

The Value of Scheduled Repeat Cranial Computed Tomography Following Mild Head Injury: Single Center Experience and Meta-Analysis

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BACKGROUND:

Following an initial CT scan revealing intracranial hemorrhage after traumatic brain injury, a standard of care in many trauma centers is to schedule a repeat CT scan to rule out possible progression of the bleed.

OBJECTIVE:

While repeat imaging is clearly indicated to assess a deteriorating patient, we evaluate the utility of routine follow-up CT in changing the management of mild head injury patients despite clinical stability.

METHODS:

The trauma database at our institution was retrospectively reviewed to identify patients following mild head injury with positive initial CT finding and scheduled repeat scan. The literature was searched for similar published studies. Patients were divided into two groups for comparison. Group A included patients who had intervention based on neurological exam changes. Group B comprised patients requiring change in management according to CT results exclusively. The meta-analysis was performed using random-effects model.

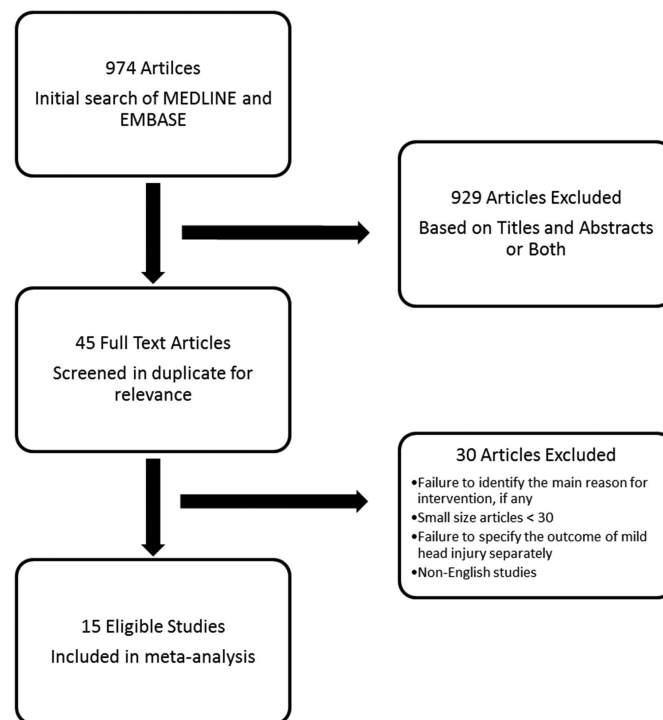
RESULTS:

Overall, 15 studies and 445 patients from the current series met our eligibility criteria totalling 2693 patients. The intervention rates for group A and B were 2.7% (95% CI 1.7–3.9) with $P = .003$ and 0.6% (95% CI 0.3–1) with $P = .212$, respectively. The statistical difference between both intervention rates was clinically significant with $P < .001$.

CONCLUSION:

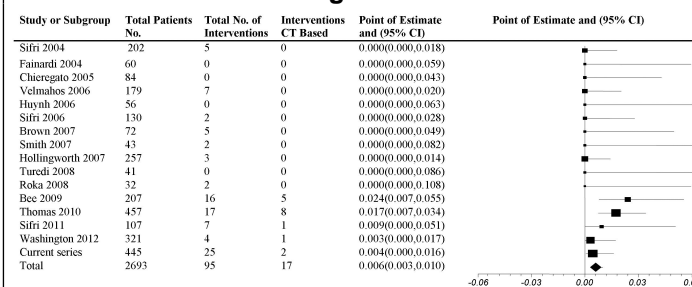
The available evidence indicates that it is unnecessary to schedule a repeat CT scan following mild head injury when patients are unchanged or improving neurologically. In the absence of supporting data, we question the value of routine follow-up imaging given the associated accumulative increase in cost and risks.

Figure 1



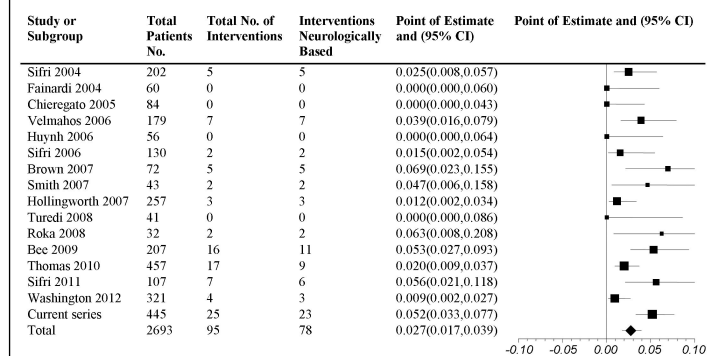
Flow chart of the search strategy.

Figure 2



Forrest plot presents the intervention rates based on repeat CT results exclusively (group B) of all studies (95% CI 0.3–1, $P = .212$).

Figure 3



Forrest plot presents the intervention rates based mainly on neurological exam changes (group A) of all studies (95% CI 1.7–3.9, $P = .003$).

Table 1

TABLE 1. Summary of the outcomes of eligible studies included in the meta-analysis in addition to the current series results^a

| Author, Year | Study Design | Total Patients No. | No. of Worsened CT (%) | Group A | Group B | Type of Interventions | CT Findings Leading to Interventions |
|--------------------|---------------|--------------------|------------------------|---------|---------|--|--------------------------------------|
| Sifri 2004 | Retrospective | 202 | 40 (19.8) | 5 | 0 | 2 ICP monitors insertion 2 Craniotomies | N/A |
| Fainardi 2004 | Prospective | 60 | 30 (50) | 0 | 0 | None | None |
| Chierigato 2005 | Prospective | 84 | 41 (48.8) | 0 | 0 | None | None |
| Velmahos 2006 | Retrospective | 179 | 37 (20.6) | 7 | 0 | 2 ICP monitors insertion 2 Craniotomies 3 Blood products | 5 SDH 3 ICH 3 SAH 1 EDH |
| Huyuh 2006 | Retrospective | 56 | 4 (7.1) | 0 | 0 | None | None |
| Sifri 2006 | Prospective | 130 | 26 (20) | 2 | 0 | 2 Craniotomies | N/A |
| Brown 2007 | Prospective | 72 | 27 (37.5) | 5 | 0 | Medical and Surgical | N/A |
| Smith 2007 | Retrospective | 43 | N/A | 2 | 0 | 2 Craniotomies | 2 SDH 2 ICH |
| Hollingsworth 2007 | Retrospective | 257 | 50 (19.4) | 3 | 0 | 3 Craniotomies | 2 SDH 1 SAH 1 EDH |
| Turedi 2008 | Prospective | 41 | N/A | 0 | 0 | None | None |
| Roka 2008 | Prospective | 32 | N/A | 2 | 0 | 2 Craniotomies | 2 ICH |
| Bec 2009 | Retrospective | 207 | 58 (28) | 11 | 5 | 6 ICP monitors insertion 12 Craniotomies | 8 SDH 3 ICH 2 SAH 1 EDH |
| Thomas 2010 | Retrospective | 457 | N/A | 9 | 8 | Medical and Surgical | N/A |
| Sifri 2011 | Retrospective | 107 | 52 (48.5) | 6 | 1 | 4 ICP monitors insertion 4 Craniotomies 1 Ventriculostomy 1 Upgrade in care | N/A |
| Washington 2012 | Retrospective | 321 | 19 (5.9) | 3 | 1 | 3 ICP monitors insertion 1 Craniotomies | 1 SDH 3 ICH |
| Current Series | Retrospective | 445 | 91 (20.4) | 23 | 2 | 6 ICP monitors insertion 17 Craniotomies 5 Mannitol administration | 12 SDH 6 ICH 2 SAH 5 EDH |

^aEDH, epidural hematoma; ICH, intracranial hemorrhage; ICP, intracranial pressure; SAH, subarachnoid hemorrhage; SDH, subdural hematoma; N/A, not available

^bAcross the table, any patient may have more than one intervention and/or radiological findings