

Onlay bone grafting simultaneous with facial soft tissue augmentation in a hemifacial microsomia patient using de-epithelialized orthograde submental flap: a technical note

Amin Rahpeyma¹
Saeedeh Khajehahmadi²

¹ Oral and Maxillofacial Diseases Research Center, Faculty of Dentistry, Mashhad University of Medical Sciences, Iran

² Dental Research Center, Faculty of Dentistry, Mashhad University of Medical Sciences, Iran

Corresponding author:

Saeedeh Khajehahmadi
Dental Research Center, Faculty of Dentistry,
Mashhad University of Medical Sciences
Vakilabad Blvd
91735 Mashhad, Iran
E-mail: khajehahmadis@mums.ac.ir

Summary

Soft tissue augmentation in hemifacial microsomia patients is a challenging procedure. Free microvascular flap transfer is considered usually as the most accepted choice. On the other hand, bone grafting, simultaneous with facial soft tissue augmentation using de-epithelialized orthograde submental flap, is a suggested procedure. Moreover, preoperative evaluation of facial artery and anterior belly of the digastric muscle are essential steps for success in such flaps. Furthermore, bone suture technique helps achieve more predictable results and reduces the need for postoperative bulky dressing.

Key Words: hemifacial microsomia, submental flap, bone graft.

Introduction

Hemifacial microsomia (HFM) is the second most prevalent congenital facial anomaly after cleft lip/palate (1), with an incidence rate of 1:5000 to 1:5600 of live births (2). The etiology of this anomaly is defective structures derived from the first and second branchial arches which are hypoplastic (3). Moreover, the severity of this anomaly varies from mild to severe forms (4). Many surgical procedures for soft tissue augmentation of the face have been suggested in such patients, where microvascular flap transfer is said to be the most accepted procedure (5).

As for providing a good foundation for soft tissue augmentation, osteodistraction, bone grafting, and orthognathic surgery have been indicated to precede soft tissue surgery (6-8).

In this paper, a case of de-epithelialized orthograde submental flap, simultaneous with bone grafting of the mandibular ramus, is presented for the correction of mandibular angle hypoplasia. This simple and easy procedure is emphasized with some technical notes that help us handle such complicated cases.

Patient presentation: a 27-year-old male patient presented to the Maxillofacial Surgery Department with congenital HFM. Right mandibular angle deficiency involving hard and soft tissues was noticed. Although the right auditory meatus was blocked, the external ear was small and deformed (microtia). The pinna was positioned inferiorly compared to the left side. A pre-auricular skin tag was present on the right side. As far as the orbits were concerned, their position and shape were normal. The masseter muscle and parotid gland on the right side were absent and the temporal muscle was hypoplastic. Moreover, the right mandibular ramus was short and abnormally shaped, whereas the condyle and coronoid processes were almost normal. Regarding his dentition, he had only eight remaining teeth in his mouth. Furthermore, the right corner of the mouth was slanted posteriorly (slight macrosomia) (Fig. 1). The severity of his deformity according to the OMENS (orbital deformity, mandibular hypoplasia, ear deformity, nerve involvement and soft tissue deficiency) classification was O₀M_{2B}E₂N₀S₂ (Fig. 2).

Surgical procedure: a decision was made to use de-epithelialized orthograde submental flap simultaneous with on lay bone grafting of the mandibular ramus. Employing color Doppler sonography, the facial artery was identified and the presence of the right digastric muscle (anterior belly) was confirmed. Moreover, the pinch test showed minimal skin laxity and the thyro-mental distance was just two fingers. As a matter of fact, a decision was made to use de-epithelialized flap design before flap elevation from the submental area (Fig. 3). Regarding the flap's pedicles, subcutaneous tissues and the platysma muscle were included in the non-pedicle side, where as on the pedicle side, subcutaneous tissues, platysma muscle, anterior belly of digastric muscle and mylohyoid muscle were included (Fig. 4).

Consequently, a supraperiosteal tunnel was created at the right mandibular angle region, extending superiorly to the zygomatic arch. Subsequently, a free cor-

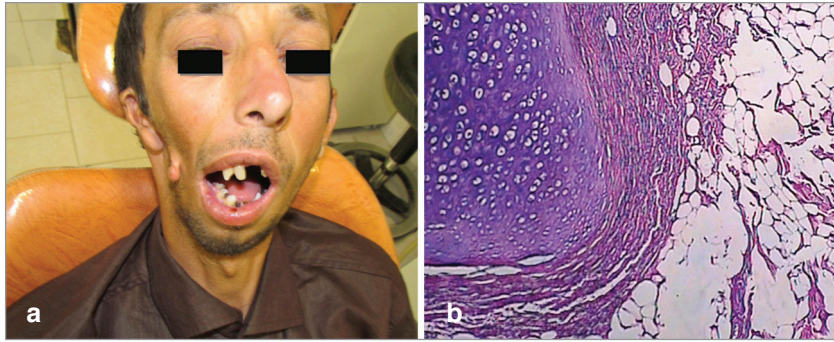


Figure 1. a: Clinical picture of hemifacial microsomia patient. b: Histopathological view of the skin tag.

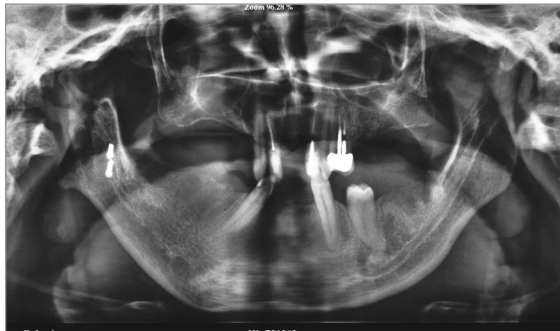


Figure 2. Post-operative pantomogram view: mandibular ramus in the right is short and abnormally shaped.



Figure 3. De-epithelialization procedure begins before flap elevation.



Figure 4. De-epithelialized orthograde submental flap.

tico-cancellous bone graft from the right anterior iliac crest was obtained. Two bone holes were made at the superior border of the bone graft and sutured to the distal part of the soft tissue flap using 2-0 vicryl suture (Fig. 5).

The bone graft was onlay-grafted on the lateral surface of the right mandibular ramus and internally fixed with two miniscrews. Then the sutures that passed through the bone holes were tightened. Accordingly, the flap covered the bone graft and filled the subcutaneous tunnel (Fig. 6). Treatment results three month after operation are shown in Figure 7.



Figure 5. Two bone holes in the distal part of free bone graft and two sutures that passed through these holes and engaged with soft tissue on the non-pedicle side.

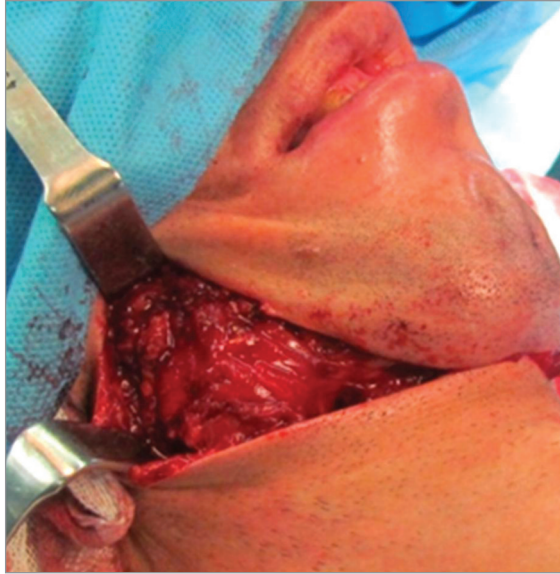


Figure 6. On lay bone grafting and simultaneous soft tissue augmentation of the defect.



Figure 7. Result of the procedure three months postoperatively.

Discussion

Submental flap, introduced by Martin in 1993, is considered a useful technique in facial reconstruction (9). Based on the composition of the flap, it can be used as a myocutaneous, faciocutaneous and osteomuscular flap (10). Moreover, based on its blood supply it can be categorized into orthograde or reverse flow (11). The advantages of this flap are large skin paddle, axial blood supply and appropriate tissue bulk (12, 13). On the other hand, the hairy nature of this flap makes it less appropriate for reconstruction of the oral cavity in males. De-epithelialized submental

flap was first reported in 1997 (14). This flap was employed for soft tissue augmentation in two HFM patients for the first time by Tan in 2007 (15).

As far as this article is concerned, new suggestions were made: a, Simultaneous bone grafting of the ramus; b, Bone suturing of the soft tissue flap, omitting tension induced on sutures after operation and making the result more predictable; c, preoperative evaluation of facial artery and anterior belly of digastric muscle. Moreover, this is an important step since muscle agenesis and absence of the facial artery can be seen in 40% of HFM patients (16, 17). These two variables can greatly affect the volume and perfusion of the flap obtained. Furthermore, osteomuscular submental flap is not indicated in these patients because of limited and insufficient bone below the inferior mandibular canal.

Generally, soft tissue augmentation in HFM can be achieved by several methods. These methods include vascularized free tissue transfer (free groin and parascapular flaps), pedicled flaps (superficial temporal fascia), and vascularized bone grafts. Moreover, non-vascularized dermis fat graft and lipo-filling are the simplest methods mentioned in literature for the treatment of such deformities (18-21). Free flaps are difficult procedures and have considerable complications. Obviously, lipo-filling is much simpler but with great resorption rates and the need for procedure repetition.

Conclusion

De-epithelialized orthograde submental flap accompanied with on lay ramus bone grafting is a useful technique for soft tissue augmentation in carefully selected HFM patients.

References

1. Monahan R, Seder K, Patel P, Alder M, Grud S, O'Gara M. Hemifacialmicrosomia: Etiology, diagnosis and treatment. *Am Dent Assoc.* 2001;132:1402-8.
2. Naikmasur VG, Mantur RS, Guttal KS. Hemifacialmicrosomia. A report of two cases. *N Y State Dent J.* 2009;75:38-43.
3. Kane AA, Lo LJ, Christensen GE, Vannier MW, Marsh JL. Relationship between bone and muscles of mastication in hemifacialmicrosomia. *Plast Reconstr Surg* 1997;99:990-7.
4. Huisinga-Fischer CE, Zonneveld FW, Vaandrager JM, Prah-Andersen B. Relationship in hypoplasia between the masticatory muscles and the craniofacial skeleton in hemifacialmicrosomia, as determined by 3-D CT imaging. *J Craniofac Surg.* 2001;12:31-40.
5. La Rossa D, Whitaker L, Dabb R, Mellissinos E. The use of microvascular free flaps for soft tissue augmentation of the face in children with hemifacialmicrosomia. *Cleft Palate J.* 1980; 17:138-43.
6. Dhillon M, Mohan RP, Suma GN, Raju SM, Tomar D. Hemifacialmicrosomia: a clinicoradiological report of three cases. *J Oral Sci.* 2010;52:319-24.
7. Myung Y, Lee YH, Chang H. Surgical correction of progressive hemifacial atrophy with on lay bone graft combined with soft tissue augmentation. *J Craniofac Surg.* 2012;23:1841-4.

8. Kim S, Seo YJ, Choi TH, Baek SH. New approach for the surgico-orthodontic treatment of hemifacialmicrosomia. *J Craniofac Surg* 2012;23:957-63.
9. Martin D, Pascal JF, Baudet J, Mondie JM, Farhat JB, Athoum A, et al. The submental island flap: a new donor site. Anatomy and clinical applications as a free or pedicled flap. *Plast Reconstr Surg*. 1993;92:867-73.
10. Amin AA, Sakkary MA, Khalil AA, Rifaat MA, Zayed SB. The submental flap for oral cavity reconstruction: extended indications and technical refinements. *Head Neck Oncol*; 2011;3:51.
11. Chen WL, Zhou M, Ye JT, Yang ZH, Zhang DM. Maxillary functional reconstruction using a reverse facial artery-submental artery mandibular osteomuscular flap with dental implants. *J Oral Maxillofac Surg*. 2011;69:2909-14.
12. Rahpeyma A, Khajehahmadi S, Nakhaei M. Submental Artery Island Flap in Reconstruction of Hard Palate after wide Surgical Resection of Verrucous Carcinoma, Two Case Reports. *Iran J Otorhinolaryngol*.2013;25:177-81.
13. Rahpeyma A, Khajehahmadi S. Oral reconstruction with submental flap. *Ann Maxillofac Surg*. 2013;3:144-7.
14. Yilmaz M, Menderes A, Barutçu A. Submental artery island flap for reconstruction of the lower and mid face. *Ann Plast Surg*. 1997;39:30-5.
15. Tan O, Atik B, Parmaksizoglu D. Soft-tissue augmentation of the middle and lower face using the deepithelialized submental flap. *Plast Reconstr Surg*. 2007;119:873-9.
16. MacQuillan A, Biarda FU, Grobbelaar A. The incidence of anterior belly of digastric agenesis in patients with hemifacialmicrosomia. *Plast Reconstr Surg* 2010;126:1285-90.
17. Huntsman WT, Lineaweaver W, Ousterhout DK, Buncke HJ, Alpert BS. Recipient vessels for microvascular transplants in patients with hemifacialmicrosomia. *Craniofac Surg*. 1992;3:187-9.
18. Cobb AR, Koudstaal MJ, Bulstrode NW, Lloyd TW, Dunaway DJ. Free groin flap in hemifacial volume reconstruction. *Br J Oral Maxillofac Surg*. 2013;51:301-6.
19. Zhang Y, Jin R, Shi Y, Sun B, Zhang Y, Qian Y. Pedicled superficial temporal fascia sandwich flap for reconstruction of severe facial depression. *J Craniofac Surg*. 2009;20:505-8.
20. Choung PH, Nam IW, Kim KS. Vascularized cranial bone grafts for mandibular and maxillary reconstruction. The parietal osteofascial flap. *J Craniomaxillofac Surg*. 1991;19:235-42.
21. Tanna N, Broer PN, Roostaeian J, Bradley JP, Levine JP, Saadeh PB. Soft tissue correction of craniofacial microsomia and progressive hemifacialatrophy. *J Craniofac Surg*. 2012;23:2024-7.