Skull X-rays after trauma: are both laterals necessary?

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SUMMARY

Eighty-eight sets of skull X-rays, each showing an unequivocal skull fracture, were examined by a radiologist under controlled conditions to see if fractures would be missed if only one lateral view was included in the X-ray series. The fracture sets were mixed at random with four times as many normal sets of skull X-rays and each fracture set was examined on two occasions, once with one lateral and once with both laterals. Two of the fractures were not visible when only one lateral was available.

INTRODUCTION

Standard textbooks of radiology are unclear as to whether skull X-rays after trauma should comprise three views (postero-anterior (PA), Townes and clinically indicated lateral) or four (PA, Townes, and right and left lateral) (Granger & Allison, 1986; Sutton, 1980; du Boulay, 1980). With thousands of skull X-ray series being taken each year, unnecessary views are an important waste of time and money. The aim of this study was to see if skull fractures would be missed if only three views of the skull (PA, Townes and clinically indicated lateral) are taken after trauma.

METHOD

Using information from earlier research three of the authors (AL, DG and JD) were able to collect 88 sets of skull X-rays (PA, Townes and right and left lateral) each of which, in their opinion, showed an unequivocal skull fracture. The patients' ages ranged from 4 months to 89 years and 39 were under 16 years. From the hospital notes

it was usually possible to identify the clinically indicated lateral. Where this was not possible, the left lateral was assumed to be the clinically indicated lateral for the purposes of this study.

From each set of films, three views (PA, Townes and clinically indicated lateral) were taken and placed in a plain envelope identified only by a number. Three hundred normal skull X-ray series were similarly assembled to provide controls. Fractures were mixed at random with controls in the ratio 1:4 and offered to a radiologist (TN) for reporting. The radiologist was unaware of the ratio of fractures to normals and was unaware of the total number of fractures. With each packet a brief clinical history was given and the radiologist was asked: (1) to identify and lateralize the fractures; (2) to state on which views the fracture was visible; and (3) to state which views allowed him to lateralize the fracture.

The whole process was then repeated using four views of both fractures and normals.

RESULTS AND DISCUSSIONS

The results are summarized in Table 1.

Of the four fractures missed with three views and seen with four views, two were missed because of observer error. That is, these fractures were readily visible on both laterals. Of the remaining two fractures missed, one was visible only on one lateral and this not the clinically indicated lateral (i.e. this fracture was not visible on the PA, Townes or clinically indicated lateral). Because the three views the radiologist was offered were the PA, Townes and clinically indicated lateral, the fracture could not be seen.

The remaining 'fracture' missed with three views and seen with four views was a sphenoid sinus fluid level. On the lateral given in the three views (i.e. the clinically

Table 1 Summary of results

Eighty-eight unequivocal skull fractures	<i>n</i>	(%)
Fractures correctly identified with three views and with four views	74	(84)
Fractures not seen with three views or four views	7	(8)
Fractures seen with three views but not with four views	3	(3.4)
Fractures seen with four views but not with three views	4	(4.5)
False positive fractures	3	
Fractures seen only on Townes view	12	(14)
Fractures seen only on both laterals	18	(20)
Fractures seen only on one lateral	2	(2.3)
Fractures requiring both laterals to lateralize	7	(8)
Fractures which could not be lateralized even with both laterals	2	(2.3)
Fractures not on clinically indicated side (where information was available and where fracture could be sided)	10	

indicated lateral), the fluid level appeared irregular and was deemed a bony edge. On the other lateral, the fluid level appeared much smoother and had moved position. This was much more clearly a fluid level. The PA and Townes view in this series were normal. Thus, both laterals were required to diagnose this basal fracture.

This study, therefore, suggests that a small number of skull fractures will not be visible if both lateral views are not taken. Because the presence of a fracture is of such undoubted importance (Jennett, 1980; Mendelow *et al.*, 1983; Gorman, 1985), the authors believe that both laterals should be taken on each occasion. Others may argue that, where resources are limited, they are better directed towards the much larger number of fractures missed because of observer error (*vide infra*).

The radiologist was given 88 fractures to report on two occasions. Allowing for the two fractures described above, he could be expected to diagnose a fracture on 176 occasions (88×2). His actual score was 155 (89%). This is similar to the rate of diagnosis achieved by casualty officers (Gorman, 1987).

Twelve fractures (14%) could only be seen on the Townes view. Of these patients nine were children. This suggests that every effort should be made to obtain a Townes view, particularly in children.

Ten fractures occurred on the side opposite to that clinically indicated. This phenomenon has been reported elsewhere. In a study of 1187 skull fractures in children 28% had no external evidence of injury and a further 12% had evidence only on the opposite side to the fracture (Harwood Nash *et al.*, 1971). Similarly, in a post-mortem study of 51 skull fractures, 21 (41%) had no corresponding external evidence of injury (Adams *et al.*, 1980). When reporting skull X-rays, radiologists should not place undue reliance on the clinical information given.

In summary, this study suggests that, if skull X-ray series after trauma include only one lateral view, then a small number of fractures may be missed. The importance of the Townes view, particularly in children, has been emphasized.

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