to decide its management approach. Due to this lack of standardization selecting which patients to operate on and the operative approach is highly variable. Moreover, there is an overlap in service between the trauma and thoracic surgeons in

Table 1: Results for all patients admitted under thoracic surgery with >2 rib fractures.

	ORIF	Cons	Total
Number of Patients N (%)	71 (22%)	258 (78%)	329 (100%)
Median number of fractures (range)	6 (2-20)	5 (3-19)	5 (3-20)
Median Age (range)	56 (22-92)	70 (22-98)	67 (22-98)
Median length of stay (range)	8 (3-38)	6 (2-55)	6 (2-55)
30 Day Mortality N (%)	0 (0%)	20 (8%)	20 (6%)

Table 2: Results for patient's age 65 or greater admitted under thoracic surgery with >2 rib fractures.

	ORIF	Cons	Total
Number of Patients N (%)	23 (13%)	156 (87%)	179 (100%)
Median number of fractures (range)	7 (3-13)	5 (3-19)	5 (3-19)
Median Age (range)	73 (66 - 92)	78 (65-98)	78 (65- 98)
Median length of stay (range)	9 (5-33)	7 (2-55)	8 (2-55)
30 Day Mortality N (%)	0 (0%)	19 (12%)	19 (11%)

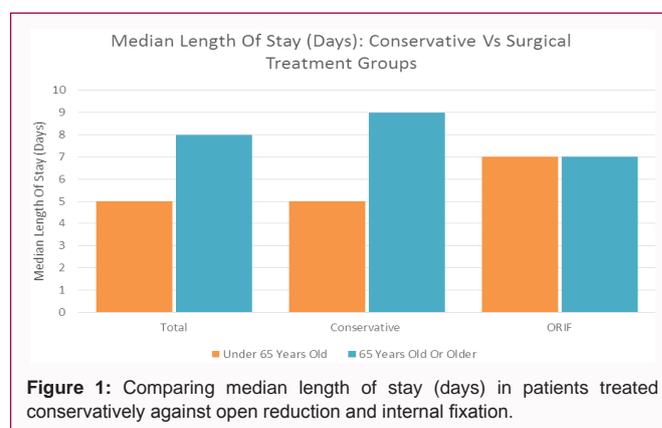


Figure 1: Comparing median length of stay (days) in patients treated conservatively against open reduction and internal fixation.

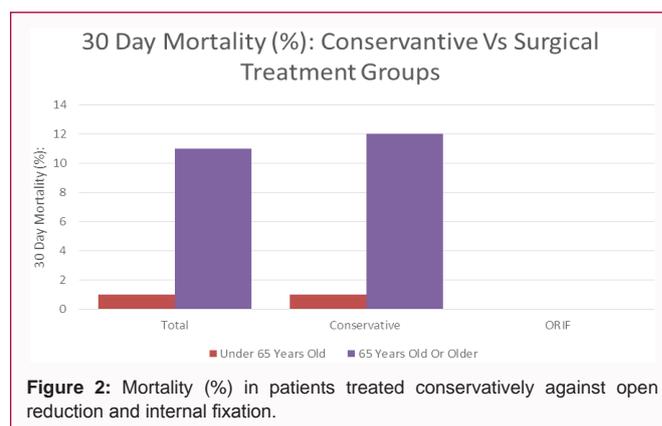


Figure 2: Mortality (%) in patients treated conservatively against open reduction and internal fixation.

both ward base management and operative technique. The choice of absolute versus relative stabilization, assessment of the underlying lung *via* Video Assisted Thoracoscopy and insertions of paravertebral blocks are entirely dependent on the surgeon's preference/training. Though in our cohort only a small percentage of patients aged 65 or over were selected for open reduction and internal fixation, using a Kaplan-Meier estimator there was a statistically significant reduction in mortality ($P=0.05$) when comparing open reduction and internal fixation to conservative management. Though this was not a randomized cohort and therefore selection bias is a factor, it is of note that patients selected for open reduction and internal fixation were

likely to have more fractures than patients managed conservatively. Assessing the literature since the turn of the century there have been 4 randomized control trials comparing ORIF to conservative management with a total cohort of 287 patients (the largest study consisting of 164 patients). Tanaka et al study [3] randomized 37 patients into ORIF (N=18) or internal pneumatic stabilization (N=18). The cohort of patients selected for this trial were patients who had been medically optimized on a ventilator, with at least 6 rib fractures at day 5 post trauma. Their study showed a statistically significant reduction in length of ventilatory support, ITU stay and incidence of pneumonia in the ORIF group. They also showed 6 months more patients in the ORIF arm had returned to work. The Granetzny et al. study [4] randomized 20 patients to each arm of their trial (40 patient's total). Their inclusion criteria looked at patients with 3 or more rib fractures. They established there was statistically significant reduction in pneumonia in their patients treated with ORIF. In 2013, Marasco et al. [5] randomized 46 patients, half into each arm comparing ORIF and conservative management. Similar to Granetzny et al. [4], their study assessed patients with 3 or more rib fractures. The study found patients treated with ORIF spent statically less time in intensive care. They also showed a reduction in pneumonia in this group however this did not reach statistical significance ($P=0.07$). The most recent study by Wu et al. [6] was also the largest. This study randomized 164 patients with 3 or more rib fractures in to an ORIF arm (N=75) and conservative management arm (N=89). Their study showed statically significant reductions in pneumonia, ITU length of stay, overall hospital length of stay and mortality. Unfortunately, the above studies did not specifically look at outcomes of frail patients however each showed a consistent reduction in hospital length of stay and pneumonia. Though in our observation study we excluded patients requiring mechanical ventilation these studies can be used as a parallax of evidence as to the need for a robust multi-centre randomized controlled trial. Currently in the United Kingdom there is a large trial multi-centre trial comparing ORIF to conservative management however the results of this are at present unknown [7]. Ever since it was recognized that the mortality post hip fracture was unacceptably high there has been a culture change amongst trauma surgeons. This change has placed a greater emphasis on not only managing the patient's fracture but also looking more long term at preventative measures both in terms of bone physiology and overall functional state. The United Kingdom's National Institute for health and Clinical Excellence (NICE) guideline CG124 [8] for hip fracture management advises: "Liaison or integration with related services, particularly mental health, falls prevention, bone health, primary care and social services". Broadly speaking this guideline advises assessing each patient for frailty and then using a multidisciplinary method to treat them. This approach includes a team of orthogeriatricians, physiotherapists, occupational therapists, social workers, pharmacists and much more. It is required because it is known that

patients who suffer with hip fractures are likely to be osteoporotic, falls risks, have polypharmacy and possible social concerns. The result of this multidisciplinary treatment pathway has been a close to 50% reduction in overall hip fracture related mortality (30 day) from 2006 to 2018 [9,10]. When considering the above scenario, it is obvious that patients suffering rib fractures are often the same subset of the population. They frequently are osteoporotic, falls risks, have polypharmacy and social concerns. However, unlike patients with hip fractures, there is no pathway to ensure, for example, calcium and vitamin D levels are checked; medications are rationalized, or their rehab needs are being met.

Conclusion

It is clear there is a great disparity between the treatment of rib fractures and other frailty fractures. This is due to a lack of guidelines/pathways regarding both operative management and perioperative care. We feel there is an emerging role for the wider use of open reduction and internal fixation for frail patients and also feel there needs to be a greater multidisciplinary approach to their care.

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