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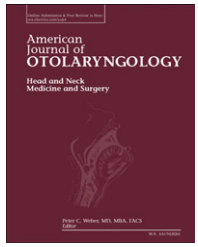

Temporal bone fractures: sequelae and their impact on quality of life☆

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ABSTRACT

Purpose: To present a prospective temporal bone fracture database, and study facial and cochleovestibular sequelae and their impact on quality of life.

Materials and methods: Prospective study of consecutive cases of 39 patients with 45 temporal bone fractures over 11-month period in a university tertiary referral center. Based on epidemiological data, clinical and imaging findings, treatment modalities and outcome of patients with follow-up of one year, the present study focused on facial and cochleovestibular sequelae and their impact on quality of life after one-year period.

Results: After 12 months, 44% of patients present with balance problems, 56% with hypoacusis, 56% with tinnitus, and 15% with facial paralysis. In 75%–80% of patients, the cochleovestibular sequelae are described as disabling. Post-trauma quality of life was significantly impaired compared with pre-trauma quality of life, even after 12 months. Long-term cochleovestibular sequelae were significantly associated with poor long-term quality of life.

Conclusions: The study demonstrates the need to focus on prevention of temporal bone fractures, notably by promoting the use of helmets and improvements in helmet design. The rapid diagnosis of temporal bone fracture is crucial as it enables effective initial management aimed at avoiding sequelae. The frequency of cochleovestibular sequelae after temporal bone fracture and their impact on quality of life demonstrate the importance of, and need for, ongoing follow-up by a local medical team who can diagnose and manage these long-term sequelae.

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1. Introduction

Cranial traumas can cause complex injuries of the petrous region, usually from motor vehicle accidents (MVA) or sports injuries. Approximately 4%–30% of head injuries involve a fracture of the cranial base, including 18%–40% with temporal bone involvement [1]. Most of these fractures are unilateral, with bilateral fractures reported in 9%–20% of cases [1]. Temporal bone fractures are a result of high energy mechanisms; hence, patients often have multiple associated injuries: intracranial injuries, skull fractures and maxillofacial fractures [2]. Although a temporal bone fracture may not be the patient's most immediately threatening problem, early involvement of the otolaryngologist (ENT) in evaluation and management can improve long-term functional outcome. Close collaboration between specialists is necessary to obtain good patient management, control and follow up [3].

Because of the presence of important sensory, neural, and vascular structures in and around the temporal bone, injuries to this region may be responsible for multiple lesions of varying severity and compromise quality of life (QOL). The most common sequelae of temporal bone fracture include facial paralysis (FP), sensorineural hearing loss (SNHL), tinnitus, vertigo and balance disturbance, and cerebrospinal fluid (CSF) leak through the fracture lines [1]. All contribute to deteriorate outcome and reduce QOL. To the best of our knowledge, no study in the English-language literature analyzes QOL after temporal bone fracture.

Based on epidemiological data, clinical and imaging findings, treatment modalities and outcome of patients, the present study focused on facial and cochleovestibular sequelae and their impact on QOL in patients with temporal bone fracture.

2. Materials and methods

This paper reports on a prospective study of consecutive cases of temporal bone fractures in a university tertiary referral center over an 11-month period (May 2009 to March 2010). Excluded from the study: cases with otological disease or FP before trauma.

2.1. Workup

Epidemiological data, the circumstances of the accident, the Glasgow Coma Scale (GCS), and associated injuries of the head and face on computed tomography (CT) were recorded. Brain injury was classified as severe (GCS 3–8), moderate (GCS 9–12) or minor (GCS 13–15). Patients were clinically investigated for otological and neurological symptoms, also with pure-tone audiometry and videonystagmoscopy (diapason test and Frenzel goggles if not possible initially). Audiometric data were analyzed using air conduction (AC), bone conduction (BC) and air-bone gap (ABG) frequency averages (0.5, 1, 2 and 3 kHz), as recommended by the Committee on Hearing and Equilibrium guidelines [4]. In case of balance problems, vertigo or abnormal videonystagmoscopy, videonystagmography was performed. FP was defined by time of onset and severity by the House Brackmann grading [5]. In cases of immediate, total or persistent FP, electromyography (EMG) (detection and stimulation data, with blink reflex testing) was performed. High-resolution CT of the temporal bone with multiplanar reconstructions was performed to locate and stage the fracture. If CT revealed carotid canal injuries, CT angiography was used to investigate vascular lesions.

2.2. Treatment strategy

Immediate and total FP were managed with surgical exploration after imaging and EMG indicated a need for nerve decompression or repair (facial canal injuries – denervation >90%). All FP were treated with high-dose corticosteroids, long-term eye care and facial physical therapy, with further interventions based on EMG results. Vestibular deficit was managed with high-dose corticosteroids and vestibular rehabilitation. SNHL and tinnitus were initially treated with high-dose corticosteroids. In the event of CSF leak, conservative measures (bed rest, head elevation, stool softeners and prophylactic antibiotics) were combined with anti-pneumococcal vaccination. If the leak persisted at day 7, surgical exploration with closure of the breach was indicated. Tympanic perforations and ossicular injuries were managed with tympanoplasty or ossiculoplasty after a minimum of 3 months.

2.3. Follow-up

Included patients were followed up during a minimum 12-month period. After 12 months, long-term data were collected by assessment of sequelae and QOL. The assessment was based on criteria determined by specialists at the hospital after a review of the literature. A combination of different validated questionnaires used: the SF36 quality-of-life scale [6], the Duke scale [7], the Dizziness Handicap Inventory [8], the Tinnitus Handicap Inventory [9] and Tinnitus Handicap Questionnaire [10]. Severity of the sequelae was evaluated on numerical scales from 1 (very mild) to 10 (very severe). QOL was evaluated on numerical scales from 0 (mediocre) to 10 (excellent).

2.4. Statistical analysis

We evaluated the relationships between the various cranial traumas, the initial ENT findings, the sequelae and QOL. Subgroup comparisons were made using the Mann–Whitney test for quantitative data and the χ^2 test or Fisher's exact test (when appropriate) for categorical data. Variations in the evolution of QOL scores were tested using the paired t-test. A p-value of <0.05 was considered significant. All these analyses were carried out using SPSS 17.0 for Windows.

3. Results

3.1. Epidemiological data

Over 11 months, 39 patients were included, and presented 45 fractures, 31 men (79%) and 8 women (21%), i.e. a sex ratio of 3.7. The mean age was 41 years (range: 4–78 years). The fracture was located on the right side in 21 cases (54%), the left side in 12 cases