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Current Practice in Cervical Spine Radiographs

Regarding the Use of Swimmers or Trauma Obliques

Abstract

The bones at the base of the neck (C7/T1) also referred to as the “cervicothoracic junction”, can be hard to see on plain x-rays; as a result various techniques are in use to supplement the initial series of three radiographs (plain x-rays) when necessary. Previous work investigating techniques used after three projections fail, issued a plea for standards to be adopted (Jenkins, Curran and Locke 1999), yet variations still persist. The current situation needs to be established and, if possible, an optimum technique endorsed. Patient benefits from standardisation of best practice include improved evaluation and reduced waiting times (often in uncomfortable immobilisation) and hence reduced hospital costs.

Practitioners will benefit from a standard technique to undertake and evaluate. The National Institute for Clinical Excellence (NICE) Head Injury guidance specific to cervical spine injury does not direct best technique.

The project is essentially a service evaluation with two phases: a short questionnaire posted to most x-ray departments in A&E hospitals in England to establish current practice then a follow-up questionnaire in a little more depth will be sent to all those sites agreeing to the second phase. The second phase is intended to try to establish the practitioners’ reasons behind the variations in practice between hospitals.

Methodology

i) Aims:

To establish in relation to the supplementary x-ray techniques used for demonstration of the seventh cervical vertebra (C7) and the first thoracic vertebra (T1) when the standard three radiographic projections do not demonstrate it;

- a) The variations in protocols used within imaging departments in England
- b) The justification for the use of these protocols.

ii. Objectives.

To conduct a literature search to review the literature;

To survey imaging departments in order to establish current x-ray protocols in conscious adult trauma patients and to provide an evaluation of the practice of current technique and the reasons behind the protocols in use.

Following the pilot study, two phases for the project are proposed:

- i) A questionnaire to establish current practice for C7/T1 demonstration.

It is proposed to undertake pilot studies within five Welsh hospitals. They are NHS Trusts governed by the same guidance but not part of the final sample. The amended questionnaire will then be distributed to all 186 English NHS Hospitals with an accident and emergency (A&E) service exceeding 8000 emergency admissions a year (HES 2007, 368 total Trusts).

The questionnaire will be addressed to the A&E Imaging superintendent. A covering letter explaining the purpose of the research will be included (Appendix 2). Follow-up, to ensure a minimum of non-responses and assiduous collation of results is proposed. A two week thank you and reminder communication, a four week replacement questionnaire to non-respondents and finally a telephone follow-up for persistent non-responders (Dillman 2007). The responses from the questionnaire will be analysed and descriptive statistics of the (anonymised) findings produced for the final report to show the protocols in use.

- ii) Analysis of the justifications for reasons behind the protocols in use.

Sites undertaking the various techniques will also be identified from these results. Respondents to the original questionnaire will have indicated willingness to complete a second questionnaire. A further covering letter explaining the

purpose of the research will be included. This second phase will produce quantitative and qualitative data for analysis and descriptive statistics undertaken to show results are gathered and if experts agree on reasons behind the protocols in use.

Identification of Participants

i.) Potential participants in the study will be identified so: The questionnaire will be addressed to the A&E Imaging superintendent (by name where known). A covering letter will be included explaining the purpose of the research, the voluntary nature and anonymity of final published results. The pilot of the initial questionnaire is to be posted to the five Welsh Trusts with high levels of A&E activity identified from Welsh Office Statistics. The initial questionnaire is to be posted to all 152 English NHS Trusts with an A&E service exceeding 8000 emergency admissions a year as depicted in HES 2007 of the 368 total Trusts in England (many with no A&E service). Radiology and A&E staff responses from trusts undertaking each technique are awaited for the second phase.

ii.) How many participants do you aim to recruit? All 152 of such Trusts (186 hospitals) initially. The second stage, involving a slightly longer and more qualitative questionnaire will only be distributed to those trusts that have indicated a willingness to partake in further study.

Potential Impact

Ethics approval has been granted by the University of Hertfordshire ethics committee and NRES have communicated that this project constitutes a service evaluation. Data will be anonymised on publication, with specific permission being sought for any direct quotation from respondents.

Respondents will be assured of the voluntary nature of the research and assured of the confidentiality and security of their responses in covering letters. Data will

be stored on secured, password protected hospital network, with email communication via the highly encrypted NHS Mail system.

Outcomes

The results are anticipated to provide an up to date picture of practices in the NHS. This is necessary to identify what today's practitioners are doing to provide imaging of the cervical spine in trauma, what images they are acquiring and their justification for those practices. The long term goal on establishing the practices and the variations within them is to develop a longer term

Literature Review

Radiographic imaging of the cervical spine frequently falls short of optimal depiction of the cervicothoracic junction and, consequently; "although missed injuries occur at all levels, most occur at the lower cervical level..." (Wee, Reynolds. and Bleetman, 2008, p154). When the cervicothoracic junction is not adequately demonstrated on the initial projections, some authorities advocate "Swimmer's Views" (France 2005 and Whitley, Sloane, Hoadley, Moore and Alsop, 2005) after a repeated lateral projection with arm traction has failed. However Davis (1989) has reported a case of subluxation of an unstable cervical spine injury in the required motion for a swimmer's. Ireland, Britton and Forester point out that: "supine obliques are performed without moving the patient and expose the patient to less radiation" (1998 p153).

Opinion suggests a great deal of operator variation in effectiveness of demonstration of cervicothoracic junction with swimmer's technique (Rethnam, Yesupalan and Bastawrous, 2008). Previous research into the topic has resulted in varied results and opinions. This main reason for this proposal is then: to provide some evidence that either "Swimmer's Views" or oblique cervicothoracic radiography are the most effective method of demonstrating the cervicothoracic junction when "3-view series" have failed to do so, in investigations where a

suspicion of a “clinically important C-Spine injury” (Stiell et al 2001 p1841) exists.

The investigation aims to establish that trauma oblique radiography is a widely employed, safe, effective technique when investigating cervical spine trauma. Kaneriyala et al, showed how: “bilateral oblique radiography appears to be cost-effective for the exclusion of cervical spine injuries,” and “suggest that it be performed routinely.” (1998 p959). Ireland and co-workers stated that supine obliques have “improved safety and reduced radiation dose” (1998 p153); Jenkins, Curran and Rocke agreed that supine obliques “give better information about spinal alignment” (1999 p215) “with less radiation of the patient” (p216). In 2002 Contractor undertook a “shortcut review” (p550) to investigate the existence of published evidence on whether “Swimmers view or supine oblique views” are best for visualisation of the cervicothoracic junction and fully outlined the search. At that time, Contractor discovered eleven papers in this method, with solely the work of Ireland et al (1998) proving relevant to his question of whether one should employ supine obliques or swimmer’s projections. An attempted replication of the search using the Medline database revealed 24 results. These can be viewed at:

<http://syndic8.scopus.com/getMessage?registrationId=AACIBDKIBCCQIBGNCACRABCRBADNDELNCSEWPACKIL>; again Ireland et al (1998) was found but now Richards’ review paper from 2004 was also found and direct reference to the Contractor’s topic is made: “Previous guidelines recommend that swimmer’s views are replaced by trauma obliques, which are of lower radiation doses and show the posterior elements more extensively, ^{202,94} allowing fracture and facet joint dislocation diagnosis” (p253; 202, being Turetsky et al and 94 Ireland et al’s work).

Guidelines: This brings forward the important topic of guidelines. The current UK situation is not entirely clear. The BTS issued guidelines in 2002 recommended the use of 45 degree supine obliques, rather than a swimmer’s projection; no direct referencing was supplied for the recommendation, although extensive results of the literature search are displayed. This researcher was

unable to find the review promised in the introduction, it seems not to have been undertaken.

The Royal College of Radiologists (RCR) 2007 publication “Making the best use of clinical radiology services” (MBUR), gives current guidance on which modality to employ and the circumstances for their best use; but no directive of which technique should be employed. The RCR give a descriptor of the level of evidence to support their guidelines, which is accessible and assists the independent reader to see the justification. National Institute for Clinical Excellence (NICE) guidance recommends Computed Tomography (CT) scanning if the cervicothoracic junction is not shown on the three standard projections.

Clearance of the cervical spine in trauma is an everyday challenge to A&E staff. The American College of Radiologists have issued “Appropriateness Criteria® on Suspected Spine Trauma” (Daffner and Hackney 2007 p762) which essentially disposes of projectional radiography in favour of Multi-Detector CT (MDCT); their edict is based on an extensive review and meta-analysis of the relevant research. A current study from Fisher and Young (2008) agrees and they are supported by Ullmann’s (2008) commentary; others have suggested a more pragmatic approach: Tins and Cassar-Pullicino suggest that: “standard 3-view radiographs are probably safe and sensible as a first-line investigation in young and middleaged adults” (2007 p98). This approach has value in view of the increased dose of MDCT cited by Rybicki et al (2002 p933) of “greater than 14-fold increase in the radiation dose to the thyroid” with MDCT. Richards has also added the warning that: “In conscious trauma patients, the additional lifetime risk may not justify CT of the whole cervical spine as a routine practice.” (p348 2008).

Plain radiographic imaging of the cervical spine can clearly be seen to have an important role in today’s trauma patients. The examination of evidence behind the techniques employed demonstration of C7/T1 is needed to enable clear guidelines for this important area, where most missed injuries in the cervical spine occur.

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