Medical Imaging in Emergency Medicine: Assessing the Use of Serial Imaging to Screen for Delayed Intracranial Haemorrhage in Patients on Anticoagulant and Antiplatelet Therapy

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Purpose

Australian Emergency Departments commonly encounter the difficult challenge of managing patients on treatment with anticoagulant and/or antiplatelet therapy (ACAPT) who present with head injuries. ACAPTs have been shown to increase the risk of intracranial haemorrhage (ICH) post trauma [1-14] and these patients require early investigation with computed tomography (CT) [5,6,15-18]. Further studies have suggested that this patient population is also at an increased risk of delayed ICH, manifesting clinically or radiographically, following an initial negative CT scan [1,5,15,16].

Many hospitals, including our institution, have adopted protocols that mandate an initial head CT combined with a minimum period of observation followed by a second CT prior to discharge. This practice uses valuable scanner time, increases the cost of patient admissions, and exposes every patient to excess ionising radiation that most would otherwise not receive.

The value of a second CT scan in patients on ACAPT has been debated in the literature, with several studies suggesting that it does help detect delayed haemorrhages that are clinically significant and that this detection may lead to successful intervention [6,10,15]. Other authors have concluded that routine, repeated CT scans are unnecessary in the absence of new clinical symptoms and that observation is sufficient in patients with negative initial head CT [1,5].

As there are only a small number of studies on this topic and disagreement as to the recommended management of these patients, more data is necessary to inform hospital policy. This study aims to evaluate the benefit of serial CT scans to screen for delayed ICH in ACAPT patients presenting with head injuries in Australian Emergency Departments.

Methods and Materials

Data was retrospectively collected between July 2010 and May 2012, corresponding to the adoption of guidelines for management of patients on ACAPT presenting to Emergency Departments with head trauma in the region studied. The data was collected from two regional hospitals, Nambour General Hospital and Caloundra Hospital, in the Sunshine Coast Health Service District, Queensland, Australia.

Data was collected from the Queensland Health PACS system. Patients were selected for this study when they presented to an emergency department within the region with
a history of head trauma and currently on ACAPT. Only patients with an initial negative scan who had repeat CT scans within 48 hours were included in the data set.

Demographic and clinical information was collected on these patients including age, gender, time between first and second CT head, type of ACAPT, International Normalised Ratio (INR) for those on warfarin, and the final radiologists report.

A negative study was marked by negative serial CT scans, whereas a positive study was marked by an initial negative CT scan followed by a positive CT scan within 48 hours.

Results

During the period between July 2010 and May 2012, 159 patients with head trauma met the inclusion criteria of this study. The patient population is comprised of 83 Males (52%) and 76 Females (48%) with an average age of 79 years. The average interval of repeated CT Scan was 17h06m.

Of the 159 patients, 100 were on only antiplatelet therapy, with 75 on monotherapy (Aspirin (49); Clopidogrel (25), and Dipyridamole (1)) and 25 on dual-therapy (Clopidogrel and Aspirin (18); and Aspirin and Dipyridamole (7)). 53 patients were on only anticoagulation therapy (Warfarin (53)). 6 patients were on combined anticoagulation and antiplatelet therapy (Warfarin and Clopidogrel (4); Warfarin and Aspirin (1); and Enoxaparin and Aspirin (1)). (Table 1 on page 5)
**Table 1**: Distribution of Anticoagulant, Antiplatelet Therapy and Delayed Intracranial Haemorrhages

*References*: Nambour General Hospital - Nambour/AU

Patients on warfarin, either alone or in combination with antiplatelet therapy, had their INR level tested in 55 of 58 cases. Of the 55 collected INR levels, 10 were less than 2.0, 35 were between 2.0 and 3.5, and 10 were greater than 3.5. (Table 2 on page 5)

<table>
<thead>
<tr>
<th>INR Level</th>
<th>Count</th>
<th>Delayed ICH Count</th>
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</thead>
<tbody>
<tr>
<td>&lt;2.0</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>2.0 – 3.5</td>
<td>35</td>
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<tr>
<td>&gt;3.5</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Unknown</td>
<td>3</td>
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**Table 2**: INR ranges for patients on Warfarin compared to Delayed Intracranial Haemorrhages

*References*: Nambour General Hospital - Nambour/AU

Over the 23-month period following the implementation of the serial CT protocol in our regional district, only one delayed ICH was detected (Fig. 1 on page 6). This patient was a 78 year-old female on Warfarin with a supratherapeutic INR of 4.3. The repeated CT scan was performed at 18 hours from the initial negative CT scan due to acute neurological deterioration during a period of observation as opposed to the post-observation screening protocol. This represents an overall rate of 0.6% for delayed ICH in this study, a rate of 1.7% in all warfarinised patients, and a rate of 10% in patients with supratherapeutic INR levels. There were no delayed ICHs identified on serial CT scans in the patients on other ACAPT agents.
Fig. 1: Serial CT images of a 78 year-old female with a delayed intracranial haemorrhage discovered after clinical deterioration during a period of observation.

References: Nambour General Hospital - Nambour/AU

Images for this section:

<table>
<thead>
<tr>
<th>Drug</th>
<th>Count</th>
<th>Percentage of Total</th>
<th>Delayed ICH Count</th>
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<td>Antiplatelets</td>
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<tr>
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<td>Dipyridamole</td>
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<td>(0.6%)</td>
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<td>Dual Therapy</td>
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<tr>
<td>Clopidogrel + Aspirin</td>
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<td>(15.7%)</td>
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<tr>
<td>Aspirin + Dipyridamole</td>
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<td>7</td>
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<td>Warfarin</td>
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<tr>
<td>Enoxaparin</td>
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<td>Combined Anticoagulant and Antiplatelet</td>
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<td>Warfarin + Clopidogrel</td>
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<td>Warfarin + Aspirin</td>
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<tr>
<td>Enoxaparin + Aspirin</td>
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<td>(0.6%)</td>
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</tr>
<tr>
<td>Total</td>
<td>159</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

Table 1: Distribution of Anticoagulant, Antiplatelet Therapy and Delayed Intracranial Haemorrhages
Table 2: INR ranges for patients on Warfarin compared to Delayed Intracranial Haemorrhages

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Fig. 1: Serial CT images of a 78 year-old female with a delayed intracranial haemorrhage discovered after clinical deterioration during a period of observation.
Conclusion

Our study found that patients on anticoagulant and/or antiplatelet therapy presenting to the Emergency Department with head trauma are unlikely to benefit from serial CT scanning for delayed bleeds unless they have a neurological deterioration within the first 24 hours. Our study is in line with recent studies [1, 5] which indicate that the risk of clinically significant delayed ICH in ACAPT patients is too low to warrant serial CT screening in general.

Our study investigated the use of routine serial CT scanning for delayed intracranial haemorrhages in patients on anticoagulant and/or antiplatelet therapy presenting with head trauma at two regional Queensland emergency departments. Over a period of 23 months we reviewed 159 patients on ACAPT who received serial CT scans following head trauma. There was only one case of delayed ICH, this was in a patient with a supratherapeutic INR level who received a second CT scan due to neurological deterioration instead of through the post-observation CT screening protocol.

A previous study has found that supratherapeutic INR levels are a risk factor for delayed ICH [9, 15], and it could be argued that these patients may require additional imaging as well as a period of observation. In our study there were only 10 patients with a supratherapeutic INR, one of which had a delayed hemorrhage. This would seem to support these prior studies, although the number of patients with supratherapeutic INR in our study was too small to derive any conclusions.

Other high-risk populations could also be studied. For example, coagulopathies second to alcoholism as intoxicated patients are prone to head trauma and the extent of coagulopathy is difficult to determine and neurological assessment can also at times be difficult with this group.

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References


