The use of hypothermia as a treatment for traumatic brain injury

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CRD summary
This review evaluated hypothermia to treat traumatic brain injuries and concluded that there may be benefits of hypothermia treatment for some patients with severe traumatic head injuries. Insufficient information was presented about the conduct of the review, quality of the included studies and results, so it was difficult to draw any conclusions about the reliability of the author’s conclusions.

Authors' objectives
To evaluate the use of hypothermia as a treatment for traumatic brain injury.

Searching
MEDLINE, CINAHL, EMBASE and PubMed were searched from 2000 to 2006 for English-language studies. Search terms were reported.

Study selection
Controlled trials of therapeutic hypothermia used for at least 24 hours compared to normothermia in adults with a closed traumatic brain injury and a Glasgow Coma Scale (GCS) score of between 3 and 8 with outcomes measured by GCS were eligible for inclusion.

Exclusion criteria applied in the included studies were: clinical brain death; prolonged hypoxia or hypotension; gunshot wound; pregnancy; undetermined time of injury; inability to begin cooling within six hours; organ failure of another system; and normal findings on a computerised tomography scan. In the hypothermia groups, patients’ temperatures were cooled to 32°C to 35°C over periods of time that ranged from 24 hours to five days. The most commonly used method to achieve hypothermia used cooling blankets. Mean time to hypothermia attainment ranged from three hours to 24 hours. Temperatures in normothermia control groups were maintained between 36.5°C and 38.5°C by use of cooling blankets. In one study, use of short-term mild hypothermia (two days) was compared to use of long-term hypothermia (five days). Outcomes measured were intracranial pressure, cerebral perfusion pressure, arterial blood pressure, continuous temperature and management appropriate for traumatic brain injury.

The author did not state how studies were selected for inclusion.

Assessment of study quality
The author did not state that a validity assessment was performed.

Data extraction
Data appeared to be extracted as reported in the individual studies, but little information on the extracted data was provided.

The author did not state how data extraction was performed.

Methods of synthesis
The results from the included studies were presented in a narrative summary grouped by outcome.

Results of the review
Six prospective controlled trials (n=946, range 30 to 392) were included in the review.

Three studies gave recommendations for use of hypothermia in traumatic brain injury. Treatment with moderate hypothermia to a temperature of 32°C or 33°C for 24 hours for patients with an initial GCS of 5 to 7 (one study). Hypothermia maintenance at 32°C for 24 hours with ICP less than 20mmHg prior to slow re-warming (one study).
Long-term mild hypothermia for five days prior to re-warming within 24 hours (one study).

Two studies reported significantly improved outcomes for patients: GCS scores of 5 to 7 for groups who received hypothermia treatment compared with normothermia groups.

Two studies found no differences in complication rates between hypothermia and normothermia groups.

**Authors' conclusions**

Hypothermia may have benefits for patients with severe traumatic brain injury (GCS 5 to 8) but appeared to be of no benefit in patients with low intracranial pressure. Hypothermia as a neuroprotective mechanism was a promising therapy, but must be explored further before suggestions could be made for changing practice.

**CRD commentary**

The review addressed a question that was broad in scope. Criteria for inclusion of studies in the review were specified. The search was adequate, but there were no attempts to search reference lists or sources for unpublished data. The restriction to English-language papers only meant that there was a risk of language biases. There were discrepancies between inclusion criteria and studies included in the review: one study accepted a patient younger than 16 years old and a study was included that did not feature a normothermia control group. The author reported no steps to eliminate error and bias at any stage of the review process. The author did not report conducting an assessment of validity, which made it difficult to assess the reliability of the evidence from the included studies. The reviewer's decision to summarise the studies in a narrative review was appropriate. The outcomes evaluated in the review were not quantified and measurements of effect were not presented for any of the outcomes examined. The results of statistical tests undertaken in the included studies were not presented. The findings of this review are unlikely to be reliable because of methodological flaws, a lack of information provided in results and absence of a study quality assessment. Substantial caution is required when interpreting the results of this review.

**Implications of the review for practice and research**

**Practice:** The author stated that there is no evidence to recommend any change in practice. Hypothermia showed promise as a treatment of traumatic brain injury and should be utilised in hospitals with specialised neuroscience units with continuous resident coverage and specialist nurse coverage in the context of further trials

**Research:** The author stated that use of hypothermia treatment should be further investigated, particularly with a focus on time from injury to ideal cooling, cooling temperatures, duration of cooling and specific populations who may benefit (particularly as it appeared that there was no benefit of hypothermia for patients with low intracranial pressure).

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