

Outcomes of treatment of fractures of the frontal sinus: review from a tertiary multispecialty craniofacial trauma service

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Abstract

There are no agreed national guidelines for the treatment of fractures of the frontal sinus and the naso-orbitoethmoid complex. The Oxford University Hospitals Craniofacial Trauma unit was set up five years ago as a joint oral and maxillofacial, ENT, and neurosurgical service, and we present our experience to date in the treatment of patients with such fractures. The study includes 91 patients with data collected from a prospective database. Patients underwent cranialisation if they met the criteria of persistent leak of cerebrospinal fluid (CSF), displaced fracture of the posterior wall or obstruction of the nasofrontal outflow tract. The mean follow-up time was 42 months (range 1–10 years). Three groups of patients were analysed. Group 1 met the criteria for, and were treated by, cranialisation (n=50). Group 2 met the criteria for cranialisation, but were treated conservatively because of coexisting conditions (n=8). Group 3 did not match the criteria for treatment, and were managed conservatively (n=33).

The numbers of patients with complications or who required further operation were: group 1 (4/50), group 2 (3/8), and group 3 (3/33). There were significantly fewer complications among those patients who met the operative criteria and were treated by cranialisation than among those treated conservatively (p=0.04). These outcomes from one dedicated multispecialist craniofacial trauma unit in the UK may help surgeons who care for patients with this specific group of injuries. Our morbidity was in keeping with published figures.

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Introduction

Fractures of the frontal sinus make up about 5% of all facial trauma,¹ and the injuries are associated with a considerable risk of morbidity and mortality. The frontal sinus is a chamber lined with mucous membrane that starts to develop in childhood, and reaches a variable size.² The posterior wall

of the sinus forms part of the anterior cranial wall, and its cranial surface is lined with dura. The anterior wall is part of the contour of the forehead. The floor of the sinus contains the nasofrontal outflow tract, which allows drainage of the contents of the sinus into the nasal cavity or, in most cases, into the ethmoid sinuses.³

Fractures of the posterior wall of the sinus may be associated with a dural tear and communication of the sinus with the sterile cranium, which creates a risk of a persistent leak of cerebrospinal fluid (CSF) and of meningitis.⁴ Obstruction of the outflow tract can cause stasis within the sinus, which may lead to sinusitis and the formation of a mucocoele.⁵

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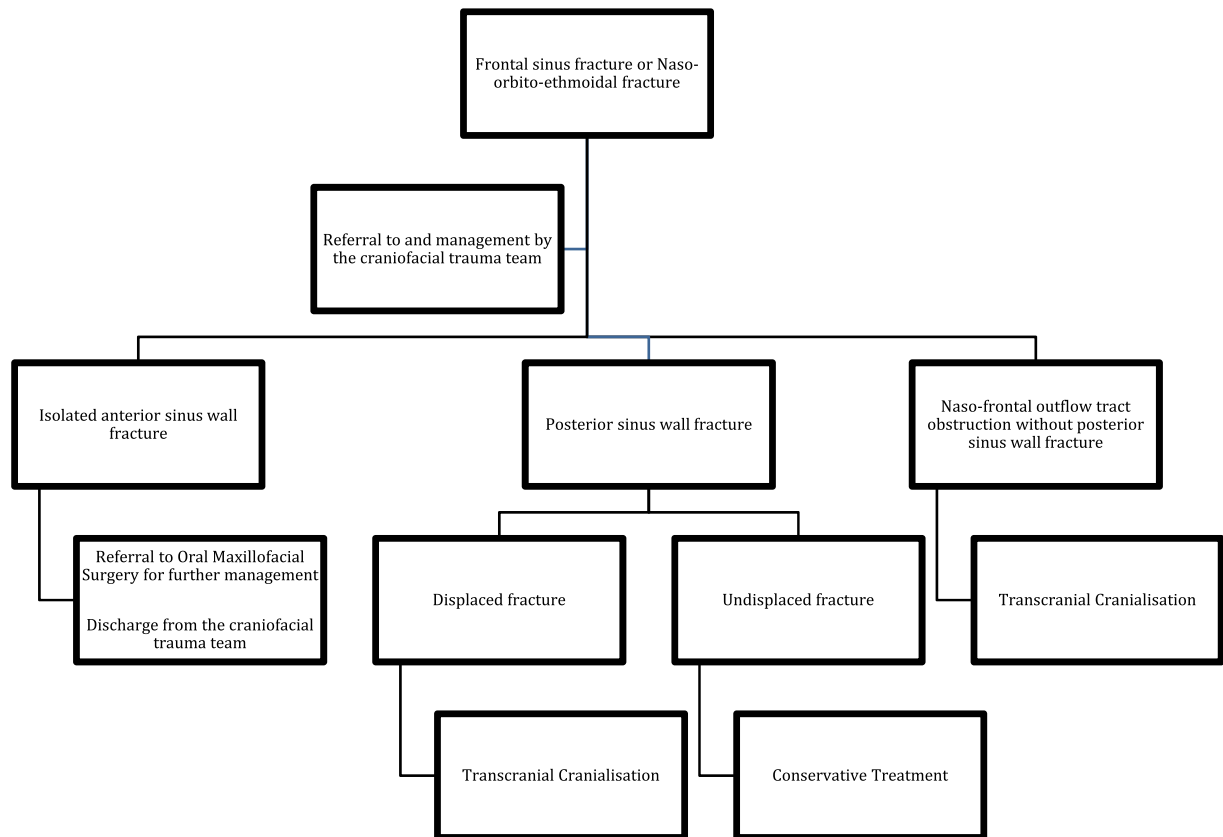


Figure 1. Management protocol for craniofacial trauma at the Oxford University Hospitals NHS Trust.

At the Oxford University Hospitals NHS Trust, a craniofacial trauma service has been established, which comprises oral and maxillofacial, neurosurgical, and ear nose and throat surgical teams. All patients who present with new fractures of the frontal sinus or naso-orbitoethmoid complex are managed in accordance with an agreed protocol based on the experience of other groups (Fig. 1).⁶ Patients who are referred with old fractures, whether previously treated or not, are also seen in the combined craniofacial trauma clinic.

The purpose of this paper is to describe our management protocol and present follow-up data to validate its safety (Fig. 2).

Patients and methods

Selection of patients

All patients who presented with a fracture of the frontal sinus or naso-orbitoethmoid complex from November 2005 to December 2014 in the catchment area of the Oxford OMFS department were followed up in the craniofacial trauma clinic and included in this study. Patients were identified for inclusion from the hospital outpatient clinic database.

The exclusion criteria were: death before discharge as a result of acute injuries, late presentation (not initially treated

by the craniofacial trauma team using our protocol), follow-up period of less than a year, and repeat craniofacial injury.

Data collection

Data were collected prospectively using a customised database, and included the patient's age, sex, mechanism of injury, other injuries sustained, Glasgow Coma Scale on admission, the primary definitive operation done, and the most recent follow-up. A retrospective review of medical records allowed completion of gaps in data.

All patients had preoperative multiaxial (sagittal, transverse, and coronal) fine cut (<2 mm slice thickness) computed tomographic (CT) scans, which were reviewed retrospectively and reported for this study by a consultant neuroradiologist to confirm that the correct type of fracture had been recorded and whether the nasofrontal outflow tract was blocked.

Fractures were classified as: fracture of the posterior wall of the frontal sinus, undisplaced or displaced; or fracture of the naso-orbitoethmoid complex, nasofrontal outflow tract not obstructed or obstructed. A displaced fracture of the posterior wall of the sinus was recorded where the displacement of the fracture was greater than the width of the displaced fragment of bone.^{6,7} The nasofrontal outflow tract was recorded as obstructed when fragments of bone completely

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