



# What Is the Incidence of Intracranial Hemorrhage Among Anticoagulated Patients With Minor Head Trauma?

## TAKE-HOME MESSAGE

Among anticoagulated patients presenting with minor head trauma, 9% may have an intracranial hemorrhage.

## METHODS

### DATA SOURCES

PubMed, EMBASE, the Cochrane databases, and the Database of Abstracts of Reviews of Effects were searched through March 2018. Google Scholar, bibliographies of included articles, and previous reviews were assessed for additional references. The authors also contacted topic experts and hand searched abstracts from academic emergency medicine research conferences to identify unpublished data.

### STUDY SELECTION

Two authors independently screened articles for inclusion, with discrepancies resolved by consensus with a minimum of 3 authors. Only studies of unselected emergency department (ED) patients receiving anticoagulation therapy who presented with a head injury and which reported the incidence of diagnosed intracranial hemorrhage were included. Anticoagulation therapy included vitamin K antagonists, dabigatran, edoxaban, apixaban, rivaroxaban, fondaparinux, and low-molecular-weight heparin. The search was limited to prospective studies and

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Editor's Note: This is a clinical synopsis, a regular feature of the *Annals'* Systematic Review Snapshot (SRS) series. The source for this systematic review snapshot is: **Minhas H, Welsler A, Turcotte M, et al. Incidence of intracranial bleeding in anticoagulated patients with minor head injury: a systematic review and meta-analysis of prospective studies. *Br J Haematol.* 2018;183:119-126**

## Results

Incidence of intracranial hemorrhage among anticoagulated ED patients with a GCS score of 15.

Outcome	No. of Studies (No. of Participants)	Percentage With ICH (95% CI), %	Heterogeneity, %
Incidence of ICH in all studies	5 (4,080)	8.9 (5.0-13.8)	93
Incidence of ICH with exclusion of studies at high risk of bias	4 (1,209)	10.9 (4.6-19.6)	NR

ICH, Intracranial hemorrhage; CI, confidence interval; NR, not reported.

The search strategy identified 10,391 studies, of which 5 prospective studies (n=4,080 participants) were eligible for inclusion. Studies were conducted in the Netherlands, France, Italy, the United States, and the United Kingdom. Study protocols varied, with 3 studies requiring that all anticoagulated patients undergo head computed tomography (CT)

as part of their initial evaluation, whereas 2 studies left the decision to physician discretion. Of the 4,080 anticoagulated patients, 4,010 (98%) were receiving vitamin K antagonists, whereas 60 were receiving a direct oral anti-coagulant and 10 were receiving enoxaparin. A total of 189 patients received a diagnosis of intracranial hemorrhage during their initial

included published studies, unpublished studies, and conference abstracts. There were no language restrictions. Studies with fewer than 20 eligible participants, those that reported only a subset of anticoagulated patients with head injury, those that reported patients receiving antiplatelet medications alone, and those that reported only the incidence of delayed intracranial hemorrhage were excluded.

### DATA EXTRACTION AND SYNTHESIS

Four reviewers independently abstracted data, with discrepancies resolved by consensus. The primary outcome was the incidence of intracranial hemorrhage among anticoagulated patients with a Glasgow Coma Scale (GCS) score of 15. When data included multiple GCS scores, authors of eligible studies were contacted and only the data on patients who had a GCS score of 15 were included. Risk of bias was assessed with the Tool to Assess Risk of Bias in Longitudinal Symptom Research Studies Aimed at the General Population.<sup>1</sup> Statistical heterogeneity was reviewed with  $I^2$ . A random-effects model was used, and a sensitivity analysis was performed with exclusion of high-risk studies.

evaluation, whereas 20 patients received a diagnosis of intracranial hemorrhage during follow-up. Accounting for the heterogeneity, random-effects modeling was performed and identified an incidence of 8.9% (Table). All studies were deemed at low risk of bias for sampling and missing data. Three studies were at low risk of bias for outcome assessment, whereas one study was at intermediate risk and one was at high risk.

### Commentary

Minor head injury is a common presentation to the ED, with greater than 1 million patients presenting each year.<sup>2</sup> Although all patients with altered mental status should receive advanced imaging as long as they are stable enough to leave the ED, the management of anticoagulated patients with a normal GCS score is more controversial. Most decision rules excluded patients receiving anticoagulation, prompting many providers to obtain imaging on all anticoagulated patients with head trauma.<sup>3,4</sup> This is also supported by a 2008 joint policy from the American College of Emergency Physicians (ACEP) and the Centers for Disease Control and Prevention that recommends consideration of neuroimaging in light of the limited data in this population.<sup>5</sup> To properly weigh the risks and benefits of this approach, it is important to understand the incidence of intracranial hemorrhage among anticoagulated patients with minor head trauma.

This study found that the adjusted incidence of intracranial hemorrhage among anticoagulated patients with minor head trauma was 8.9%. Previous studies of patients no longer receiving anticoagulation and with minor head injury have identified rates of intracranial hemorrhage between 4.6% and 6.3%.<sup>6,7</sup> Although differences between studies prevent direct comparison, this suggests that anticoagulation may be associated with an increased risk of intracranial hemorrhage.

It is important to consider several limitations with regard to the

present study. First, only 5 studies were included, and the majority of the data was from a single study with a high risk of bias. Additionally, there was significant statistical and clinical heterogeneity. There were differences in the imaging protocols, with only 3 studies requiring all patients to receive a head CT, whereas the other 2 left it to the provider's discretion. There were also differences in the follow-up protocols, ranging from 24 hours of direct observation to a 10-week electronic chart follow-up. Moreover, although all patients were required to have a GCS score of 15, the mechanisms of injury and definition of minor head injury varied between studies. Additionally, the majority of patients were receiving vitamin K antagonists, so it is unclear whether this would apply to direct oral anticoagulants. Finally, there were no data on the need for intervention for the intracranial hemorrhage, so it is unclear how many cases were clinically significant.

According to the data,<sup>8</sup> head CT should be considered for all anticoagulated patients with minor head trauma regardless of GCS score. Further studies are needed to identify anticoagulated patients at low risk of intracranial hemorrhage for whom head CT may be avoided and to determine the incidence of intracranial hemorrhage among patients receiving direct oral anticoagulants.

1. Clinical Advances through Research and Information Translation (CLARITY) Group. Tool to Assess Risk of Bias in Longitudinal Symptom Research Studies Aimed at the General Population. Available at: <https://www.evidencepartners.com/wp-content/uploads/2017/09/Tool-to-Assess-Risk-of-Bias-Longitudinal-Symptom-Research>

1. Studies-Aimed-at-the-General-Population. pdf. Accessed October 22, 2018.
2. Mannix R, O'Brien MJ, Meehan WP 3rd. The epidemiology of outpatient visits for minor head injury: 2005 to 2009. *Neurosurgery*. 2013;73:129-134.
3. Stiell IG, Wells GA, Vandemheen K, et al. The Canadian CT Head Rule for patients with minor head injury. *Lancet*. 2001;357:1391-1396.
4. Stiell IG, Clement CM, Rowe BH, et al. Comparison of the Canadian CT Head Rule and the New Orleans Criteria in patients with minor head injury. *JAMA*. 2005;294:1511-1518.
5. Jagoda AS, Bazarian JJ, Bruns JJ Jr, et al; American College of Emergency Physicians; Centers for Disease Control and Prevention. Clinical policy: neuroimaging and decisionmaking in adult mild traumatic brain injury in the acute setting. *Ann Emerg Med*. 2008;52:714-748.
6. Albers CE, von Allmen M, Evangelopoulos DS, et al. What is the incidence of intracranial bleeding in patients with mild traumatic brain injury? a retrospective study in 3088 Canadian CT head rule patients. *Biomed Res Int*. 2013;2013:453978.
7. Uccella L, Zoia C, Bongetta D, et al. Are antiplatelet and anticoagulants drugs a risk factor for bleeding in mild traumatic brain injury? *World Neurosurg*. 2018;110:e339-e345.
8. Minhas H, Welshe A, Turcotte M, et al. Incidence of intracranial bleeding in anticoagulated patients with minor head injury: a systematic review and meta-analysis of prospective studies. *Br J Haematol*. 2018;183:119-126.

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