The ability of artificial intelligence to correctly identify extra and intra axial intracranial haemorrhage in A&E patients on non-contrast CT Head; A single centre review of Brainomix.

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Background

Artificial intelligence is gaining further interest within the field of radiology, particularly neuro-radiology. In the last few years, artificial intelligence (AI) has most notably been implemented into stroke imaging; primarily with Brainomix (reviewing of the e-ASPECTS scoring). Given the success of the AI system to identify pathology on this, Brainomix further developed a novel AI tool which targets looking at acute haemorrhage on a non-contrast CT (1).

Aims

To review the ability of Brainomix AI software to detect cases of acute sudural haemorrhage, subarachnoid haemorrhage and intraparenchymal haemorrhage from CT Heads of patients admitted via A&E.

Methodology

All A&E admission CT Heads were reviewed from 1st July – 30th November 2023. Patients were included if the AI software was implemented and the case demonstrates either; a subdural haemorrhage, a subarachnoid haemorrhage or an intraparenchymal haemorrhage. Each of the positive cases were reviewed in detail by a consultant radiologist with specialist interest in neuro-radiology. The false negative rates and true positive rates (sensitivity) were calculated for each type of haemorrhage. Where multiple different types of haemorrhage were present in a single case, each type was categorized separately to review the sensitivity of the AI software.

Results

3332 CT Heads were identified in during this time period.

43 cases were identified with having subdural haemorrhage. 15 were excluded because they demonstrates chronic subdural haemorrhage. 28 cases of acute subdural haemorrhage were reviewed; of which 12 were false negative on Brainomix (42.9%). 32 cases of subarachnoid haemorrhage were identified. Of which, 19 were false negatives on Brainomix (59.4%). 44 cases of intraparenchymal haemorrhage were identified. Of which, 1 was false negative (2.2%).

An overview of the results are demonstrated in table 1, with figures 1-4 examples of cases.

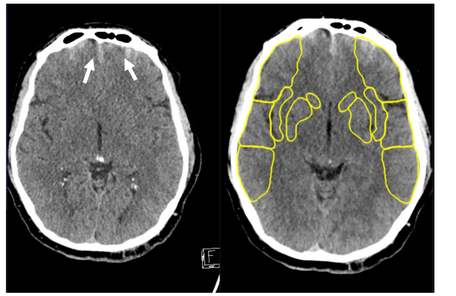
Table 1: Summary of the true positive and false negative cases for intracranial haemorrhage by the Brainomix software.

		Brainomix		Total
		True positive	False negative	
Intracranial haemorrhage	Subdural haemorrhage	16	12	28
	Subarachnoid haemorrhage	13	19	32
	Intraparenchymal haemorrhage	43	1	44

Conclusion

Within our cohort, the novel Brainomix software had excellent sensitivity for intraparenchymal haemorrhage, but had poor sensitivity to both subdural and subarachnoid haemorrhage. It currently is not sufficient sensitivity to incorporate into work flow programmes and may be used as a “second looker”.

Figure 1: False negative subarachnoid haemorrhage



White arrows demonstrates the missed subarachnoid haemorrhage.

Figure 2: True positive intraparenchymal haemorrhage

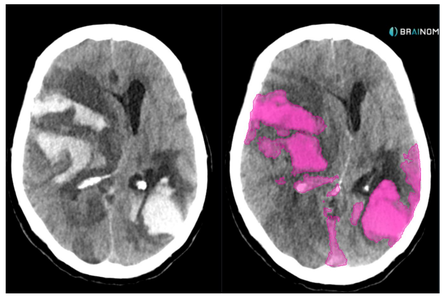
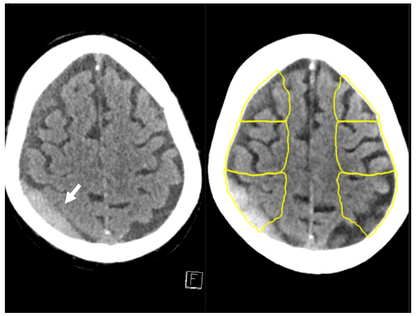


Figure 3: False negative subdural haemorrhage



White arrow demonstrates the missed subdural haemorrhage.

Figure 4: Subdural haemorrhage correctly identified but also normal anatomy



White arrow demonstrates normal anatomy identified. Blue arrow demonstrates the correctly identified subdural haemorrhage.

References

1. 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.