Rib fracture management in the older adult; an opportunity for multidisciplinary working

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The elderly will soon make up the largest number of patients sustaining major trauma; a fall from standing height is their most common mechanism of injury[1]. Rib fractures are a common consequence of blunt chest trauma and are important to recognise and diagnose as complications can be fatal. They can be considered a surrogate for major trauma as up to 90% of patients will go on to have additional injuries identified[2]. The older adult presents a unique challenge. Their injuries are often under-estimated and therefore under-triaged. Delays to diagnosis are not uncommon[3].

The mortality and thoracic morbidity in the elderly as a result of rib fractures is double that of their younger counterparts. In elderly patients, for each additional rib fracture, mortality increases by 19% and the risk of pneumonia increases by 27%[4]. It is therefore not surprising that older adults who sustain rib fractures have increased lengths of stay and more prolonged intensive care admissions[5–7].

Elderly patients whose injuries are not recognised at the front door are usually spread across a number of different bed bases within the hospital. They are often on medical wards where staff have comparatively limited experience in managing traumatic injuries. Older adults who sustain rib fractures are often frail and comorbid. Their injuries cause decompensation of their medical problems and delirium which in turn leads to complex discharge planning; issues that surgical teams do not feel best placed to deal with. Decisions regarding which team these patients should be admitted under can therefore be contentious. Nationally, there is significant variation, and even in institutions such as ours where pathways do exist, conflicts often arise as to where the patient should be managed and by whom.

This article aims to address the key issues that arise when managing older adults with rib fractures and highlights the importance of tailoring clinical care to their specific needs.

Imaging

A plain chest radiograph will only detect 50% of rib fractures[8] whereas computerised tomography (CT) is significantly more sensitive and is therefore the recommended imaging modality[9]. Due to underlying osteoporosis, the elderly can sustain life-threatening injuries following what can be perceived as minor insults. Therefore, as clinicians, we should have a very low

threshold for performing cross sectional imaging if chest injuries are suspected; particularly in this patient group. The presence of flail chest is associated with significant mortality (15-17%)[10]; paradoxical movement of the flail segment during inspiration restricts the underlying lung tissue, increases the likelihood of lung contusion and leads to ineffective ventilation.

Risk stratification

There are a number of risk stratification scores that have been validated for use in rib fractures. In our centre we use the Battle Score[11] which comprises a number of factors that are known to influence outcomes (Table 1).

The final score is then converted to a percentage risk of developing complications (Table 2). Complications in this instance refers to mortality, morbidity (including all pulmonary complications), admission to intensive care and prolonged inpatient admission (greater than 7 days).

With a point given to each decade of life, the elderly automatically score highly. For example, an 80-year-old with a background of asthma and atrial fibrillation who is taking Apixaban will score 16 on the Battle Score without having even sustained a fracture. Additionally, this scoring system does not make any adjustment for patients with lower baseline saturations; such as those with Chronic Obstructive Pulmonary Disease (COPD).

Other validated scores include the Rib Score (RS), Rib Fracture Score (RFS) and the Chest Trauma Score (CTS). In a recent comparison of these three scores[12], the CTS was felt to be most useful in predicting outcomes in patients over the age of 65. A score of six or more was associated with an increased mortality, increased length of stay and increased rates of pneumonia. This scoring system puts less emphasis on patient specific characteristics but gives points for injury related factors including the number of ribs fractured, bilateral fractures and the presence of pulmonary contusions[13].

Analgesia

Morbidity and mortality from rib fractures occurs as a result of respiratory complications. Direct trauma, impaired gas exchange and pain-induced hypoventilation predispose to atelectasis, retention of pulmonary secretions, pneumonia and respiratory failure. Adequate analgesia is therefore the cornerstone of effective rib fracture management.

As a general rule, escalation of analgesia is guided by the risk stratification score although in our experience, individual patient requirements can vary hugely. Lower scores are treated with oral analgesia in the first instance whereas the highest scores should be referred for specialist pain team input and consideration of regional anaesthesia.

Locally, patients are grouped depending on their Battle Score (Table 3).

It is vital that patients are able to cough and take a deep inspiration. If pain is continuing to limit effective respiration or engagement with physiotherapy then analgesia must be up-titrated as a priority. Elderly patients with cognitive impairment may not always be able to articulate that they are in pain and so attention should be paid to non-verbal and observational cues. These include autonomic changes, facial expressions and body language as well as inter-personal interactions. Tools such as The Abbey Pain Scale[14] or Visual Analogue Scales should be considered. Alongside many other causes, pain is also a well-recognised trigger for delirium. Analgesia should therefore always be reviewed in a patient who is newly confused.

There are several factors that must be taken into account when prescribing in the elderly. Non-steroidal anti-inflammatory drugs (NSAIDs) are often contra-indicated in the older adult due to pre-existing medical conditions such as heart failure, renal failure or risk of gastro-intestinal bleeding. Codeine and oral morphine are renally excreted and should be used with extreme caution in renal impairment due to the risk of accumulation. Oxycodone is therefore preferred. With all routes, opioids can cause hypotension, sedation, falls and delirium.

The use of Patient Controlled Analgesia (PCA) requires both cognitive ability and manual dexterity. Patients who are confused, have concurrent upper limbs injuries or those with severe arthritis are likely to have difficulties and this must be taken into consideration. >>

Risk factor	Score	
Age	1	Score 1 for each additional 10-year increase after the age of 10
Number of rib fractures	3	Score 3 for each additional rib fracture
Chronic lung disease	5	
Anticoagulant use pre-injury	4	
Oxygen saturations	2	Score 2 per 5% reduction in oxygen saturations; starting at 94%

Table 1: Battle Score.

Final risk score	Probability of developing complications
0-10	13%
11-15	29%
16-20	52%
21-25	70%
26-30	80%
31+	88%

Table 2: Probability of complications.

	Battle score	Recommendation
Conservative	0 -10	simple oral analgesia, may be safe for discharge home
Progressive	11-20	consider PCA
Aggressive	21-30	PCA and consideration of regional anaesthesia
Emergent	31 or more	urgent assessment for regional anaesthesia

Table 3: Battle score and recommendations.

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Regional anaesthesia reduces the systemic opioid burden which is particularly important in the elderly who are more susceptible to side effects[15]. Conventional techniques to manage rib fractures include epidural analgesia, paravertebral and interpleural blocks. However, these are relatively contra-indicated in those who are anti-coagulated[16]; which accounts for a moderately large proportion of older adults. Epidurals in particular also come with other added side effects including hypotension, urinary retention and the potential for motor block which can limit mobility[17]. Serratus anterior and erector spinae blocks are comparatively newer techniques which have fewer side effects and very few contra-indications; making them an ideal option for the elderly population.

Other considerations

Chest physiotherapy is essential for all patients with rib fractures[18]. Evidence also supports the use of humidified oxygen and saline nebulisers to help with secretion clearance[19]. In patients with lung contusions, clinicians should have a low threshold for starting antibiotics if infection is suspected; though to our knowledge, there is currently no evidence to support their use prophylactically.

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Rib fracture patients admitted under the care of Trauma and Orthopaedics (in contrast to General Medicine or Cardiothoracics) tend to be polytrauma patients who have additional injuries. This adds an extra layer of complexity to their management. In particular, patients with spinal injuries who require immobilisation or spinal precautions are at higher risk of deterioration from a chest point of view as their ability to comply with physiotherapy and clear secretions is limited. It is important that this increased risk is recognised from the outset as these patients usually require rapid escalation of analgesia; often irrespective of their risk stratification score.

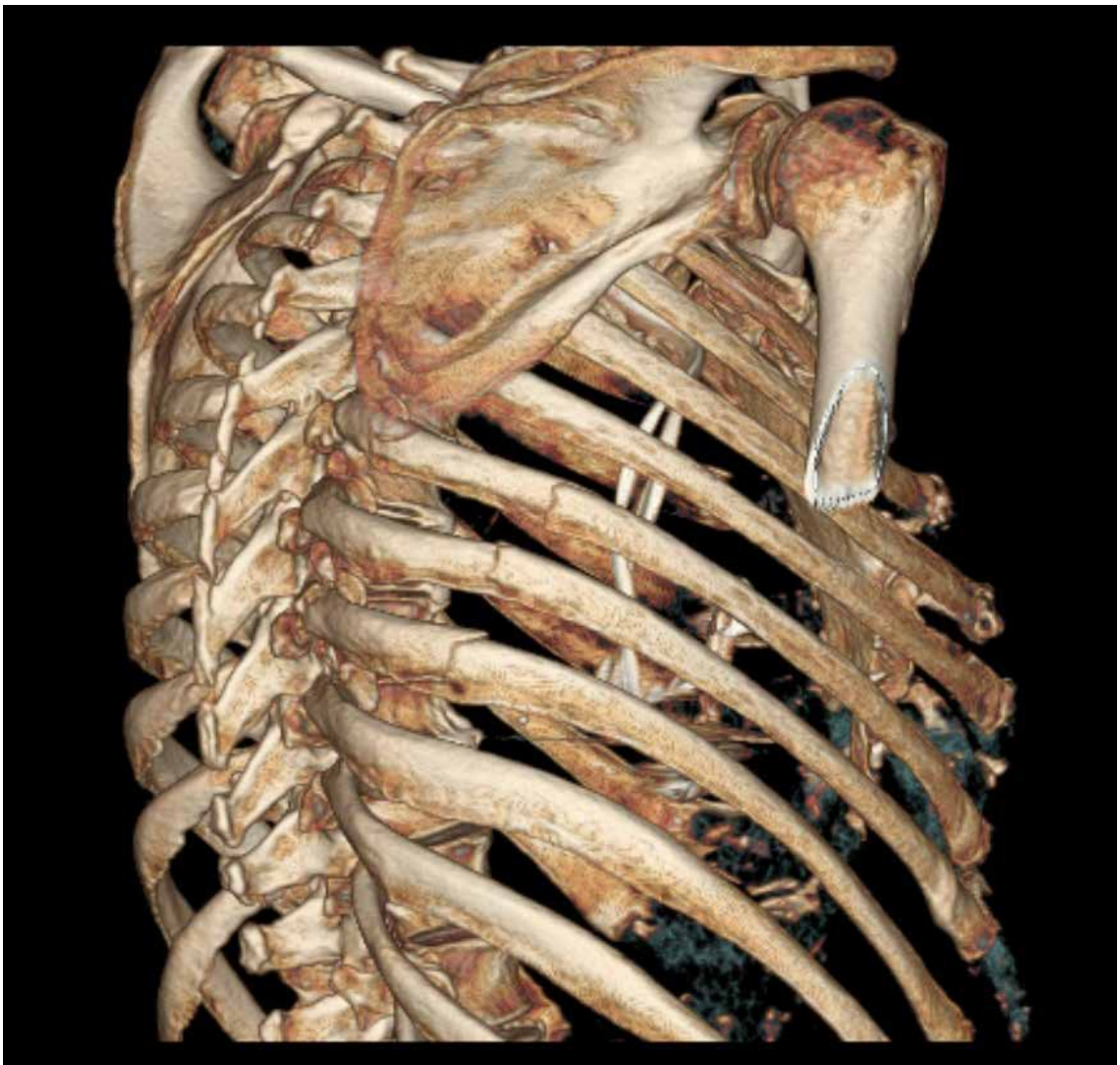


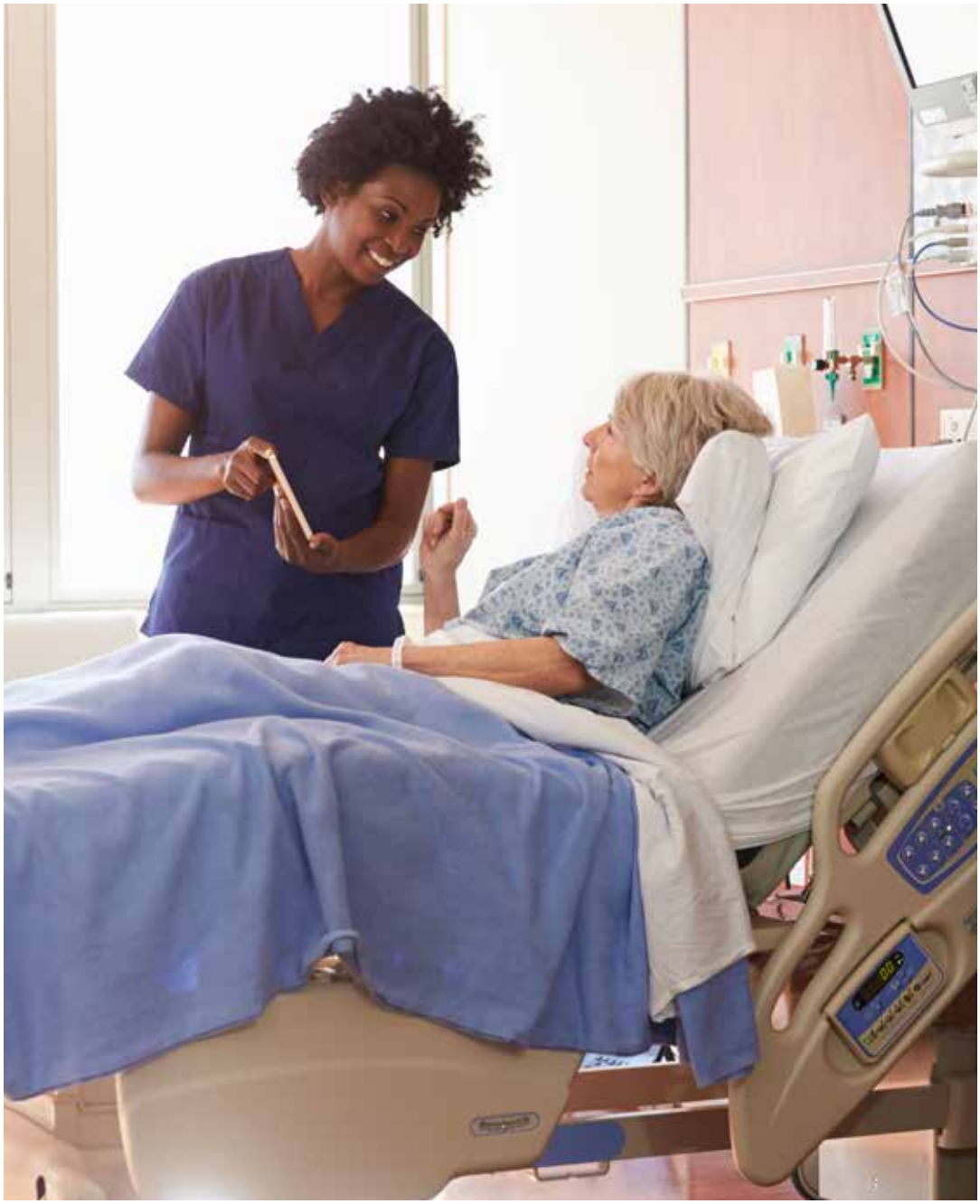
Figure 1: 3D rib fracture reconstruction. Image courtesy of Dr Ed Sellon MRCS MSc(SEM) FRCR RAMC, Consultant Radiologist, Oxford University Hospitals NHS Foundation Trust.

Risk stratification tools such as the Battle score are useful to help communicate the severity of an injury to both patients and families. In turn, they can also be used to introduce discussions around escalation of treatment. Many patients who sustain rib fractures are elderly and frail with multiple comorbidities and ensuring that appropriate ceilings of care are put in place in a timely manner is essential.

Surgical fixation

Surgical fixation aims to stabilise the chest wall to facilitate effective respiration but is a somewhat controversial area and consensus on management is required; particularly in the elderly population. Several studies have proposed that fixation in patients with severe flail chest can lead to a reduction in the incidence of pneumonia, reduced length of intensive care admission, improved lung function and earlier return to work[20–22].

However, the majority of trials have only included patients that are eligible for mechanical intubation and ventilation and therefore omit the frail elderly. A study published earlier this year looking at non-flail injuries has suggested that surgical fixation can improve the primary outcome of pain control at two week follow-up[23]. However, patients aged over 80 were actively excluded. There remains a paucity of robust evidence when it comes to surgical management in the older adult.



Our experience

Whilst orthogeriatrics is a well-established model in hip fracture care, most geriatricians do not have experience in managing patients with rib fractures. Perioperative medicine is a rapidly emerging speciality and, in this context, we have recently become one of a few centres in the UK to launch a Major Trauma Geriatrics service. This has provided us with an insight into the challenges we face in caring for these patients.

It is clear that management of elderly patients with rib fractures requires a multi-disciplinary approach from physicians, trauma and orthopaedic surgeons, thoracic surgeons and specialist pain teams including anaesthetists who are skilled at performing regional blocks. This however raises questions about where these patients should be managed and by whom. Physicians are not traditionally trained to manage rib fractures and nursing staff on medical wards often not familiar with patient-controlled analgesia or epidural catheters. Conversely, surgeons are arguably not best placed to care for the complex elderly who do not require operative intervention. Inter-disciplinary learning and shared decision making is therefore key.

In our experience, there are relatively few anaesthetists who are skilled in the newer regional anaesthetic techniques which may be more suited to the elderly population. This means that their availability can be limited; especially out of hours when increasing constraints on emergency operating theatre capacity means that these patients are often not seen as a priority.

Locally, we have developed a rib fracture working group and pathway; aiming to raise awareness of chest wall trauma in older adults and promote prompt recognition of injury through early CT. Appropriate analgesia is guided by the Battle Score and patient pathways through the hospital are facilitated by early senior clinical review. Through clear lines of communication and collaborative learning we are aiming to improve the quality of care for these patients.

The Future

Many elderly patients admitted with rib fractures have their diagnosis delayed as their injuries are not immediately recognised. Choice of analgesia is limited in the context of cognitive impairment, comorbidities and concurrent use of anticoagulation. As a result, these patients are at particularly high risk of deterioration and it is therefore vital that care is escalated early. Multi-disciplinary rib fracture working groups, clear clinical pathways, expansion of orthogeriatric/perioperative medicine services and further research to help guide best practice are all required if we are to improve outcomes for this patient group. ■

References

References can be found online at www.boa.ac.uk/publications/JTO.