Medical, Social and Societal Issues in Infants with Abusive Head Trauma

Abstract
Abusive head trauma (AHT) is the leading cause of death from traumatic brain injury in under 2 years. AHT presents with acute encephalopathy, subdural hemorrhages and retinal hemorrhages occurring in the context of an inappropriate or inconsistent history. We retrospectively analyzed, over a 10 year period, admissions and transfers to our hospital with suspected AHT to assess patterns of presentation, symptoms, investigations, subsequent confirmation, social work input and both neurological and social outcomes. We analyzed all suspected AHT infants and children looking for the time of presentation, presenting symptoms, caregivers concerns prior to presentation, a family profile including stressors, investigations (in particular neuroradiology and ophthalmology assessments), treatment in hospital, length of stay in hospital, social work involvement, subsequent discharge, neurological outcome and subsequent social work follow up. Data was collected from the hospital HIPE system, RIS (radiology reporting system) and records from the social work department from a period October 1998 to January 2009 inclusive. Of 22 patients with confirmed AHT, 15 were males and 7 females. Ages ranged from 1 to 54 months with a median of 4 months and a mean of 7 months and a male:female ratio of 3:1. Eighteen (75%) were normal on follow up. This was for a period from 2 months to 6 years. The median was 28 days and mean 33 days. Ten (45%) infants required ventilatory support. Uncommon symptoms included apnoea, limpness, vomiting, lethargy and bulging fontanelle. Twelve (55%) had unclassified symptoms. One (5%) patient was admitted for psychological reasons. The father was the sole minder in 5 cases. The mother was the sole minder in 4 cases. There was a delayed history in 4 cases. One had multiple visits to his GP.

Methods
Abusive head trauma was defined as a triad of findings which included subdural hemorrhage, retinal hemorrhage and encephalopathy where there was confirmation of a case conference, civil or criminal court proceedings or admission by the perpetrator. Using the hospital HIPE system, RIS (radiology reporting system) and records from the social work department, we identified 48 patients with subdural hemorrhages from October 1998 to January 2009 inclusive. Of 22 patients with confirmed AHT, 15 were males and 7 females. Ages ranged from 1 to 54 months with a median of 4 months and a mean of 7 months and a male:female ratio of 3:1. Eighteen (75%) were normal on follow up. This was for a period from 2 months to 6 years. The median was 28 days and mean 33 days. Ten (45%) infants required ventilatory support. Uncommon symptoms included apnoea, limpness, vomiting, lethargy and bulging fontanelle. Twelve (55%) had unclassified symptoms. One (5%) patient was admitted for psychological reasons. The father was the sole minder in 5 cases. The mother was the sole minder in 4 cases. There was a delayed history in 4 cases. One had multiple visits to his GP.

Results
Of 22 patients with confirmed AHT, their ages ranged from 1 to 54 months with a median of 4 months and a mean of 7 months. The male:female ratio was 3:1. Eighteen were Irish and 4 came from non-Irish backgrounds. Six of the male partners were not the biological fathers. Eight were the first born in the family. Most often no explanation was forthcoming to explain the injuries, in three a low fall was put forth as an explanation and in just these patients (1 of the total) did the parents subsequently admit to shaking the infant. In terms of parental SEG status, 16 were unemployed. Six were higher professionals from SEG groups A-C. Two came from SEG groups D-F. Four were unclassified. The most common symptoms were seizures and irritability followed by vomiting, feeding, a bulging fontanelle and lethargy. The father was the sole minder in 5 cases. There was a delayed history in 4 cases. One had multiple visits to his GP.

Discussion
Abusive head trauma presents with acute encephalopathy, subdural hemorrhages and retinal hemorrhages occurring in the context of an inappropriate or inconsistent history. We retrospectively analyzed, over a 10 year period, admissions and transfers to our hospital with suspected AHT to assess patterns of presentation, symptoms, investigations, subsequent confirmation, social work input and both neurological and social outcomes. We analyzed all suspected AHT infants and children looking for the time of presentation, presenting symptoms, caregivers concerns prior to presentation, a family profile including stressors, investigations (in particular neuroradiology and ophthalmology assessments), treatment in hospital, length of stay in hospital, social work involvement, subsequent discharge, neurological outcome and subsequent social work follow up. Data was collected from the hospital HIPE system, RIS (radiology reporting system) and records from the social work department from a period October 1998 to January 2009 inclusive. Of 22 patients with confirmed AHT, 15 were males and 7 females. Ages ranged from 1 to 54 months with a median of 4 months and a mean of 7 months and a male:female ratio of 3:1. Eighteen (75%) were normal on follow up. This was for a period from 2 months to 6 years. The median was 28 days and mean 33 days. Ten (45%) infants required ventilatory support. Uncommon symptoms included apnoea, limpness, vomiting, lethargy and bulging fontanelle. Twelve (55%) had unclassified symptoms. One (5%) patient was admitted for psychological reasons. The father was the sole minder in 5 cases. The mother was the sole minder in 4 cases. There was a delayed history in 4 cases. One had multiple visits to his GP.

Figure 1
Figure 2: Imaging in AHT
Figure 3: retinal hemorrhages in AHT

All our cohort had retinal hemorrhages with 8 of 24 specifically in the posterior pole of the retina (see Figure 3). Hospital stays ranged from 1 to 124 days (the median was 28 days and mean 33 days). Ten (45%) infants required ventilatory support. Eighteen (75%) were normal on follow up. This was for a period from 2 months to 6 years. Two had ADHD. Two had language delay. Two had motor delay. Social workers became involved in 8 cases immediately. Six cases had delayed social work involvement.
up to 4 days after admission and 2 were delayed for more than 10 days. All had community social work referrals. Outcomes post case conference were that 6 were returned to their parents at home after discharge from the hospital. Seven returned to relatives of the parents, 6 went to foster parents (5 voluntarily), 1 died and 1 left the country. Just one criminal prosecution is being pursued at present.

Discussion

Our findings are consistent with previously published reports on AHT in highlighting the young age of the victims (median 4 months of age), the significant predominance of male infants (3:1 in this series), the high rate of probable male perpetrators (just over 50%) and relatively high rates of mortality and morbidity. This study highlights the very significant effects of AHT, it has some limitations. Firstly, it is a highly selected sample of admissions to a tertiary paediatric hospital and thus results may not reflect the true number of cases in the community. Secondly, the data collected was retrospective and thus the information obtained was limited to the quality of notation in the medical record. We felt that going through in great detail all the notes from the hospital social work department gave us a very accurate picture in terms of family make up and case conference discussions. Lastly, as data collection occurred during a time period (1998-2009) when the recognition and diagnosis of AHT was evolving, it is possible that in the early period some cases of AHT may not have been recognised. All the children in our study had intracranial hemorrhage. In a study by Hettler et al., subdural hematomas were found in 88% of infants with AHT.

When assessing children for AHT, it is important to detail types of retinal hemorrhage. These may include preretal, intraretinal and subretinal hemmorhages. Two-thirds of AHT victims had numerous, multi-layered retinal hemorrhages extending to the ora. Absence of retinal hemorrhage does not rule out child abuse. Traumatic retinoschisis is a particularly diagnostic lesion caused by traction applied to the retina by the raised intraocular pressure as the child is subject to a shaking force. Retinal hemorrhages associated with birth trauma or inflicted injury are associated with extraordinary force. Retinal hemorrhages should be evaluated within a month of birth. Likewise, retinal hemorrhage occurs rapidly in accidental head injury and is associated with extraordinary force. None of our children had fractures in our cohort. Branting et al. showed that up to 27% of skull fractures secondary to abuse can heal without significant injury. Most of these are located at the posterior aspect of the rib. There are usually no signs of bruising over these areas and many of these rib fractures may go unnoticed if there is no displacement so it is recommended that a repeat X-ray is carried out 10-14 days later.

Management of AHT centers around treatment of the acute medical condition. This is complemented with a multidisciplinary team approach involving social workers both within the hospital and in the community. As shown in our results, children with AHT may present with non-specific signs like apnoea, vomiting, lethargy and seizures. Very often, the initial diagnosis may be confused with sepsis. Apnoea often identifies the timing of injury as it occurs around the same time as the hypoxico-ischaemic event occurs. Multiple seizures are common in AHT. These seizures may be difficult to treat requiring anaesthetic agents. Management of AHT is multi-disciplinary and the early involvement of hospital social workers is desirable. In our study, 6 cases of 22 were seen on arrival to the emergency department. Six infants were interviewed within 4 days of admission with a further 2 only after 10 days. Social workers provide counselling and support for families involved with AHT. To date, there has been just one criminal prosecution in our series. In other countries, prosecutions of AHT cases have become more difficult. Drawbacks of this study is that it is a case series and a cross-sectional study from a defined population would have been preferable. This will be addressed by a prospective study which is currently being undertaken by the Irish Paediatric Surveillance Unit.

Children with suspected AHT should undergo appropriate investigations which should include brain imaging, ophthalmological examination, X-rays and blood investigations. Immediate social assessment should be a priority. AHT is devastating to the infant and ongoing care of these infants places a substantial burden on the medical system, caregivers and society in general. A prospective study of AHT in Ireland is currently being addressed by the Irish Paediatric Surveillance Unit.

Correspondence: AJ Nicholson
Childrens University Hospital, Temple Street, Dublin 1
Email: AJ.Nicholson@cuh.ie

References