

Case Report

Delayed progressive haematoma after Le Fort I osteotomy: A possible severe complication in orthognatic surgery

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ABSTRACT

Although the Le Fort I osteotomy is a safe surgical technique, many complications have been reported. We present a case of an extended cervico-facial haematoma due to delayed bleeding from the terminal branches of the maxillary artery after orthognatic surgery. A 23-year-old man was referred to our observation for the surgical correction of a class III asymmetric malocclusion. The patient underwent a Le Fort I osteotomy, with impaction of the maxilla, associated with an Epker mandibular bilateral sagittal split osteotomy, with maxillary advancement and rigid internal fixation of the mandible with four miniplates and another four for the upper maxilla as well. The first post-surgery day, the patient developed a gradual dispnea together with neck swelling. By second postoperative day, the patient's general condition improved with a progressive normalization of laboratory tests values. The Computerised Axial Tomography (CAT) scan confirmed a decrease in the parapharyngeal thickening. Total recovery was achieved within two months, the final clinical check showed a healthy appearance with good occlusion. An increased knowledge of the basic biology of the Le Fort I osteotomy, the development of instruments specially designed for the Le Fort I procedure and the use of hypotensive anaesthesia could reduce the morbidity and duration of this procedure.

Key Words: Complication after surgery, haematoma, Le Fort I osteotomy

Received: August 2012
Accepted: November 2012

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INTRODUCTION

Skeletal malocclusions can be treated in many patients with orthopaedic devices.^[1,2] The plan of treatment of deformities of the jaws includes pre-surgical orthodontic treatment designed to eliminate dental compensations present (i.e., the anomalies of the teeth that have taken place) and the preparation of the dental arches in relation to the scheduled surgery. In the field of orthodontics and surgery, studies have

been carried out to improve some characteristics like the modulus of elasticity and frictional modulus of orthodontic appliances.^[3-7] Although the Le Fort I osteotomy is a safe surgical technique, many complications have been reported with a low incidence of occurrence.^[8] These include swelling, haemorrhage, infections, nerve injuries, bone necrosis, TMJ problems, periodontal disease, ophthalmic and middle ear disorders, dysphagia and psychological problems.^[9,10] In particular, vascular complications can arise from direct trauma to the vessels due to the blind nature of the osteotomy in the maxillary posterior area. Unwanted fracture lines may also extend to the pterygopalatine fossa, skull base and to the orbit. As a rule, the osteotome position during pterygomaxillary separation is contiguous to the internal maxillary artery (IMA), therefore, complications are rare. The entire course of internal maxillary artery (IMA) from

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its retro-mandibular origin to its termination within the pterygopalatine fossa is vulnerable to iatrogenic injury.^[8] Therefore, to avoid possible delayed complications^[8,10] and facilitate their management, continuous postoperative monitoring is essential. The descending palatine artery is the vessel most often involved in traumatic injuries during orthognatic surgery of the maxilla.^[11] Less often, the maxillary artery and its terminal branches, the pterygoid venous plexus, the internal carotid artery, and internal jugular vein may be damaged.^[12] O'Regan^[13] recently reported in a prospective study many operative or postoperative vascular complications. We present a case of an extended cervico-facial haematoma due to delayed bleeding from the terminal branches of the maxillary artery after orthognatic surgery.

CASE REPORT

A 23-year-old man was referred to the Department of Maxillofacial Surgery, University of Verona, Italy for the surgical correction of a class III asymmetric malocclusion [Figure 1a]. The patient underwent a Le Fort I osteotomy, with impaction of the maxilla associated with an Epker mandibular bilateral sagittal split ramus osteotomy, with maxillary advancement and rigid internal fixation of the mandible with four miniplates (Osteomed), and four miniplates for the upper maxilla as well. Intermaxillary elastic traction was applied.

The patient had a medical history of one wisdom tooth extraction, performed under local anaesthesia. No allergies or congenital or systemic disease were reported. Preoperative vital parameters were: temperature, 36.4°C; heart rate, 62 bpm; blood pressure, 120/65 mmHg; respiration rate, 17 breaths per minute and 100% oxygen saturation. Preoperative laboratory tests showed RBC, 4.86 E + 12/L; Hb, 14.1 g/dL; Ht, 43.1%; coagulation tests were normal (prothrombin time 1.05 INR, activated partial thromboplastin time 1.18 and fibrinogen 241 mg/dL, Clauss method 7.11 µmol/L. The patient received a single-shot antimicrobial prophylaxis using 1 gm of Amoxicillin, in addition to a single dose of corticosteroids (1 gm of Methylprednisolone) one hour before the operation.

The surgical procedure was performed in general hypotensive anaesthesia, with the following parameters: Blood pressure, 100/70 mmHg; heart rate, 80 beats per minute and 100% oxygen saturation.

Sevoran, Fentanyl, Remifentanyl, 1500 ml of crystalloids and 500 ml of colloids were infused. No intraoperative complications occurred.

The first post-surgery day, the patient developed a gradual dispnea together with neck swelling. A CAT scan with contrast agent was performed, showing a parapharyngeal thickening, with dislocation and compression of upper airways; laboratory values were Ht, 34.9 %; Hb, 12.3 g/dL; RBC count, 3.81 E + 12/L. After 5 hours, a progressive worsening of the general condition led to immediate intubation. Laboratory results in the emergency room were Ht, 28.2%; Hb, 9.9 g/dL; RBC count, 3.06 E + 12/L; prothrombin time, 1.20 INR, activated partial thromboplastin time, 1.18 and fibrinogen, 452 mg/dL. The patient was sedated with midazolam and diprivan and was given amoxicillin vial gm, 1 fl every 8 hour a day and methylprednisolone vial 125: 1 vial 3/die. The same night, a CAT scan showed a wider extension of the haematoma on the upper and lower airways, together with a decrease in the diameter of the parapharyngeal space [Figure 1a and b]. The patient underwent a bilateral carotid arteriography [Figure 2], and a slight bleeding from the palatine branches of the left ascending pharyngeal artery which was probably closed by the arterial spasm induced by the catheter was revealed. Other CAT slices didn't show a significant difference in comparison with the first CAT.

On the second postoperative day, the patient's general condition improved with a progressive normalization of laboratory tests values. On the fourth postoperative day, the CAT scan confirmed a decrease in the parapharyngeal thickening. After 3 days of clinical observation, intubation was removed. Total recovery from haematoma was achieved within two months and the final clinical check showed a healthy appearance with good occlusion.

DISCUSSION

Le Fort I osteotomy is a standard orthognatic surgery procedure used for the correction of dentofacial deformities. It was first described by vom Lagenbeck in 1859^[14] and it was used for the first time in 1927 by Wassmund.^[15] Axhasen in 1934^[16] and Schuchardt in 1942^[17] described the use of an osteotome to separate the pterygomaxillary suture. Bell studied the biological basis for maxillary osteotomy, bone healing and revascularization after corticotomy.^[18-20]

It is of great importance to understand the mechanism of the complications in order to minimize the potential risks. Pterygomaxillary disjunction is the most critical step during the osteotomy. Vessel injury

may occur when the maxillary tuberosity is separated from the pterygoid plates with an osteotome, or during the downfracture procedure.^[21] Precious^[12] reported that pterygomaxillary separation can be achieved safely and easily by leverage alone without the use of a pterygoid chisel. He described the use of Tessier's spreaders, together with digital manipulation to achieve pterygomaxillary separation followed by maxillary mobilization.^[22] Smith's 3-prong spreaders, Turvey's maxillary expanders, and modified mobilisation forceps are also used to aid leverage.

In Le Fort I osteotomy, most often, a haemorrhage arises from the branches of IMA. The pterygopalatine branch of the IMA runs into the pterygopalatine fossa. Collaterals of the IMA include the posterior, superior, alveolar, infraorbital, greater palatine, lesser palatine, ascending pharyngeal, vidian, and sphenopalatine.^[8]

The descending palatine artery may be a common source of bleeding during and after Le Fort I osteotomy because of its anatomic location in the posteromedial wall of the maxillary sinus.

Arterial haemorrhage tends to be more persistent and can be recurrent, which makes it more difficult to manage. Bleeding can occur intraoperatively during the osteotomy, but also within the first 2 weeks following surgery and generally presenting as epistaxis.^[10] In some cases, even months after the procedure, there can be a delayed presentation of pseudoaneurysm.^[8]

In order to investigate the major cause of bleeding after a Le Fort osteotomy, an angiography is the test of choice. A CAT scan is useful to define the newly established bone anatomy, the location of the pathology, and the vessel relationships to the fracture line.^[23] A CAT scan with contrast agents provides faster, easily detectable and interesting clues for the type of pathology of the affected side.

Treatment modalities used to arrest postoperative haemorrhage include nasal packing, packing of the maxillary antrum, reoperating with clipping or electrocoagulation of the bleeding vessels, the use of topical haemostatic agents in the pterygomaxillary region and selective embolization of the maxillary artery and its terminal branches.^[10]

According to literature, different embolization materials have been used with various degrees of success for pseudoaneurysm treatment: Gelfoam, Gianturco coils, stainless steel coils with gelatin or Dacron fibres, guide



Figure 1a: Class III asymmetric malocclusion



Figure 1b: Haematoma on the upper and lower airways



Figure 2: The patient underwent a bilateral carotid arteriography

wires, detachable balloons, N-butyl cyanoacrylate, autologous clot, polyvinyl alcohol, complex platinum coils, Guglielmi detachable coils.^[21]

The last choice remains the ligation of the external carotid artery.

Concerns about the risk of haemorrhage as a result of pterygomaxillary separation led to the development of an osteotomy technique anterior to the pterygomaxillary suture. Dupont^[24] described a transbuccal approach to a vertical osteotomy through the tuberosity. Rohner^[25] described an endoscopically assisted Le Fort I osteotomy to ensure preservation of the descending palatine artery.

Ueki *et al.*^[26] recently reported the use of an ultrasonic bone curette to mobilize the pterygoid process, thus avoiding the damage to the descending palatine vessels. For the authors, the Ultrasonic bone curette offers a safe procedure for performing pterygoid process fractures, without damaging the surrounding tissues. This technique allows surgeons to perform procedures in the pterygomaxillary area to safely mobilize the pterygoid process.

During the intraoperative phase, any kind of bleeding was noticed when the blood pressure increased to 120/80.

A straight follow-up of the patients is important in cases who may show vascular hypersensitivity, able to cause a vessel spasm release the day after the operation. The creation of a follow up protocol in day surgery patients is therefore vital.

Continuous patient monitoring facilitates early detection of postoperative complications and their management. New trends for ambulatory surgery reduce costs for patients but can increase medical responsibility. For legal reasons, even if it is necessary to mention typical complications during preoperative counselling, it is ideal to follow up on patients with standard checkups. Not only should the patient be informed about the frequency of complications, but he should also be told about its implications in later life. Thus, the elective character of orthognathic surgery is of special importance.

CONCLUSION

Once a frequent complication, haemorrhage has become rare when the surgical technique is handled by an experienced orthognathic surgeon. Sometimes,

despite preoperative planning and a careful surgical technique, postoperative complications may occur. It is important to check immediate or delayed postoperative bleeding also, using a protocol that can take care of day surgery patients.

An increased knowledge of the basic biology of the Le Fort I osteotomy, the development of instruments specially designed for this Le Fort I procedure and the use of hypotensive anaesthesia have dramatically reduced the morbidity and duration of this procedure.

REFERENCES

1. Lucchese A, Sfondrini MF, Manuelli M, Gangale S. Fixed space maintainer for use with a rapid palatal expander. *J Clin Orthod* 2005;39:557-8.
2. Lucchese A, Carinci F, Brunelli G. Skeletal effects induced by twin block in therapy of class II malocclusion. *Eur J Inflamm* 2012;10:83-7.
3. Lucchese A, Sfondrini MF, Cacciafesta V, Gangale S. Mechanical properties of FRCs and orthodontic twisted wires: a three point bending test. *Am Ass Orthod*; 2005; San Francisco California.; 2005.
4. Lucchese A, Carinci F, Brunelli G, Monguzzi R. An *in vitro* study of resistance to corrosion in brazed and laser welded orthodontic *Eur J Inflamm* 2011;9:67-72.
5. Lucchese A, Carinci F, Brunelli G, Monguzzi R. Everstick® and Ribbond® fiber reinforced composites: Scanning electron microscope (sem) comparative analysis. *Eur J Inflamm* 2011;9:73-80.
6. Sollazzo V, Pezzetti F, Massari L, Palmieri A, Brunelli G, Zollino I, *et al.* Evaluation of gene expression in MG63 human osteoblastlike cells exposed to tantalum powder by microarray technology. *Int J Periodontics Restorative Dent* 2011;31:e17-28.
7. Farronato G, Maspero C, Farronato D. Orthodontic movement of a dilacerated maxillary incisor in mixed dentition treatment. *Dent Traumatol* 2009; 25:451-6.
8. Panula K, Finne K, Oikarinen K. Incidence of complications and problems related to orthognathic surgery: a review of 655 patients. *J Oral Maxillofac Surg* 2001;59:1128-36; discussion 37.
9. Favero L, Marcon M, Winkler A. Complications during the use of orthodontic micro-implants. *Mondo ortodontico* 2008;33:403-14.
10. Cunningham SJ, Crean SJ, Hunt NP, Harris M. Preparation, perceptions, and problems: a long-term follow-up study of orthognathic surgery. *Int J Adult Orthodon Orthognath Surg* 1996;11:41-7.
11. Lanigan DT, Hey JH, West RA. Major vascular complications of orthognathic surgery: hemorrhage associated with Le Fort I osteotomies. *J Oral Maxillofac Surg* 1990;48:561-73.
12. Precious DS, Goodday RH, Bourget L, Skulsky FG. Pterygoid plate fracture in Le Fort I osteotomy with and without pterygoid chisel: a computed tomography scan evaluation of 58 patients. *J Oral Maxillofac Surg* 1993;51:151-3.
13. O'Regan B, Bharadwaj G. Prospective study of the incidence of serious posterior maxillary haemorrhage during a tuberosity

- osteotomy in low level Le Fort I operations. *Br J Oral Maxillofac Surg* 2007;45:538-42.
14. Reuther J. Orthognathic surgery: corrective bone operations. *Mund Kiefer Gesichtschir* 2000; 4 Suppl 1:S237-48.
 15. Lucchese A , Gherlone E, Portelli M, Bertossi D. Tooth orthodontic movement after maxillofacial surgery. *Eur J Inflamm* 2012;10:227-32.
 16. Axhausen W. The treatment of delayed and absent fracture healing by means of free bone grafts. *Langenbecks Arch Chir* 1969; 325:825-34.
 17. Schuchardt K. Treatment of oral deformities; progenia, prognathism and open bite. *Langenbecks Arch Klin Chir Ver Dtsch Z Chir* 1957;287:733-6.
 18. Bell WH, Fonseca RJ, Kenneky JW, Levy BM. Bone healing and revascularization after total maxillary osteotomy. *J Oral Surg* 1975;33:253-60.
 19. Bell WH, Levy BM. Revascularization and bone healing after anterior mandibular osteotomy. *J Oral Surg* 1970;28:196-203.
 20. Bell WH. Biologic basis for maxillary osteotomies. *Am J Phys Anthropol* 1973;38:279-89.
 21. Fernandez-Prieto A, Garcia-Raya P, Burgueno M, Munoz-Caro J, Frutos R. Endovascular treatment of a pseudoaneurysm of the descending palatine artery after orthognathic surgery: technical note. *Int J Oral Maxillofac Surg* 2005;34:321-3.
 22. Epker, Stella, Fish LC. *Dentofacial deformities*. St. Louis: Mosby, 1996.
 23. Precious DS, Morrison A, Ricard D. Pterygomaxillary separation without the use of an osteotome. *J Oral Maxillofac Surg* 1991;49:98-9.
 24. Dupont C, Ciaburro TH, Prevost Y. Simplifying the Le Fort I type of maxillary osteotomy. *Plast Reconstr Surg* 1974;54:142-7.
 25. Rohner D, Yeow V, Hammer B. Endoscopically assisted Le Fort I osteotomy. *J Craniomaxillofac Surg* 2001;29:360-5.
 26. Ueki K, Hashiba Y, Marukawa K, Okabe K, Alam S, Nakagawa K, *et al.* Assessment of pterygomaxillary separation in Le Fort I Osteotomy in class III patients. *J Oral Maxillofac Surg* 2009;67:833-9.

How to cite this article: Bertossi D, Malchiodi L, Shideh E, Albanese M, Portelli M, Lucchese A, *et al.* Delayed progressive haematoma after Le Fort I osteotomy: A possible severe complication in orthognathic surgery. *Dent Res J* 2012;9:S246-50.

Source of Support: Nil. **Conflict of Interest:** None declared.