Poster no: 20

Defining what Constitutes a 'Healed' Spinal Fracture in a Patient Managed with Non-Operative Treatment

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Introduction

Spinal fractures are breaks in the spine and can be managed either conservatively or surgically. Conservative treatment involves rest, analgesia, braces if required and monitoring via imaging if required (1). There are no specific guidelines regarding how to assess whether a fracture has healed, clinically or radiologically. Therefore, decisions are made based on the clinician's opinion from their experience. It is important to assess fracture healing as accurately as possible, otherwise it can cause the patient unnecessary pain and suffering. I reviewed some existing literature and found that an absence of a fracture line on imaging is a common criteria clinicians use to decide a fracture has healed. For example, a study was done to identify how long it takes for lumbar stress fractures in cricket bowlers to heal, in which they stated: "For the purposes of the study, bone healing was defined as no fracture line"(2). Another article on Bone Mineral Density and its' impact on bone healing stated the following: "The healing of vertebral fractures encompasses the process of necrotic bone resorption and new callus formation"(3). Similarly, in another article about healing of long bones in men with spinal cord injuries, the fracture healing was assessed using the Lane-Sandhu score.

Image of part of the Lane-Sandhu score

Fracture formation was scored according to the Lane-Sandhu score by two independent radiologists.

Points	Callus and fracture line
0	No callus tissue, fracture line clear
1	25% callus tissue, fracture line still clearly visible
2	50% callus tissue, fracture line blurred
3	75% callus tissue, fracture line barely visible
4	100% callus tissue, no remaining fracture line visible

(4)

Lane-Sandhu score is radiological grading system for spinal fractures.

As there is no specific criteria and guidance on assessing fracture healing, there is a difference in treatment for patients across the country. There should be a standardised national criteria to ensure equitable care for all patients.

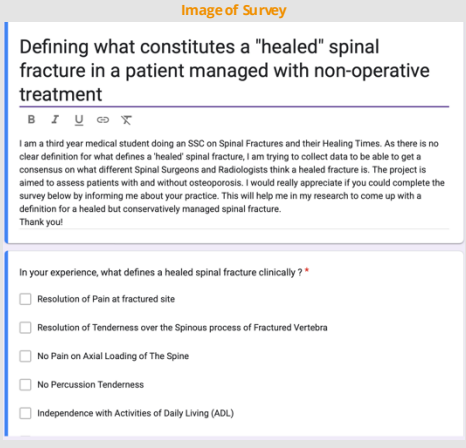
Objectives

- To carry out a literature analysis to gain an understanding of what factors clinicians consider when assessing fracture healing.
- Gain clinical exposure in the field of Trauma and Orthopaedics and Spinal Surgery to gain practical experience of fracture healing assessments.
- Create a survey to form a consensus amongst clinicians and create a criteria for assessing spinal fracture healing.
- Gaining a consensus on spinal fracture healing times, both clinically and radiologically.

Methodology

- I created a Google Form which included check boxes and long text fields.
- I made the questions using information I gathered from existing literature as well as my tutor's expertise.
- I used literature websites such as PubMed and ScienceDirect to do my literature search.
- I then found spinal surgeons and radiologists across the UK on BASS, BUPA and Top Doctors.
- Emails were sent out to all the doctors. The total number of doctors I emailed was 130.
- The total number of responses was 32.
- The results were then observed using the graphs made by Google Forms.

Image of Survey



This is an image of the start of my survey. It consists of 13 questions which are either checkboxes or long-text answer fields.

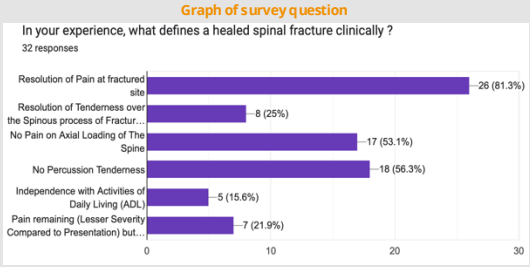
Acknowledgements

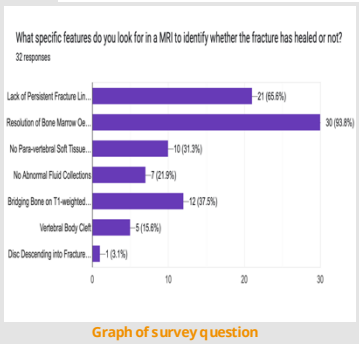
I would like to thank Mr. Savithru Prakash, Spinal Surgeon, for assisting me with this project and Mr. McCarthy, Spinal Surgeon, for allocating this project to me.

Results

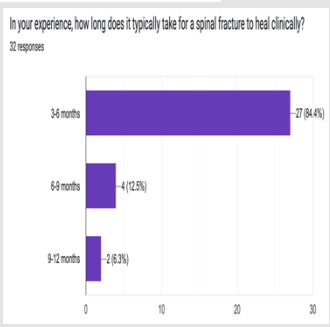
- Responders include 27 Spinal Surgeons and 5 Radiologists.
- Resolution of pain at the fracture site was the most commonly identified clinical feature in identifying a healed spinal fracture.
- Arrest of Progressing Loss of Vertebral Body Height and Arrest of Progressing Kyphosis on a Standing X-ray were the most observed features on X-rays.
- Bridging Callus and Visible Trabeculation and Absence of Cavitation were the most identifiable features of a healed fracture on CT scan.
- Resolution of bone marrow oedema was the most widely agreed upon feature on MRIs.
- Most agreed upon healing time 3-6 months, both clinically and radiologically.
- Although the number of respondents was low, there seems to be a promising pattern in the results.

Graph of survey question





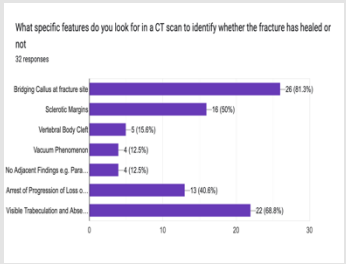
Graph of survey question



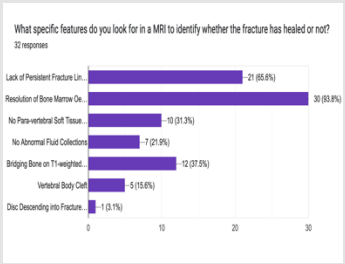
Graph of survey question

Conclusion

- In conclusion, there was a strong consensus amongst clinicians on which features they prefer to look for, both clinically and radiologically. For example, a common feature was the absence of a "bridging callus at the fracture site", which is also supported by the literature I have read. An article on the impact of bone mineral density on fracture healing stated, "The healing of vertebral fractures encompasses the process of necrotic bone resorption and new callus formation" (3).
- Similarly, the lack of a persistent fracture line was also a common result supported by my literature analysis. An article on the influence of blood supply on fracture healing was done, where they stated: "there were no fracture lines, or any indirect signs of bone trauma or vessel canal damage found at the CT scan"(5).
- As the sample size was small, the reliability of these results is not significant enough to create a healed fracture criterion, but it is a step forward in forming a consensus amongst relevant clinicians.



Graph of survey question



Graph of survey question

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Abstract

Defining what constitutes a 'healed' spinal fracture in a patient managed with non-operative treatment.

Objectives:

- Create a survey to collect opinions from experienced spinal surgeons and radiologists across the UK on which qualities they relate to a healed spinal fracture, in an aim to form a definitive criterion for a healed spinal fracture.
- Do a literature analysis to get an understanding of the factor's clinicians may consider when assessing fracture healing.
- Gaining a consensus on spinal fracture healing times, both clinically and radiologically.
- Gain practical experience in clinic to get a better understanding of the features clinicians look for when assessing spinal fractures.

Background:

As there is no clear definition on what a "healed" spinal fracture is, most researchers and clinicians choose a feature based on their own expertise. There're multiple features clinicians may look for, clinically and radiologically. Clinical signs of a healed fracture may include Resolution of Pain, No Percussion Tenderness, Independence with Daily Activities (IDA). Whereas radiologically, Callus Formation, Absence of Fracture Line, Resolution of Bone Marrow Oedema etc. are classic features clinicians search for.

Methodology:

The survey was created using google forms with multiple questions, including check boxes and long text fields. This allowed responders to select multiple relevant options as well as add additional findings not mentioned in the survey.

The questions were created using knowledge gained from literary articles as well as the support from the facilitator of this project.

Websites such as BASS (British Association of Spine Surgeons), BUPA and Top doctors were used to find spinal surgeons and radiologists across the country. I then proceeded to email them through my temporary NHS email and University email with a request to fill in my survey.

The responses were then analysed by observing the graphs generated by Google Forms.

Results:

Around 130 surgeons and radiologists were emailed with 32 responses. 27 of these responders were Spinal Surgeons, with 5 of them being Radiologists. The analysis revealed that resolution of pain is the main clinical feature clinicians look for, with X-rays being the most used modality. Cortical continuity, Arrest of Progressing Kyphosis, and Arrest of Progressing Loss of Vertebral Body Height were the most observed X-ray findings. Bridging Callus at the Fracture Site and Visible Trabeculation and Absence of Cavitation were the main features on CT scans, with Resolution of Bone Marrow Oedema and Lack of a Persistent Fracture Lines being the most observed findings on MRI scans. Clinically, 3-6 months was the agreed upon healing time, whereas radiologically, 3-6 months and 6-9 months were agreed upon, respectively.

Conclusion:

In conclusion, there was a strong consensus amidst the clinicians on which features are important for them to look for, particularly on how long a fracture takes to heal clinically. The criteria used to assess whether a fracture has healed has been a subjective debate, but there seems to be correlations amongst clinicians on which features most of them look for.

As the sample size was small, the reliability of these results is not significant enough to create a healed fracture criterion, but it is a step forward in forming a consensus amongst relevant clinicians.

AI declaration

I declare that this work is entirely my own and no part of it has been produced by Generative AI tools.