

Case report

Head injuries in full contact karate competition! Is the prejudice in management minimising the required investigation?

Michael R. Graham, Bruce Davies and Julien S. Baker ✉

Health and Exercise Science Research Laboratory, School of Applied Sciences, University of Glamorgan, Pontypridd, Wales, CF37 1DL, UK

Abstract

A 33 year old male karate practitioner presented himself for a full-contact national karate competition. This individual competed for approximately 2 minutes and received a kick to the head. He collapsed in the competitive arena, and suffered a tonic-clonic seizure, lasting for 3 minutes 25 seconds. Examination in the competitive arena revealed an individual who was unconscious. First aid, and paramedic support was provided immediately. Medical assessment identified the presence of vital signs. Glasgow coma scale (GCS), post trauma was recorded as 3/15 until the fifth minute. A patent airway was established and a neck brace was applied. Blood pressure within 1 minute of trauma was 195/98 mm.Hg, heart rate was 185 bpm and respiratory rate was 40 breaths·min⁻¹. Oxygen was administered via a ventimask. The patient was conveyed to the medical area. The patient regained consciousness one minute after the seizure had resolved, but had amnesia concerning the event. GCS at five minutes was recorded as 13/15. The patient was transferred by ambulance to the nearest Hospital. The patient was discharged, following examination without further investigation. The finding of this study suggests that an individual with a history of head injury should have received computerised tomography as a minimum investigation. This may help alleviate the risk of further medical complications.

Key words: Cerebral trauma, computerised tomography, mild head injury, prevention.

Case report

In 2006 a 33 year old male, height 1.68 metres, weight 60 kg and body mass index (BMI) 21.3 kg·m⁻² who had completed a detailed medical questionnaire, presented himself for a medical prior to a full-contact martial arts competition. His past medical history was unremarkable.

At rest his blood pressure (BP) was 130/78 mmHg; heart rate (HR) was 72 bpm; rate pressure product (RPP) was 94 bpm. X mm.Hg x 10⁻² respiratory rate (RR) was 18 (Table 1).

Routine medical examination including central nervous system examination was satisfactory allowing competitive participation.

This individual competed for two minutes before receiving a direct kick to the head. Examination in the competitive arena revealed an individual who was unconscious. He was enduring a tonic-clonic seizure, recorded as lasting for 3 minutes 25 seconds. First aid, and paramedic support was provided immediately. Medical assessment identified the presence of vital signs. Glasgow coma scale (GCS) was recorded as 3/15 (E1, V1, M1).

A patent airway was established and a neck brace was applied. BP within 1 minute of trauma was recorded at 195/98 mm.Hg. HR was recorded at 185 bpm; the RPP was 361 bpm. X mm.Hg x 10⁻², and RR was 40 breaths·min⁻¹. His airway was clear and his capillary refill was < 2 seconds. Re-examination using the GCS was 3/15 (E1V1M1) every minute for the first five minutes (Table 2). Oxygen was administered via a venti-mask. The patient was conveyed to the medical area and disqualified on medical grounds.

The patient regained consciousness one minute after his seizure resolved. GCS on regaining consciousness and recorded at six minutes was 13/15 (E4, V4, M5) (Table 2).

Examination of central nervous system (CNS) revealed left sided hyper-reflexia and a left up-going planter response. Bilateral pupillary examination revealed an equal reaction to light and accommodation response. Bilateral retinoscopy examination with direct ophthalmoscope was unremarkable. A decision was made to admit him to nearest hospital, known to have a neurosurgical unit. The British Red Cross Ambulance Service conveyed him there within five minutes of his seizure stopping.

A GCS score of 8 or less suggests a severe brain injury (Teasdale and Teasdale, 1974). The "Revised Trauma Score" (Champion et al., 1989) in its present form does not accurately describe the relation of GCS, SBP, and RR to mortality (Moore et al., 2006). The Revised Trauma Score is a physiological scoring system, which until recently has been considered to have high inter-rater reliability and demonstrated accuracy in predicting death. It is scored from the first set of data obtained on the patient, and consists of systolic BP (SBP) and RR.

Six minutes post-competition the BP of the individual male was 173/88 mmHg; the HR was 70 bpm; the RPP was 121 and RR was 33.

A full history was difficult because the individual had a speech impediment, which had not been elicited pre-competition, but which he was lucid enough to point out. The patient complained of a headache and nausea, but had no memory of a blow to the head.

The patient was admitted to the nearest hospital with a neurosurgical unit. The hospital accident and emergency (A & E) department was contacted to advise on the patient's history, and request a neurosurgical opinion, but the telephone line was persistently engaged. The hospital was contacted every 1-2 minutes for the next hour and every five minutes for the following hour but

Table 1. Cardiovascular and respiratory parameters measured for individual competitor. Normal and hypertensive values are also provided.

Variable	SBP	DBP	HR	RPP	RR
Rest pre-trauma	130	78	72	94	18
1 min post-trauma	195	98	185	361	40
6 min post-trauma	173	88	70	121	33
Normal Values	120	80	75	86	15
Hypertensive Values	140	90	75	98	

SBP = Systolic blood pressure (mm.Hg), DBP = Diastolic blood pressure (mm.Hg), HR = Heart Rate (beats per minute), RPP = Rate Pressure Product (SBP X HR x 10⁻²), RR = Respiratory Rate (breaths per minute)

the hospital line remained engaged and remained engaged for the remainder of the day (a Saturday).

The patient was discharged without computerised tomography (CT), despite a letter being presented to the A & E senior house officer requesting a neurosurgical opinion.

The British Red Cross ambulance returned the patient to the karate venue so he could be taken home, by his family and acquaintances. He was taken to his sister's house for rehabilitation and remained there for one week, before returning home. He received contact by text and telephone with the karate medical team on a daily basis until he returned to work, one week after the event. Two weeks after the trauma he resumed training and is subsequently sparring. There appeared to be no long term consequences.

Discussion

Brain injuries may be graded into mild, moderate and severe depending on clinical and neuro-imaging criteria. Mild brain injuries (MBI) are usually defined by an initial unconsciousness limited to 30 minutes, a Glasgow score between 13 and 15, the absence of intra-cranial lesion on the CT scan, a post-traumatic amnesia period between one and 24 hours (Kosakevitch-Ricbourg, 2006).

GCS scores are widely used to quantify level of consciousness in the pre-hospital environment.

Values for field GCS are highly predictive of arrival GCS, and both are associated with outcome from

traumatic brain injury. A change in GCS from the field to arrival is highly predictive of outcome (Davis et al., 2006). Detailed clinical examination is of no diagnostic value in detecting intracranial injuries found on head CT scan. A head CT scan is considered essential in patients with observed loss of consciousness or post-traumatic amnesia and GCS 13-15, as part of their evaluation to avoid missing an intracranial injury in the USA (Halley et al., 2004).

The British Medical Association has been campaigning vociferously to illegalise boxing for many years (Sheldon, 2003). There is an unfortunate belief within the national health service, that injuries incurred as a consequence of full contact sports, are self-inflicted and less deserving than injuries from accidents outside sport. The cost of CT scanning all head injuries is prohibitive. The decision to refer such a head injury for tertiary assessment can often lie with the most junior of medical staff in an A & E department, who may be influenced by these prohibitions and due to high work load may harbour prejudice against such "self-inflicted" injuries. Patients with a cranial CT scan, that shows no intra-cerebral injury and who do not have other body system injuries or a persistence of any neurological finding can be safely discharged from the emergency department without a period of either inpatient or outpatient observation (Shackford et al., 1992). Implementation of this practice could result in a potential decrease of more than 500,000 hospital admissions annually in the USA (Livingston et al., 2000).

Table 2. Glasgow Coma Scale: Individual subject readings.

	One Minute Post-trauma (3)	Four Minutes Post-trauma (4)	Six Minutes Post-trauma (13)
Best Eye Response: (Max 4)			
1. No eye opening	√		
2. Eye opening to pain		√	
3. Eye opening to verbal command			
4. Eyes open spontaneously			√
Best Verbal Response: (Max 5)			
1. No verbal response	√	√	
2. Incomprehensible sounds			
3. Inappropriate words			
4. Confused.			√
5. Orientated.			
Best Motor Response: (Max 6)			
1. No motor response	√	√	
2. Extension to pain			
3. Flexion to pain			
4. Withdrawal from pain			
5. Localising pain			√
6. Obeys commands			

The risk of having an intra-cerebral haemorrhage from a MBI is 38%, with 7% requiring neurosurgical intervention (Thiruppathy and Muthukumar, 2004). The consequences of a MBI may be simple but the injured often suffer from a transitory post-concussive syndrome (Kosakevitch-Ricbourg, 2006). Traumatic stress states are a well known pathology and consist of a psychological reaction against the trauma. The acute traumatic stress may or may not run its course to a chronic post-traumatic stress disorder.

Conclusion

An immediate examination post trauma can not diagnose or preclude an intra-cranial haemorrhage. Because kicks to the head are the primary target for an opponent's blows, karate practitioners are at risk of acute and chronic neurological trauma. An episode of unconsciousness and post-traumatic amnesia and a GCS < 15 should make CT scanning mandatory. Workers within the NHS framework should receive further training and education, which would help eliminate misconceptions that sports injuries are 'self-inflicted' and hence, in some way, 'less deserving'. This case was one of the 62% and had a successful outcome. The next case may be one of the 38% and may not!

References

- Champion, H.R., Sacco, W.J., Copes, W.S., Gann, D.S., Gennarelli, T.A. and Flanagan, M.E. (1989) A revision of the trauma score. *Journal of Trauma* **29**, 623-629.
- Davis, D.P., Serrano, J.A., Vilke, G.M., Sise, M.J., Kennedy, F., Eastman, A.B., Velky, T. and Hoyt, D.B. (2006) The predictive value of field versus arrival Glasgow Coma Scale score and TRISS calculations in moderate-to-severe traumatic brain injury. *Journal of Trauma* **60**, 985-990.
- Halley, M.K., Silva, P.D., Foley, J. and Rodarte, A. (2004) Loss of consciousness: when to perform computed tomography? *Paediatric Critical Care Medicine* **5**, 230-3.
- Kosakevitch-Ricbourg, L. (2006) Mild brain injuries: definition, classifications and prognosis. *Revue de Stomatologie et de Chirurgie Maxillo-faciale* **107**, 201-205.
- Livingston, D.H., Lavery, R.F., Passannante, M.R., Skurnick, J.H., Baker, S., Fabian, T.C., Fry, D.E. and Malangoni, M.A. (2000) Emergency department discharge of patients with a negative cranial computed tomography scan after minimal head injury. *Annals of Surgery* **232**, 126-133.
- Moore, L., Lavoie, A., Lesage, N., Abdous, B., Bergeron, E., Liberman, M. and Emond, M. (2006) Statistical validation of the revised trauma score. *Journal of Trauma-Injury Infection & Critical Care* **60**, 305-311.
- Shackford, S.R., Wald, S.L., Ross, S.E., Cogbill, T.H., Hoyt, D.B., Morris, J.A., Mucha, P.A., Pachter, H.L., Sugerman, H.J. and O'Malley, K. (1992) The clinical utility of computed tomographic scanning and neurologic examination in the management of patients with minor head injuries. *Journal of Trauma* **33**, 385-394.
- Sheldon, T. (2003) Boxing should be banned unless rules are tightened, advises Dutch body. *British Medical Journal* **327**, 1186.
- Teasdale, G. and Jennett, B. (1974) Assessment of coma and impaired consciousness. A practical scale. *Lancet* **2**, 81-84.
- Thiruppathy, S.P. and Muthukumar, N. (2004) Mild head injury: revisited. *Acta Neurochirurgica (Wien)* **146**, 1075-1082.

Key points

- Head injuries are common in full contact sports.
- GCS is the examination of choice to determine neurological status in the field.
- Detailed neurological examination cannot detect intra-cerebral haemorrhage.
- 38% of mild brain injuries result in intra-cerebral haemorrhage.
- Discussion between clinicians in the field and hospital clinicians is necessary to provide full details of the clinical picture to avoid premature discharge.

AUTHORS BIOGRAPHY

Michael GRAHAM

Employment

Senior Lecturer Health and Exercise Science Research Unit, University of Glamorgan

Degree

MbChB

Research interests

Sports Medicine

E-mail: mgraham@glam.ac.uk

Bruce DAVIES

Employment

Professor Applied Physiology, Health and Exercise Science Research Unit, University of Glamorgan

Degrees

BSc, MSc, PhD

Research interests

Cardiovascular disease

E-mail: bdavies1@glam.ac.uk

Julien Steven BAKER

Employment

Professor Applied Physiology, Health and Exercise Science Research Unit, University of Glamorgan

Degrees

BA (Hons), MSc, PhD

Research interests

High intensity exercise, oxidative stress, muscle metabolism

E-mail: jsbaker@glam.ac.uk

✉ Julien Stevan Baker

Health and Exercise Science Research Laboratory, School of Applied Sciences, University of Glamorgan, Pontypridd, Wales, CF37 1DL.