A systematic review of the diagnostic accuracy of ocular signs in pediatric abusive head trauma

Bhardwaj G, Chowdhury V, Jacobs MB, Moran KT, Martin FJ, Coroneo MT

CRD summary
This review concluded that intraocular haemorrhage in infants (particularly bilateral, extensive, and multilayered) was highly specific for abusive head trauma diagnosis. Limitations in the synthesis, the possibility of missing studies, and lack of details on the review process mean that the authors' conclusions should be interpreted with some caution.

Authors' objectives
To assess the accuracy of various ocular signs for paediatric abusive head trauma.

Searching
PubMed, EMBASE, the Cochrane Library, American College of Physicians (ACP) Journal Club, DARE and NHS EED were searched from inception to September 2009. Search terms were reported. (Full details of the search were reported in Appendix 1, page 992.e1). Reference lists of retrieved studies were screened. The review was restricted to studies with English abstracts.

Study selection
Diagnostic cohort studies, case-control studies or consecutive case series that assessed the accuracy of ocular findings for the diagnosis of abusive head trauma in infants or children were eligible for inclusion. Acceptable reference standards were cases accompanied by confessions, witnessed by reliable third parties, confirmed by legal proceedings, or with multidisciplinary assessment using standard criteria. Studies had to report sufficient data to allow calculation of sensitivity and/or specificity, and adequately describe the method of ocular examination. Case reports and studies that were considered to use an inadequate method of ocular examination were excluded.

In most of the included studies, children were younger than four years. Children in the control groups (in the studies that included controls) had suffered head trauma, sudden infant death syndrome, subdural haematoma and other causes (not further defined).

One reviewer screened the search results for relevance. Potentially relevant articles were assessed for inclusion independently by all authors. Disagreements were resolved by consensus.

Assessment of study quality
Study quality was assessed using a modified version of QUADAS (Quality Assessment of Diagnostic Accuracy Studies). Full details of the items assessed and criteria used to rate each item were reported in Appendix 2 (page 992.e2).

The authors did not state how many reviewers performed the quality assessment.

Data extraction
Data were extracted on the proportion of patients with the various ocular findings assessed, separately for cases and controls. It appeared that these data were used to produce 2x2 tables of test performance from which estimates of sensitivity and specificity were calculated.

The authors did not state how many reviewers performed the data extraction.

Methods of synthesis
A mainly narrative synthesis was reported. Mean values for sensitivity and specificity across studies were also reported;
details on how these were calculated were not reported, but formal statistical pooling did not appear to have been conducted.

**Results of the review**

Twenty studies were included in the review (n=1,873, range 10 to 838). Six studies were retrospective chart reviews, four were prospective clinical series and ten were autopsy series. Only two studies mentioned that examiners were blinded to the injury. More than half of the studies did not report adequate details on confirmation of abuse. There was a possibility of incorporation bias in all except four studies.

Twenty studies assessed intraocular haemorrhages. Overall mean diagnostic sensitivity was 75% and specificity was 94% for abusive head trauma. In the clinical series, sensitivity was 74% (range 51 to 100%); in the autopsy series, sensitivity was 82% (range 63 to 100%). Three studies (that only reported cases with retinal findings) and two autopsy series (that reported all types of child abuse) were not included in previous means; these studies found intraocular haemorrhage in 46% of cases. Almost all cases of intraocular haemorrhage involved the retinal layers (94% in clinical series, 99% in autopsy series). Intraocular haemorrhage at the posterior pole was the most common finding, but extensive, bilateral and multilayered intraocular haemorrhage was the most specific indicator for abusive head trauma.

Optic sheath haemorrhages were assessed in eleven studies; the overall diagnostic sensitivity was 72% and specificity was 71% for abusive head trauma.

Seven studies each assessed traumatic retinoschisis and perimacular retinal folds; these were reported in 8% and 14% of abusive head trauma respectively, but were not reported in other conditions.

**Authors' conclusions**

Prospective consecutive studies confirmed that intraocular haemorrhage in infants (particularly bilateral, extensive, and multilayered) were highly specific for abusive head trauma. Optic nerve sheath haemorrhages were significantly more common in acute head trauma than in other conditions in autopsy studies. Traumatic retinoschisis and perimacular retinal folds were present in a minority of abusive head trauma, but rarely seen in other conditions.

**CRD commentary**

The review addressed a focused question supported by clearly defined inclusion criteria. The literature search was appropriate for published studies, but specific attempts were not made to locate unpublished studies, so there was a possibility of publication bias. Some efforts were made to minimise the risk of language bias, but restriction of the review to studies with English abstracts meant that there was some possibility of publication bias. Some steps were taken to minimise bias and errors in the selection of studies, but the process of data extraction and quality assessment were not reported.

Study quality was assessed using appropriate criteria; full details on the criteria used for scoring and results of the quality assessment were reported, but quality was not considered in the synthesis of results. Details on methods used to summarise data were not reported, so it was unclear whether appropriate methods of meta-analysis were used. It was not always clear which studies contributed to summary estimates. The authors acknowledged that the results of the meta-analysis may be unreliable. Heterogeneity was not formally assessed, although the authors did mention that there was substantial heterogeneity between studies.

Limitations in the synthesis, the possibility of missing studies, and lack of details on the review process mean that the authors' conclusions should be interpreted with some caution.

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

The authors did not state any implications for research or practice.

**Funding**

None.
Bibliographic details

PubMedID
20347153

DOI
10.1016/j.ophtha.2009.09.040

Original Paper URL
http://www.ophthalmologyjournaloftheao.com/article/S0161-6420(09)01153-1/abstract

Indexing Status
Subject indexing assigned by NLM

MeSH
Child Abuse; Child, Preschool; Craniocerebral Trauma /diagnosis /etiology; Databases, Bibliographic; Humans; Infant; Infant, Newborn; Optic Nerve Injuries /diagnosis /etiology; Reproducibility of Results; Retinal Hemorrhage /diagnosis /etiology; Retinoschisis /diagnosis /etiology; Sensitivity and Specificity

AccessionNumber
12010003637

Date bibliographic record published
15/09/2010

Date abstract record published
09/03/2011

Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.