The faciocervicopectoral flap for non-oncological cases of cheek reconstruction

RM Makkar

Cairo University, Egypt

ABSTRACT

INTRODUCTION Major facial defect has been a challenging case for plastic surgeons in terms of wound healing and covering technique for a long time.

METHODS Eight faciocervicopectoral (FCP) flaps were performed for reconstruction of major cheek defects due to handmade explosive and gun injuries. They were evaluated perioperatively and postoperatively with regard to operative time and operative blood loss as well as the function and cosmetic appearance.

RESULTS The technique showed marvellous cosmetic results but encountered minor postoperative flap complications.

CONCLUSIONS The FCP flap is one of the best solutions for coverage of a simple or complex cheek defect. Application of the FCP flap is easy and rapid.

KEYWORDS

Cheek reconstruction – Faciocervicopectoral flap – Cervicopectoral flap – Faciopectoral flap

Accepted 11 March 2013

CORRESPONDENCE TO

Rami Makkar, 19 Naguib Hashad Street, Heliopolis, Cairo, Egypt
E: rmmramymakkar@hotmail.com

During the 2011 Egyptian revolution, we encountered plenty of unexpected and unseen injuries due to the violence used against the rebels. Among these injuries were mandibular fractures associated with major cheek defects that required rapid surgical intervention by a minimal procedure with minimal blood loss. In addition, some cases were suffering from severe bleeding that obliged the vascular team to ligate the external carotid artery to stop bleeding from the wound. They used a linear incision at the anterior border of the sternocleidomastoid muscle to expose the carotid artery.

The most suitable reconstructive method was the faciocervicopectoral (FCP) flap for covering the soft tissue defect after fixation of the mandible. A number of authors have stated that this flap has many advantages.^{1,2} It is easy to perform, rapid and safe to harvest, and compatible with cervical dissection. It has an acceptable cosmetic result.

Despite the fact that this flap is well known for use in reconstruction of the cheek following extensive surgery for head and neck malignancies, it has not gained as much reputation in non-oncological cases as it is only cited rarely in the literature.³ The reason for this could be that in trauma patients a question may be raised concerning the length of the incision compared with the size of the defect. Alternative procedures such as regional and microvascular flaps provide adequate fill of most defects but offer a less than optimal texture and colour match as well as creating a donor defect.⁴

This paper describes a series of eight patients who presented with major fractures in the mandible requiring fixation, and major cheek defects, which were reconstructed using the FCP flap. The purpose of this study was to evaluate the feasibility of this flap for non-oncological cases and to assess the quality of the flap and the resulting scar.

Methods

Eight FCP flaps following reconstruction of the mandible were performed between 29 January 2011 and 16 August 2012 for reconstruction of the cheek and lower face. The mean patient age was 24.75 years (range: 7–42 years).

The defect resulting from the injury was located in the cheek region between the angle of the mouth and the lobule of the ear, over the body and ramus of the mandible, reaching up to the zygomatic arch. The size of the defect ranged from 3cm to 5cm and 3.5cm to 7cm in width and length respectively before debridement, with an increase in both dimensions by 0.5–1cm after debridement. The mean defect size was 3.93cm x 5.25cm. The trauma (causative agent) was due to handmade explosive and handmade guns fired from a very near range inflicting this severe (major) localised type of trauma not seen before. All patients included in the study were male and had fractures of the mandible that needed fixation (Table 1).

Table 1 Preoperative parameters

Case	Age	Mode of trauma	Associated injuries	Size of the defect (cm)
1	23	Shotgun	Fracture of outer table of the mandible, injury to facial nerve	4 x 6
2	9	Shotgun	Comminuted fracture of the body and angle of the mandible	5 x 7
3	25	Explosive bomb	Simple fracture of the body of the mandible	4 x 4.5
4	7	Explosive bomb	Comminuted fracture of the body and angle of the mandible	5 x 6
5	32	Shotgun	Simple fracture of the body and angle of the mandible	3 x 3.5
6	33	Fireworks	Simple fracture of the body of the mandible	4 x 5
7	42	Shotgun	Comminuted fracture of the body, angle and ramus of the mandible	3.5 x 4
8	27	Explosive bomb	Comminuted fracture of the body of the mandible	3 x 4
Mean	24.75			3.93 x 5.25

Table 2 Operative time and estimated blood loss

Case	Flap harvesting	Fixation of mandible	Estimated blood loss
1	35 mins	30 mins	500ml
2	28 mins	180 mins	350ml
3	32 mins	120 mins	400ml
4	30 mins	150 mins	350ml
5	25 mins	150 mins	450ml
6	25 mins	60 mins	300ml
7	30 mins	180 mins	500ml
8	30 mins	150 mins	300ml
Mean	29.37 mins	127.5 mins	393.75ml

Table 4 Length of hospital stay and follow-up period (shaded cases = marginal infection)

Case	Hospital stay	Follow-up duration
1	8 days	12 months
2	8 days	8 months
3	6 days	3 months
4	7 days	9 months
5	7 days	3 months
6	7 days	6 months
7	7 days	5 months
8	6 days	4 months
Mean	7.0 days	6.3 months
	7.3 days	

Table 3 Postoperative complications

Case	Congestion	Infection	Failure or flap loss	Cosmetic results
1	Minimal, resolved after 48h	No	No	Parents asked for scar revision
2	Minimal, resolved after 48h	Marginal	No	Parents asked for scar revision
3	No	No	No	Accepted
4	No	Marginal	No	Parents asked for scar revision
5	Minimal, resolved after 72h	Marginal	No	Accepted
6	No	No	No	Accepted
7	Minimal, resolved next day	No	No	Accepted
8	No	No	No	Accepted

The flap was used for delayed reconstruction. Initial surgery was performed to stop bleeding (case 2), for wound debridement and for closure of the defect under tension. The oral mucosa was sutured with 2/0 absorbable sutures and the skin with 2/0 non-absorbable sutures to prevent/minimise wound infection.

Reconstruction was performed 3–4 days after the initial trauma. The surgical technique recommended by the AO (Arbeitsgemeinschaft für Osteosynthesefragen) was used for fixation of the bone.^{5,6} Resurfacing of the lower face was achieved with the FCP flap. For harvesting the flap, the surgical technique proposed by Soler-Presas *et al* in 1997² was used, which was promoted by Copcu *et al* in 2003⁷ and Chen *et al* in 2007⁸ (Fig 1). The amount of blood loss and the total operative time of the procedure was documented as well as the timing for harvesting the flap and its inset at the site of the defect (Table 2).

The follow-up period ranged from 3 to 12 months with a mean duration of 6.3 months. During the follow-up period, the flap was evaluated for both immediate and delayed post-operative complications as well as for cosmetic outcome. Cosmetic results were evaluated according to patients' and surgeons' satisfaction, whether accepted or not. Movement

of the mandible and full range movement of the neck were assessed.

Results

All of the flaps survived without ischaemia or venous insufficiency and all of the wounds healed completely with only marginal skin infection in three cases. Local care consisting of repeated dressings with antiseptic solution and saline under cover of antibiotics assisted the flap to heal gradually in the subsequent six weeks without requiring additional surgery. No wound dehiscence occurred (Table 3).

The mean hospital stay for all patients was 7.0 days. This was nearly the same for the three patients who developed complications (7.3 days) as they were discharged from hospital but needed to return twice a day to have their dressings changed.

The functional outcome was successful in terms of mouth opening and movement of the neck with no limitation of movement. All of the patients were pleased with the quality of the reconstruction and the quality of the resulting scar. There were no problems with regard to contracture or hypertrophic scars but one patient was not happy with the length of the scar (case 1). The parents of the paediatric patients also asked for revision surgery for the scar (cases 2 and 4).

Discussion

The face is exceptionally important as it is the medium through which individuals interact with the rest of society. The unique character of the facial skin and the close anatomic and functional association with the underlying muscles allow the face to express emotions that are essential for social interaction. Reconstruction of major facial soft tissue deficits after trauma is a continuing challenge for surgeons, who wish to reliably restore facial function and appearance,⁹ especially if bony structures have been exposed or resected.¹⁰

The random vasculature of the subdermal plexus supplies most local cheek reconstruction flaps.¹¹ Depending on the volume of tissue lost, local flaps such as cutaneous cheek rotation flaps, transposition flaps from the forehead region, randomised and axial flaps raised from the cervical or thoracic skin and muscles (eg deltopectoral skin flaps, pectoralis major musculocutaneous flaps) have limited indications if the defect size and localisation compromise flap design.¹⁰

The pedicled pectoralis major flap or the trapezius myocutaneous flap, which can provide enough transplant tissue, are suitable for the reconstruction of large defects in soft tissue. However, these flaps are too bulky to be suitable for the reconstruction of medium-sized or small defects in oral and facial regions. The greatest disadvantage of the trapezius myocutaneous flap for cheek reconstruction is that repositioning of the patient on the operating table is necessary.¹² Furthermore, an operation for thinning the flap can be necessary because the flap is fat and clumsy.¹⁵

Pallua and Magnus Noah used the supraclavicular artery island flap to reconstruct skin defects of the cheek, chin, neck and chest.¹⁴ The clavicular region was acknowledged

as the most suitable donor site for resurfacing the defect. The traditional subclavicular flaps in this region were conventionally pedicled by the perforators of internal thoracic arteries or intercostal arteries.¹⁵

In recent years, the emphasis appears to have shifted to the radial forearm flap,¹⁶ which may provide thin, pliable tissue for the reconstruction of many defects. However, the donor and recipient sites of this flap are not in the same operative field so two operating teams are required, and the complex techniques necessary for this type of flap extend operating time. In addition, donor site morbidity may occur when harvesting the flap.¹²

Large, deep, complex or compromised wounds often have to be reconstructed with distant or free flaps but they usually lead to poor colour and texture match for facial skin.¹⁷ Primary reconstruction of such defects with microsurgical techniques is now the protocol. Although free microvascular tissue transfer may be an acceptable solution, especially in multilayer defects, differences of skin colour and structure of the harvested tissue may make them conspicuous.¹⁰ Furthermore, in view of the long operative time, the need for expertise and infrastructure, and the large work volume in developing countries, microsurgical reconstruction cannot be offered to all patients with such defects.¹⁸

The basics of the platysma myocutaneous flap, which was first used for the reconstruction of intraoral defects nearly 30 years ago, have been used for various head and neck defects.¹⁹ The platysma myocutaneous flap was first introduced by Futrell *et al* in 1978²⁰ and Coleman *et al* in 1983²¹ for the reconstruction of a variety of head, face and oral defects.²² Since then, the use of extraoral platysma flaps has only been described rarely. In the literature, the use of a platysma myocutaneous flap for through-and-through closure is not discussed.²³

The platysma-based flap described is not a typical pedicled myocutaneous flap but rather a transpositional rotated flap. The blood supply of the platysma is well described. The submental artery from the facial artery is the primary vessel to the platysma muscle. The superior thyroid artery, occipital artery and posterior auricular artery are identified as secondary vessels. The external jugular vein provides the primary venous drainage, together with the submental vein,¹⁹ but has not gained widespread acceptance because of problems with vascularity.¹⁵

Of all these methods, the platysma myocutaneous flap is a good candidate for cheek reconstruction for several reasons. It is proximal to the surgical area, and easily harvested and transplanted to the defect; it is a thin, pliable flap and does not require a second donor site; and, in addition, the donor site can be closed directly with an acceptable scar.¹²

The hatched flap is a well known flap used to cover round defects with primary closure of the donor sites in a V-Y fashion. This provides a stable coverage of the defect by a skin flap from the adjacent area, therefore having similar colour, texture and sensation to the lost skin.²⁴

The cervicofacial flap has been the reconstruction of choice for midface soft tissue defect for over 30 years. Deep plane dissection has been advocated to decrease complication rates and improve results.²⁵

Proper reconstruction of cutaneous cheek defects should result in satisfactory aesthetic and functional outcomes. Avoiding wound closure tension is critical to optimise flap viability. Tension can be minimised for a particular defect by careful attention to flap design. Orientating the vector of maximal tension over the donor site rather than the flap itself limits angular tension that otherwise might lead to vascular compromise. Sufficient undermining of surrounding tissues should also be performed to reduce closure tension. Meticulous haemostasis will decrease the risk of haematoma formation under the elevated tissues.¹¹

Consequently, large defects of the cheek can be addressed with the FCP flap as it carries the advantages discussed above. It is basically a rotation advancement flap. It provides an excellent surgical exposure⁷ as an ideal neck incision requires sufficient exposure of the operative field, viability of the elevated skin flap, protection of the carotid artery and acceptable postoperative cosmetic results.²⁶ We have encountered neither necrosis (whether partial, superficial or total) nor failure of the flap. Moreover, the study confirmed what was concluded by many authors regarding the usefulness of the platysma muscle and its overlying skin.

Shorter operative time alone cannot be accepted as an advantage but it should be borne in mind that a longer operative time may cause more morbidity under general anaesthesia as shown by Singh *et al.*,²⁷ who concluded that for procedures lasting less than eight hours, the risk of complications was lower than for prolonged operations.²⁸ Local flaps are always advantageous compared with microsurgical reconstruction techniques or distant flaps as they are simple and fast to harvest.⁷

Conclusions

The FCP is a reliable local flap: it is proximal to the operative field, easily harvested and transplanted to the defect. Furthermore, it is a thin, pliable flap with good colour match and minimal donor site morbidity.

References

1. Anand AG, Amedee RG, Butcher RB. Reconstruction of large lateral facial defects utilizing variations of the cervicopectoral rotation flap. *Ochsner J* 2008; **8**: 186–190.
2. Soler-Presas F, Cuesta-Gil M, Borja-Morant A *et al.* Midface soft tissue reconstruction with the facio-cervico-pectoral flap. *J Craniomaxillofac Surg* 1997; **25**: 39–45.
3. Bianchi B, Ferri A, Ferrari S *et al.* Free and locoregional flap associations in the reconstruction of extensive head and neck defects. *Int J Oral Maxillofac Surg* 2008; **37**: 723–729.
4. Lazaridis N, Tilaveridis I, Dalambiras S, Iordanidis S. The fasciocutaneous cervicopectoral rotation flap for lower cheek reconstruction: report of three cases. *J Oral Maxillofac Surg* 1997; **55**: 1,166–1,171.
5. Lavertu P, Wanamaker JR, Bold EL, Yetman RJ. The AO system for primary mandibular reconstruction. *Am J Surg* 1994; **168**: 503–507.
6. Schön R, Roveda SI, Carter B. Mandibular fractures in Townsville, Australia: incidence, aetiology and treatment using the 2.0 AO/ASIF miniplate system. *Br J Oral Maxillofac Surg* 2001; **39**: 145–148.
7. Copcu E, Metin K, Aktas A *et al.* Cervicopectoral flap in head and neck cancer surgery. *World J Surg Oncol* 2003; **1**: 29.
8. Chen W, Zeng S, Li J *et al.* Reconstruction of full-thickness cheek defects with combined temporalis myofacial and facial-cervico-pectoral flaps. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2007; **103**: e10–e15.
9. Mureau MA, Hofer SO. Maximizing results in reconstruction of cheek defects. *Clin Plast Surg* 2009; **36**: 461–476.
10. Hakim SG, Jacobsen HC, Aschoff HH, Sieg P. Including the platysma muscle in a cervicofacial skin rotation flap to enhance blood supply for reconstruction of vast orbital and cheek defects: anatomical considerations and surgical technique. *Int J Oral Maxillofac Surg* 2009; **38**: 1,316–1,319.
11. Tollefson TT, Murakami CS, Kriet JD. Cheek repair. *Otolaryngol Clin North Am* 2001; **34**: 627–646.
12. Peng LW, Zhang WF, Zhao JH *et al.* Two designs of platysma myocutaneous flap for reconstruction of oral and facial defects following cancer surgery. *Int J Oral Maxillofac Surg* 2005; **34**: 507–513.
13. Xianjie M, Zheng Y, Ai Y *et al.* Repair of faciocervical scars by expanded deltopectoral flap. *Ann Plast Surg* 2008; **61**: 56–60.
14. Pallua N, Magnus Noah E. The tunneled supraclavicular island flap: an optimized technique for head and neck reconstruction. *Plast Reconstr Surg* 2000; **105**: 842–851.
15. Xie F, Wang J, Li Q *et al.* Resurfacing large skin defects of the face and neck with expanded subclavicular flaps pedicled by the thoracic branch of the supraclavicular artery. *Burns* 2012; **38**: 924–930.
16. Poeschl PW, Kermer C, Wagner A *et al.* The radial free forearm flap – prelaminate versus non-prelaminate: a comparison of two methods. *Int J Oral Maxillofac Surg* 2003; **32**: 159–166.
17. Mureau MA, Posch NA, Meeuwis CA, Hofer SO. Anterolateral thigh flap reconstruction of large external facial skin defects: a follow-up study on functional and aesthetic recipient- and donor-site outcome. *Plast Reconstr Surg* 2005; **115**: 1,077–1,086.
18. Ahmad QG, Navadgi S, Agarwal R *et al.* Bipaddle pectoralis major myocutaneous flap in reconstructing full thickness defects of cheek: a review of 47 cases. *J Plast Reconstr Aesthet Surg* 2006; **59**: 166–173.
19. Puxeddu R, Dennis S, Ferrel C *et al.* Platysma myocutaneous flap for reconstruction of skin defects in the head and neck. *Br J Oral Maxillofac Surg* 2008; **46**: 383–386.
20. Futrell JW, Johns ME, Edgerton MT *et al.* Platysma myocutaneous flap for intraoral reconstruction. *Am J Surg* 1978; **136**: 504–507.
21. Coleman JJ, Jurkiewicz MJ, Nahai F, Mathes SJ. The platysma musculocutaneous flap: experience with 24 cases. *Plast Reconstr Surg* 1983; **72**: 315–323.
22. Chen W, Li Y, Wang N. The need for a complete platysma component for platysma myocutaneous flaps? An introduction of the expanded cutaneous-dominant platysma flap for facial defect reconstruction. *J Plast Reconstr Aesthet Surg* 2010; **63**: 2,172–2,176.
23. Olasz L, Szalma J, Lempel E *et al.* Application of platysma-based transpositional flap for through-and-through facial defect when the facial artery circulation is blocked or compromised. *J Oral Maxillofac Surg* 2011; **69**: 1,242–1,247.
24. Elshahat A. The versatility of the hatchet flap in soft tissue reconstruction and a proposed new classification. *Eur J Plast Surg* 2012; **35**: 351–357.
25. Austen WG, Parrett BM, Taghinia A *et al.* The subcutaneous cervicofacial flap revisited. *Ann Plast Surg* 2009; **62**: 149–153.
26. Shaw HJ. A modification of the MacFee incisions for neck dissection. *J Laryngol Otol* 1988; **102**: 1,124–1,126.
27. Singh B, Cordeiro PG, Santamaria E *et al.* Factors associated with complications in microvascular reconstruction of head and neck defects. *Plast Reconstr Surg* 1999; **103**: 403–411.