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Open reduction and internal fixation of palatal fractures using three-dimensional plates

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Abstract

The maxilla is arguably the most anatomically intricate structure of the craniofacial skeleton, and the hard palate is an important bone that regulates the width and architecture of the face. The management of palatal fractures has long been a matter of debate, and varies with anatomical pattern and other injuries to the craniofacial skeleton. We have studied 18 palatal fractures during a five-year period that were treated using 3-dimensional rectangular plates placed across the palatal vault together with fixation of other fractures of the facial bones. Healing was satisfactory in all patients by 12 weeks, with no complications. We think that open reduction and internal fixation of palatal fractures with 3-dimensional plates offers adequate stability with minimal complications.

Keywords: Palatal fractures; 3D plates; Open reduction and internal fixation; titanium plates

Introduction

Palatal fractures were first described by Rene Le Fort in 1901 in his series of experiments about the pattern of maxillary fractures,[1] and the proportion of palatal fractures among midface fractures ranges from 8%–13.2%.[2] The classic clinical signs of such fractures include widening of the midface, palatal ecchymosis in closed fractures, and laceration of the palatal mucosa in open fractures. We know of two published classifications of palatal fractures, Hendrickson's, which was based on the anatomical pattern,[3] and Park's which was based on the management protocol.[4]

Management of palatal fractures remain the most controversial and challenging of all facial fractures. For years they were treated with various methods which include the Kirschner wire, intermolar wiring, transpalatal wiring, and arch bars.[5] The stability obtained from these methods was not adequate, however, and the search for better osteosynthesis for palatal fractures still continues. We know of no published reports of successful internal fixation.

Here we propose a method of open reduction and internal fixation of palatal fractures with 3-dimensional miniplates, which offers adequate stability and avoids the complications involved with other methods of fixation.

Patients and methods

From February 2011 to February 2017 we treated 18 patients (age range 19–51 years) for palatal fractures in the department of oral and maxillofacial surgery. All fractures were in addition to other facial fractures, and they were all treated with open reduction and internal fixation using 3-dimensional

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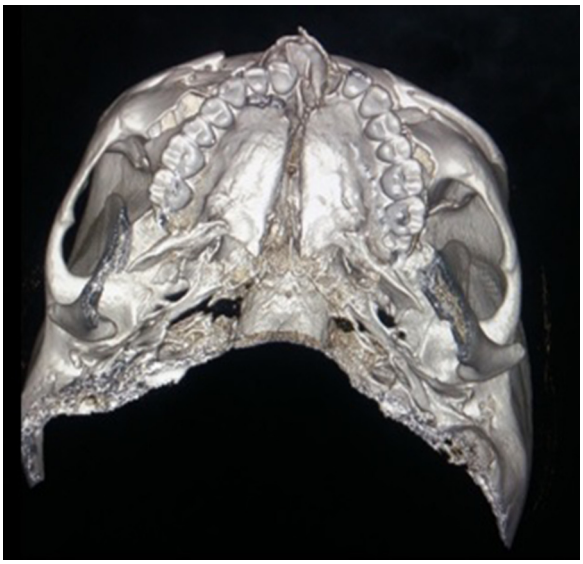

Fig. 1. Three-dimensional reconstruction of a sagittal palatal fracture.

rectangular plates. Informed consent was obtained from all the patients.

The diagnosis was made after correlating the clinical signs found on examination with the findings of computed tomographic scans. A DICOM viewer was used to assess the axial, coronal, and sagittal planes as well as 3-dimensional reconstruction images (Fig. 1). Patients were then treated by operation under general anaesthesia with submental intubation. Erich's arch bars were placed for all the fractures. Absolute reduction of the fractured segments was not achieved with the placement of an arch bar, and the palatal spread persisted even after the placement of the arch bar (Fig. 2). The palatal fracture was fixed before any other facial fractures were dealt with.

In open fractures the existing laceration was used to gain access to the fracture, and in closed fractures a vertical incision was made and a mucoperiosteal flap raised on either side of the fracture without interfering with its blood supply

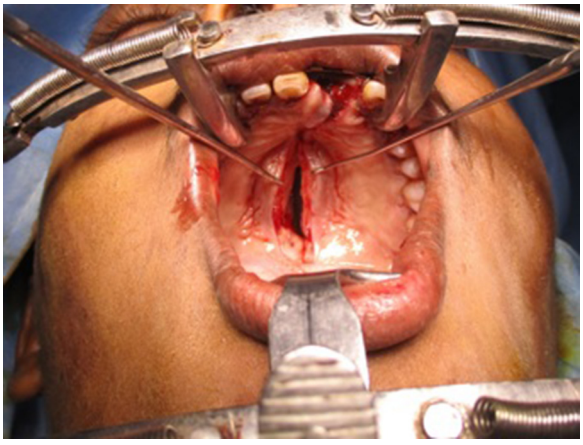

Fig. 2. Intraoperative image of the fracture. The palatal spread persisted, even after the placement of an arch bar.

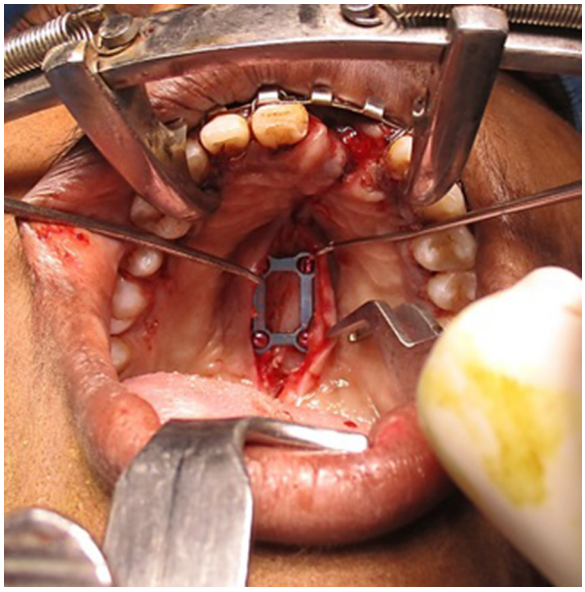

Fig. 3. Fixation of the segments of the palatal fracture with a 3-dimensional plate after anatomical reduction.

from the greater palatine vessels. The complete exposure of the bony palate allowed thorough visualisation of the fracture, and aided precise anatomical alignment and fixation of the segments. We used Hayton Williams' forceps around the maxillary arch in the molar region to reduce the fracture segments to their anatomical position, and they were fixed in that position using 3-dimensional rectangular plates along the long axis of the palate (Fig. 3) with 2.0×4.0 mm screws. Other fractured facial bones were reduced and fixed in sequence. The palatal mucosa was closed with simple interrupted sutures of 4/0 polyglactin 910 (Ethicon) (Fig. 4).

At the end of the operation the patient was extubated and recovery was uneventful. No patient needed postoperative intermaxillary fixation. All patients were followed up for a minimum of 12 weeks. During follow up patients were reviewed both clinically and radiologically. The clinical vari-

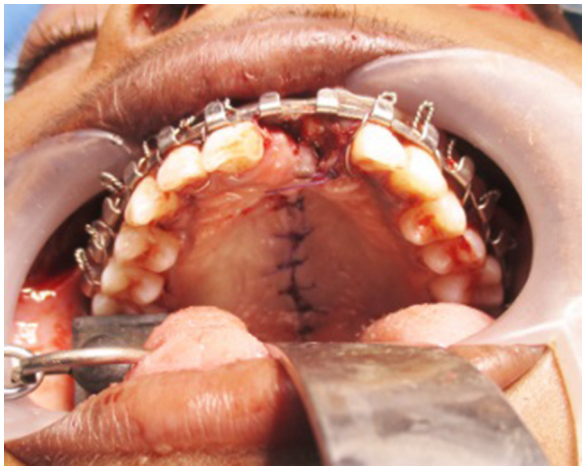

Fig. 4. The fracture site closed with an absorbable suture.