“Tension Band Wiring” A Simplified Approach for Fracture Reduction and Intermittent Stabilization

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Abstract

Introduction Development in plating systems and technical knowledge regarding the osteosynthesis has made open reductions and rigid internal fixation as the most frequently used mode of treatment in facial skeleton fractures. Various modalities for fracture reduction/stabilization during fixation have been mentioned in literature, describing the use of custom made instruments or reduction forceps etc.

Material and Method We have used a method of “TENSION BAND WIRING” as a means of reducing and temporarily stabilizing the fracture segments in the mandible during rigid fixation. TENSION BAND WIRING method has been used in eighty patients having fractures in relation to mandibular symphysis, parasymphysis and body region.

Conclusion In our opinion, this method is quick, simple and effective way of achieving initial reduction and stabilization of bone prior to final rigid fixation. The added advantages are reduced operating time, reduced instrumentation and assistance which in turn provide clear and more accessible surgical field.

Keywords Mandibular fracture · Tension band wiring

Mandibular fractures are common facial injuries. During past few decades treatment of these fractures have evolved from intraosseous wiring, lag screws, compression plates [1], to miniplates [2] and memory clamps [3]. Few authors have reported no difference of results between the current

methods with recommendations of further testing [4]. But there is general consensus that open reduction and rigid internal fixation used to treat the facial fractures allow prompt recovery and early oral rehabilitation.

The overall outcome of open reduction and rigid fixation depends on perfect reduction of displaced fracture segments [5] as after rigid fixation, stiffness of plates prevent bone moulding due to muscle action during function.

Conventional bone reduction techniques involve either manual or forceps assisted maneuvers [6]. We have used a technique of TENSION BAND WIRING, that uses two monocortical stainless steel/titanium screws and 24 gauge stainless steel wire for fracture reduction and initial stabilization. The concept relies on the tension produced across the fracture line by wire loop tightened around screws, which in turn result in fracture reduction. This concept is almost similar to tension band technique used for fixation of patellar fracture in orthopaedic surgery [7].

Technical Note

After nasoendotracheal intubation arch bars [Erich's] are placed in both upper and lower i.e. maxillary and mandibular arch. Arch bars in mandibular arch are left slightly loosened to allow for upper border manipulation while doing fracture reduction.

Fracture site is exposed via intraoral vestibular degloving incision after infiltration of xylocaine with adrenaline [1:100,000] in area of fracture. Subperiosteal exposure of fracture is done and one hole on each side of fracture is drilled by $1.5 \times 6 \text{ mm}^2$ drill bit. Holes are drilled approximately at a distance of 1–2 cm from line of fracture and perpendicular to fracture line. $2 \times 8 \text{ mm}^2$ self tapping stainless steel/titanium screws are tightened into the holes

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on each side, so that approximately 2 mm of screw length remains above the bone to engage wire loop. A 24 gauge wire loop is placed around the screws and tightened while exerting the pull perpendicular to screws.

Wire is tightened in a way so that finally the wire loop exerting tension force lies in contact with fracture line, thereby minimizing the moment arm of torque and hence the lingual separation of the fracture segment.

After accurate fracture reduction, mandibular arch bars are tightened and IMF is done to stabilize occlusion. Rigid fixation is carried out by fixing four holed plate at lower border below the tension band wiring. After fixation of this plate tension band wiring is removed and another four holed plate is adapted in place of tension band wiring and fixed. Same holes drilled earlier can be used for the second plate fixation.

Intensity of the traction can be varied by using more set of tension band wiring or by changing wire thickness or screw position.

Wounds Are Closed By Using Resorbable Suture Material

We have applied this method to treat 80 patients out of which 46 patients had symphysis fracture, 27 patients had parasymphysis fracture and 7 patients had body of mandible fracture. Out of 27 parasymphysis fracture, 12 patients had oblique fractures. Out of 80 fractures, 67 fractures were displaced and 13 fractures were undisplaced.

In our 2 year follow up period we didn't come across any case of non union/malunion. Three patients had infection in late post operative period which was overcome by bone plates and screw removal under antibiotic coverage.

Eight patients had minor discrepancy in occlusion which was treated by IMF elastics for 10–14 days in immediate post operative period.

Fig. 1 Tension band wiring in situ with reduced fracture

Fig. 3 Upper plate utilizing the holes drilled for tension band wiring

Fig. 2 Lower border plating of reduced fracture with tension band in situ

Fig. 4 Completed plating with anatomic fracture reduction

Discussion

Treatment of mandibular aims in achieving the bony union, good occlusion, preserve IAN and mental nerve function, to prevent malunion and to attain optimal cosmesis. Rigid plate and screw fixation has advantage of allowing the patient to return to function without the need of 4–6 weeks of IMF; but success of rigid fixation depends upon accurate reduction.

Tension band wiring is simple and quick method of achieving reduction and simultaneously to stabilize fracture segments during rigid fixation without use of additional assistance or expensive instrumentation. Bone fragments can easily be reduced and area of surgery is maintained clean by eliminating assistance and instruments which use to block surgeon's field of vision and work.

By altering the no. of screws, position of screws or wire thickness this method is helpful in reduction and stabilization of most of the displaced fracture sites also.

As per our view, this is easy, technically simple and cost effective method of fracture reduction and intermediate stabilization before the final rigid fixation (Figs. 1, 2, 3, 4).

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