The patient with head injury and a Glasgow coma score of 15 — is a brain CT examination indicated?

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Abstract

The decision as to whether to perform a CT examination of the brain in patients with a Glasgow coma score of 15 after injury is often difficult, given the limited CT scanning facilities available in state hospitals.

A retrospective evaluation of 100 consecutive head-injury patients presenting with a Glasgow coma score of 15 at Tygerberg Hospital was therefore carried out. In a surprisingly high number of patients (50%) abnormal findings due to the injury were detected. Analysis of the clinical history parameters did not demonstrate a significant association with abnormal CT findings. It is therefore concluded that brain CT examination in patients with a Glasgow coma score of 15 is justified, and that the Glasgow coma scale is a poor predictor of intracranial injury.

Introduction

There is intense debate in the medical literature over whether head-injury patients with a Glasgow coma score of 15 need to be examined by CT. This debate is driven by the need to identify all patients with potentially serious injuries against the limited CT scanning facilities available at many institutions.

The Glasgow coma scale was developed in 1974 as an evaluation instrument to monitor patients with altered consciousness. It is a simple and reproducible examination, utilising three categories of patient response, i.e. the ability to open the eyes, the best verbal response, and the best motor response.

Patients and methodology

This study is based on the retrospective database evaluation of 100 consecutive head-injury patients (injuries < 36 hours before admission) referred for a brain CT investigation. All patients were 13 years of age or older, and on admission had a Glasgow coma score of 15. The full-time trauma doctors at the Trauma Unit at Tygerberg Hospital assessed the Glasgow coma score of patients on admission.

Results

In this study of 100 head-injury patients, the CT examination was abnormal in 56 patients (56%). In 6 patients the pathology was unrelated to the head injury (Fig 1).

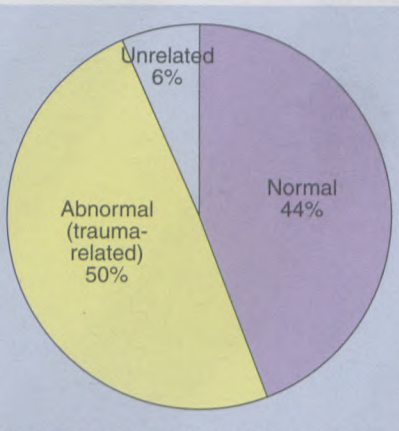

Fig. 1. CT findings for 100 head-injured patients with a Glasgow coma score of 15.

The spectrum of unrelated pathology in the 6 patients was as follows:

- Cysticercosis
- Posterior cerebral artery infarct
- Posterior cerebral artery aneurysm
- Calcified granuloma
- Posterior inferior cerebral artery infarct with subarachnoidal bleeding
- Lacuna infarct of the basal ganglia

Mechanisms of injury (Fig. 2):

- 19 motor vehicle accidents (MVAs)
  - 6 pedestrians
  - 12 passengers
  - 1 motorcycle/motorbike cyclist
- 68 assaults
  - 7 physical
  - 60 object

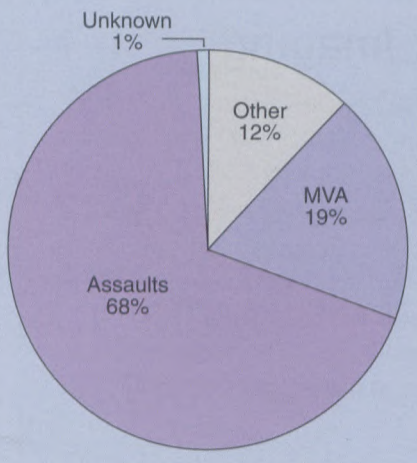

Fig. 2. Mechanism of injury in 100 patients with Glasgow coma score of 15.

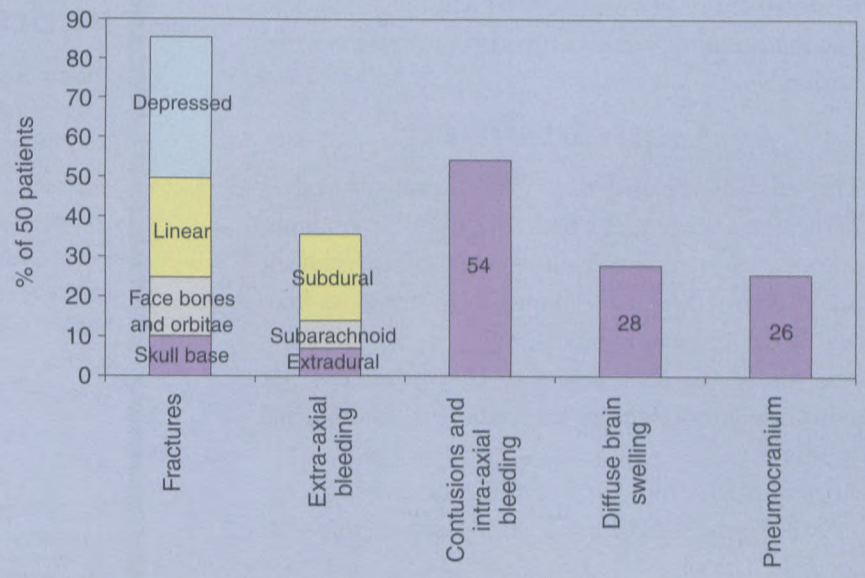

Fig. 3. Findings in 50 patients with an abnormal trauma related CT.

- 1 unknown
- 12 Other
- 1 Unknown

Skull X-ray findings

- 42 (84%) of the 50 patients had single or multiple injuries
- The findings in the 42 patients with fractures were:
  - 15 (36%) extra-axial bleeding
  - 22 (52%) intra-axial bleeding or contusions
  - 22 (52%) diffuse brain swelling and/or pneumocranium
- 9 (16%) of the 50 patients did not have a fracture, but showed:
  - 2 patients had a small subdural bleed
  - 1 patient had subarachnoid bleeding
  - 5 patients had a contusion

Discussion

Fifty patients had abnormal CT findings related to their trauma (Figs 3 and 4). This is a very high incidence and there are several reasons for this. One of these is in the design of this study. Most studies in the literature are based on consecutive head-injury patients with a Glasgow coma score of 15, all of whom had routine brain CT, while in this study only patients with clinical indications were examined. In comparison, Jeret *et al.*[1] found abnormal findings in 9.4% of 712 consecutive patients with a Glasgow coma score of 15 who were evaluated with brain CT over a 1-year period.

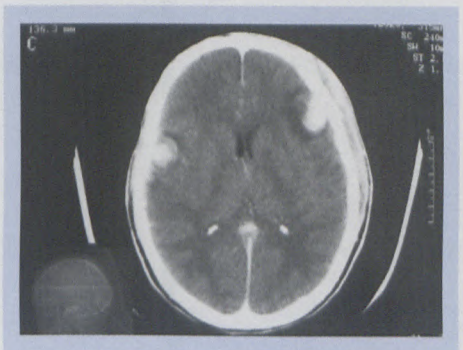

Fig. 4. CT scan of a patient with a Glasgow coma score of 15 who was assaulted. There are right parietal and left frontal cerebral contusions.

Age

The average patient age was 31 years (median 28 years). This compared with larger studies in the literature, with a average age of 33 years.[2]

Gender

Seventy-two percent of patients were male and 28% were female. This is comparable with other studies which showed that more males than females presented with head injuries in trauma units.[3,4]

Mechanisms of injury

Sixty-eight patients were assaulted, 19 were MVA patients, 12 had fallen and 1 history was unknown.

In a study of 2 766 patients, Shackford *et al.*[5] identified assault as the mechanism of injury in only 8% of patients. Livingston *et al.*[6] showed that as a mechanism of injury assault was associated with a higher incidence of intracranial pathology. The very high percentage of assaults in this study in comparison with the literature is probably the reason for the high number of abnormal CTs.

Clinical history

In the patient group with abnormal CT findings, 96% had headache,

34% nausea and vomiting, 22% loss of consciousness, 10% had memory loss and 10% convulsions. No clear distinction was observed in comparison with the normal CT group.

Conclusion

This analysis revealed that 56% of patients with a Glasgow coma score of 15 had abnormal CT findings, many of which were significant. Assault as a mechanism of injury occurred far more frequently in this series than in large series analysed in other countries.

Analysis of the clinical history parameters did not demonstrate any significant association with abnormal CT findings.

An abnormal neurological examination and suspicion of a skull fracture did have a strong association with abnormal CT findings.

In 84% of patients with one or more fractures, the CT examination was abnormal.

In light of the above findings it can be concluded that brain CT examination in patients with a Glasgow coma score of 15 is justified, and that the Glasgow coma scale is a poor predictor for normal brain CT examination.

References

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Further details regarding this position may be obtained from Professor Mark Khangure, Head of Department, Diagnostic and Interventional Radiology, Royal Perth Hospital on (+61 8) 9224 2126, facsimile (+61 8) 9224 2912, e-mail: mark.khangure@health.wa.gov.au or Dr Elizabeth Wylie, Department of Diagnostic and Interventional Radiology, Royal Perth Hospital on (+61 8) 9224 2125, facsimile (+61 8) 9224 2912 or e-mail: liz.wylie@health.wa.gov.au

Applications stating qualifications, previous experience and the names and addresses of two professional referees should be forwarded to Joyce O'Hara, Senior Administrative Assistant, Clinical Services, Royal Perth Hospital, GPO Box X 2213, Western Australia 6847.

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MPP24338