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Craniocerebral War Missile Injuries: Clinical and Radiological Study

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Summary

In this study we reviewed the initial clinical and radiological management and early outcomes of 176 consecutive patients from the war in Croatia.

Keywords: War injury; missile injury; intracranial foreign bodies; computed tomography.

Introduction

Despite the fact that numerous articles have been published on this topic it is clear that different authors suggest slightly distinct approaches in diagnosis and treatment of patients with craniocerebral missile injuries [2–4]. Here, we present our experiences in the management of 176 patients with craniocerebral missile injuries sustained during the war in Croatia from 1991 to 1995.

Patients and Methods

During the war in Croatia, 176 patients (86,4% were soldiers, and 13,6% civilians) with craniocerebral missile injuries were hospitalized at the Department of Neurosurgery, University Hospital Split. The mean GCS score for 156 patients on admission was 10 (range 3–15), while twenty patients were comatose.

After initial evaluation and stabilization all patients underwent plain X-ray skull radiography and computed tomography. Patients with extensive entry wounds were operated on and after craniectomy, debridement of devitalized tissue and debris, removal of the visible foreign bodies and some bone or metal fragments visualized on the pre-operative NCT was done, followed by dural closure with fascia lata, periosteum or rarely with lyophilized dura. For statistical analysis chi-square test with Yates correction was used. Probability of less than 0,05 was considered statistically significant.

Results

By using clinical and radiological procedures we observed the following neurological complications: CSF fistula in 19, meningo-encephalitis in 13 patients (7 of them also had CSF fistula), seizures in 8, hydrocephalus in 2, while brain abscess occurred in 9 patients. Nineteen patients (10,7%) died during the hospitalisation.

Discussion

Complications which occurred in 38,6% of all cases, were mostly postoperative cerebrospinal fluid fistulas (39%) and infections (16,5%). In our work, we did not find any statistically important connection between postoperative cerebrospinal fluid fistulas and the kind of the substitute used for the dural defect closure. Furthermore, we found that the basal cerebrospinal fluid fistulas significantly affected the occurrence of complications, especially infections (chi square = 4,57; $p = 0{,}032$). We also observed a statistically important connection between remaining bone fragments and the occurrence of infection (chi square $= 9,42$; $p = 0{,}002$) a different result from Aarbi [1]. It is important to emphasise that all patients with CNS infection and retained foreign bodies had at least two other risk factors such as GCS ≤ 5, extensive brain injuries, CSF fistula, and craniobasal penetrating injuries [5]. Of the total number of all patients 10 (5,6%) died immediately after hospitalisation, and 9 (5,1%) died during the treatment as a result of compli-

cations. The most common causes of mortality were infections of the central nervous system or sepsis.

As it is shown in this paper, the predictors of mortality in craniocerebral war missile injuries included: GCS $\leq$ 5, bihemispheric lesions, perforating injuries and high velocity injuries with bullets. The, radiological method of choice for initial and follow-up examinations of patients with craniocerebral injuries is computed tomography.

References

1. Aarabi B (1990) Surgical outcome in 435 patients who sustained missile head wounds during the Iran-Iraq war. Neurosurg 27(5): 692–699
2. Bešenski N, Jadro-Šantel D, Jelavić-Koić F *et al* (1995) CT analysis of missile head injury. Neuroradiology 37: 207–211
3. Brandvold B, Levi L, Feinsod M, George ED (1990) Penetrating craniocerebral injuries in the Israeli involvement in the Lebanese conflict, 1982–1985. J Neurosurg 72: 15–21
4. Carey ME, Young HF, Rish BL, Mathis JL (1974) Follow-up study of 103 American soldiers who sustained a brain wound in Vietnam. J Neurosurg 41: 542–549
5. Janković S, Bradarić N, Bušić Ž *et al* (1997) Early intracranial infections after brain missile injuries: the role of computed tomography in diagnosis and treatment. Acta Med Croat 51: 233–237

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