Criteria-based direct Emergency Department access to poly-trauma whole-body CT leads to a dramatic fall in plain radiograph use prior to whole-body CT.

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Our Interest

Traumatic injuries are the cause of 5.8 million deaths annually, accounting for almost 10% of global mortality and up to 29% of deaths among adults aged 15-59 years. It is no surprise then, that trauma diagnosis and treatment has been an area of great recent research and development.

One of the most profound changes in the field of trauma imaging in recent years has been the ever increasing use of CT for initial trauma diagnosis. The accuracy of CT compared to plain radiographs, combined with the speed of modern multi-slice scanners, has contributed to the ever growing demand for whole-body CT scanning as a rapid assessment tool in poly-trauma patients.

Whether whole-body CT scanning is preferable to the more traditional use of plain radiographs, supplemented with targeted CT, has been the subject of recent debate, with multi-centre trials, such as the much publicised REACT-2 trial attempting to shed further light on the issue.

- Does direct access to whole-body CT speed up poly-trauma patient assessment?
- Does it reduce morbidity and mortality by allowing prompt diagnosis and treatment of serious injuries?
- Are we in fact merely increasing the patient dose with little/no benefit to our patients?
- Do plain radiographs still have a vital role to play in the assessment of poly-trauma patients?

Our Work

Encouraged by recent studies, as well as discussions with our local Accident and Emergency (A&E) Consultant body, our Major Trauma Centre sought to implement a robust protocol for the imaging of poly-trauma patients.

In 2013, a "criteria based patient selection protocol" for direct Accident & Emergency access to poly-trauma, whole-body CT was introduced in order to guide clinical decision making and speed up patient imaging. It would replace the previous system which relied on initial clinical and plain radiograph assessment, followed by targeted CT if required.

The criteria for the new protocol were modified from patient inclusion criteria to the REACT-2 trial (see Figure 1). When the criteria are met, and if the A&E team feel it is appropriate, the patient may proceed directly to CT without prior discussion with a radiologist.

A retrospective sample of 60 poly-trauma whole-body CT scans, performed over a two month period, were analysed in 2012 (prior to protocol implementation) and in 2014 and 2015 (after protocol implementation).

Data was collected on a range of parameters including; time to CT, time to initial report, accuracy of findings and any associated imaging performed.

One of the most striking and significant trends noted upon analysis was the interoperability between the proportion of patients undergoing a plain radiograph examination of the chest (CXR) or pelvis (PXR) prior to CT. This poster compares our findings before and after protocol implementation.

Our Results

In 2012, prior to "direct access to CT" protocol implementation, 73% of poly-trauma patients (44/60) had a CXR and 60% (36/60) had a PXR prior to CT.

These numbers were reduced drastically in 2014, following protocol implementation, with only 37% of patients (22/60) having a CXR and 25% (15/60) having a PXR prior to CT.

In 2015, no patients (0/60) had a CXR and only 2% (1/60) had a PXR prior to CT.

None of the plain radiographs yielded any results that were not also noted on the subsequent CT.

Interestingly, over the same time period, the number of CT scans that were "negative" for any acute injury went up from 27% in 2012 to 47% in 2015 (see Figure 2).

Although not statistically significant, there also appears to be a slight gradual improvement in the time taken from scanning to the generation of a report (see Table 1).

Our Conclusions

These results show that a "criteria-based" direct access to CT protocol in A&E is associated with a dramatic fall in the use of plain radiographs prior to whole-body CT, implying that faster access to CT removes the need for plain radiographs to direct urgent intervention for life-threatening injuries. This may also serve to ultimately reduce patient radiation dose as it avoids double-scanning of a given body part.

Our results also demonstrate a gradual increase in the percentage of "negative" CT scans (with no acute findings). The exact relevance of this is unclear but it could be argued that the mere presence of a "direct to CT" protocol is likely to lower the clinicians’ threshold for considering a scan, a case of supply feeding demand. Equally it could be argued that the patient selection criteria may be too broad and are leading to over-scanning in certain patient subgroups.

More work is required in order to fully answer these questions and, indeed, we hope to in the future be able to look more closely at;

a) The total radiation doses received by patients and whether the reduction in use of plain radiographs had any effect?

b) Which patient selection criteria are predictive of "positive" and which of "negative" findings?

c) Whether the reduced time to diagnosis translates into reduced morbidity or mortality?

Our Take-home Message

There is little doubt that whole-body CT can be vital as a rapid assessment tool for patients with multiple or massive injuries and implementing a "direct access to CT" protocol can greatly expedite the patient pathway and direct urgent intervention in poly-trauma patients.

More work needs to be done on the cost-benefit analysis of time saved (and morbidity avoided) vs. increased radiation dose. Further work is also needed to optimise the patient selection criteria for such a "direct access" protocol.