

**Cervical spine trauma imaging: is an additional swimmers projection of the cervico-thoracic junction justified?**

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## Cervical Spine Trauma

### Imaging: Is an Additional Swimmers

### Projection of the Cervico-Thoracic Junction Justified?

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## INTRODUCTION

NICE Head and Cervical Spine Guidelines (2007) advocate three-view Plain Radiography over CT for the initial assessment of cervical spine trauma. They state that if C7-T1 is not visualised by plain radiography then a CT should be undertaken to exclude fracture. However, they provide no indication of what protocol should be utilised when the cervico-thoracic junction is not visualised by the first radiographic imaging attempt. This study aimed to evaluate current practice. Since this study was undertaken NICE(2014) have released an updated guideline however still advocates only three-view PR for non head trauma patients.

It is universally agreed in literature that the lateral projection is the most difficult to obtain due to the overlying dense structure of the shoulders. To combat this, literature recommends a variety of additional views: Arm Traction/ Swimmers/ Oblique's, (Whitley et al 2005, Carver and Carver 2006, Bontrager and Lampignano 2010, Hardy and Snaith 2011). Though they do not state which projection is the optimal choice and NICE (2007) also offer no indication of which additional projection to use. The literature suggests that the Swimmer's View (SW) is the preferred additional technique in line with 87% of NHS A&E departments (Fell,2011).

## METHODOLOGY

A retrospective quantitative purposive audit of trauma patients was performed over a two month period (N=107). Ethical approval was granted by the NHS Trust. No personal patient details were recorded.

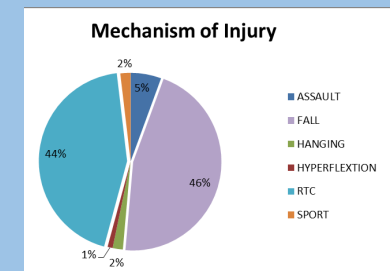
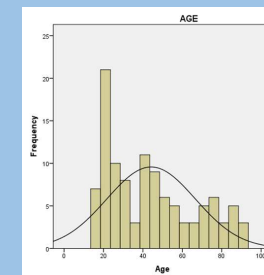
## INCLUSION CRITERIA:

Age of patient: >16 years (Adult) - Examination: C -Spine three-view radiographic trauma series, Patient Presentation: Trolley

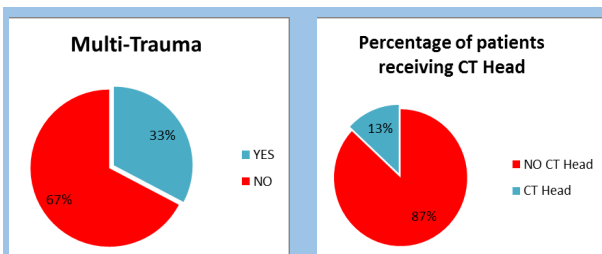
## VARIABLES

Age, Gender, Admission Date, PR Time, CT Time, Clinical status, Glasgow Coma Scale Score (GCS) on entry, Multiple Trauma, Mechanism of injury, PR performed, Plain radiographs; Is C7 – T1 visualised? Swimmers View Performed, CT Performed, Is C7-T1 Visualised on three-view PR/SV? To assess if C7-T1 was visible on three view PR/SV, an assessment criteria was established using a range of published literature (Whitley et al 2005, Carver and Carver 2006 and Bontrager and Lampignano 2010).

## RESULTS AND DISCUSSION



The 19-24 year old age group was dominated by 'RTC' (44%, N=47) and the over 30's dominated by 'FALLS' (46%, N=49).

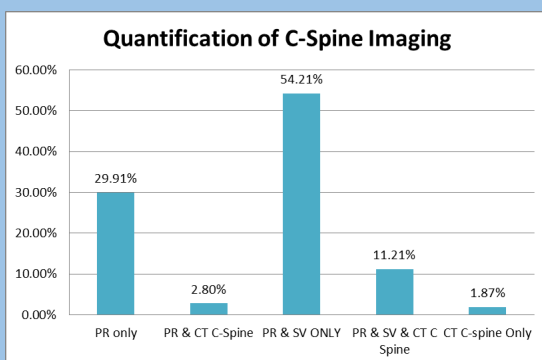


In 33% of cases (N=35) the patient presented as part of a multiple trauma. 13% (N=14) of cases included head trauma and required CT to exclude brain injury.

Five different imaging options could be identified in clinical practice;

Imaging Options	What Imaging is included
3 view Plain Radiography (PR)	AP, Peg, Lateral
3 view PR and CT C-Spine	When C7-T1 not visible, or continued clinical suspicion of trauma.
PR and Swimmers View (SV) Only	When C7-T1 not visible on lateral an additional SV was done.
PR and Swimmers View and CT- Spine	When C7-T1 not visible on PR or SV, or continued clinical suspicion of trauma.
CT C-Spine Only	Clinical fracture, or head injury with GCS <12

Routine three view PR was routinely performed with all patients however the lateral failed to demonstrate C7-T1 in 70% of cases.



Further analysis demonstrates the different imaging techniques employed. Consistent with Fell (2011) this highlighted the Swimmer's View as the most frequently deployed option when C7-T1 is not demonstrated by the routine 3 views.

Previous studies (Ireland et al 1998, Ulfin et al 2008) suggest a 37-55% success rate for the Swimmer's View however this research found a much higher value of 74%, suggesting a good level of radiographic skill within the hospital. Nevertheless, the question is why is this high dose projection being performed at all, bearing in mind that the patient might well be referred for CT in addition?

Contributing factors: imaging protocol/ uncooperative patient/ size of patient/ patients other injuries/head injury/ ability of radiographer/ non-use of arm traction technique.

Interestingly multiple injury and head injury were not found to be significant contributors.

The primary reason for additional projections is the perceived requirement for the radiographer to comply with imaging protocol; C7-C1 'must' be demonstrated. The radiographer is ideally placed to determine, as part of the justification for imaging process, the likely outcome of the initial 3 view imaging and further projections. The use of arm traction for example might be an essential component of the initial lateral projection, subject to viable patient condition.

## CONCLUSION

The research findings highlight the practical limitations of the plain radiography technique. Additional imaging is required in 70% of cases.

This could potentially be reduced if the radiographer becomes an integral part of the decision making team and is able to recommend the optimal

imaging technique as part of the justification process. Further training can increase the success rate of the Swimmer's projection with viable patients.

Whilst acknowledging the increase in thyroid dose by utilising CT, direct referral is perhaps justified in cases where the radiographer considers that the visualisation of C7-T1 is unlikely to be achieved after the initial lateral projection, particularly if the patient presents with the clinical symptoms of cervical spine trauma.

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