The ability of artificial intelligence to correctly identify acute haemorrhage in A&E patients on a non-contrast CT Head: A review of false positives in Brainomix in a single centre.

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Background

Intracranial haemorrhage continues to correlate with high morbidity and mortality. As expected, there is a necessity to exclude this prior to thrombolysis. Given this, a non-contrast CT head to exclude this prior to thrombolysis has continued to be a key aspect within the stroke pathway (1). In the last few years, artificial intelligence (AI) has been implemented into the pathway with stroke imaging; most notably with Brainomix (reviewing of the e-ASPECTS scoring). This scoring system produces a quantitative score which predicts functional outcome, symptomatic haemorrhage and likelihood of a good clinical outcome following thrombolysis. Based on the success and accuracy of the e-ASPECTS scoring from Brainomix, the team developed a further AI tool which targets looking at acute intracranial haemorrhage on a non contrast CT (2).

Aims

To identify the cases of false positives by Brainomix AI software. Next, to review these cases and postulate reasons for this occurring with evaluation of the original images and AI images.

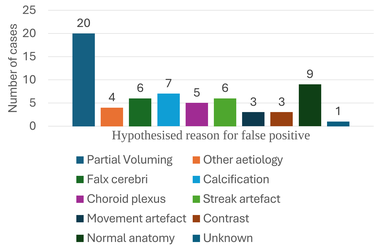
Methodology

All A&E admission CT Heads were reviewed from 1st July – 30th November 2023. Cases were included if the AI software was used and if the primary clinical indication was for possible stroke. Each of the cases were reviewed and a random sample of 60 false positive cases were selected to be reviewed in detail by a consultant radiologist with specialist interest in neuro-radiology.

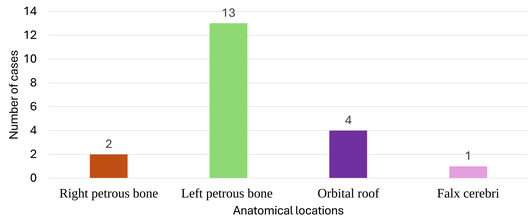
Results

3332 CT Heads were identified in the period. Of this, a sample of 60 false positive cases were selected for a detailed review of reasons for this occurring with a consultant radiologist with a specialist interest in neuro-radiology. The most common reason for overcalling appeared to be due to partial voluming. The results of the potential reasons for the false positives are demonstrated in graph 1. The two most prevalent possible reasons for overcalling were due to misinterpretation of partial voluming and normal anatomy (e.g. hyperdense structures like the choroid plexus). The most common regions for false positives due to possible partial voluming and normal anatomy to occur are demonstrated in graph 2 and 3.

Graph 1: Overview of reasons for false positives



Graph 2: Regions affected by partial voluming



Graph 3: Normal anatomical locations identified as possible haemorrhage

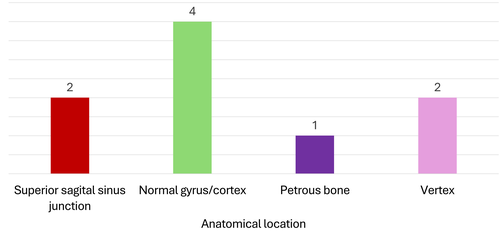


Figure 1: Petrous bone and partial voluming

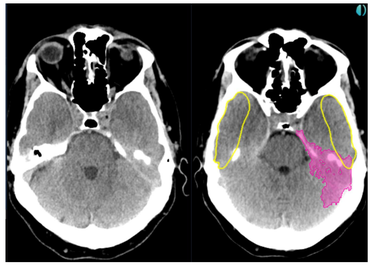


Figure 2: Falx Cerebri

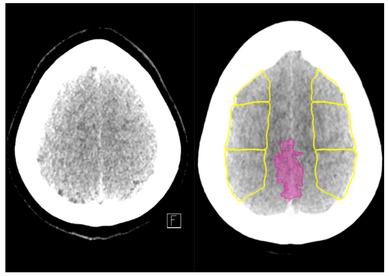
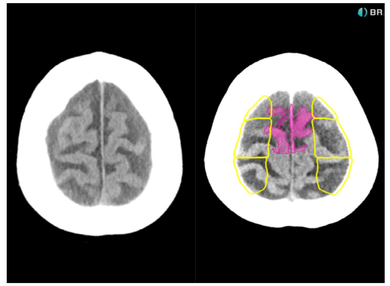


Figure 3: Normal gyrus



Conclusion

Although AI shows promise, in its current state there are limitations in its ability to differentiate acute haemorrhage from normal CT findings. This is most evident adjacent to the petrous bone and other hyperdense structures like the falx cerebri (especially if calcified), and the choroid plexus.

References

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2. Vacek A, Mair G, White P, Bath PM, Muir KW, Salman RA-S, et al. Evaluating artificial intelligence software for delineating hemorrhage extent on CT brain imaging in stroke: AI delineation of ICH on CT. J Stroke Cerebrovasc Dis. 2024;33(1):107512.