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SURGICAL ANATOMY IN ENDOSCOPIC FACIAL REJUVENATION

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SUMMARY

Endoscopic facial rejuvenation is a new technique which allows to greatly reduce the scar morbidity especially in the forehead region. Other advantages are its safety and accuracy due to the excellent magnification provided by the endoscope which enhances the visualization of muscles, nerves and vessels and shows clear surgical planes. Anyway, a sound knowledge of the distribution of the fascial system at the temporo-zygomatic region and of the relationships between the temporal fasciae, the interposed fat pads and the frontal branch are fundamental both in the prevention of nerve injury and in the successful result of the endoscopic procedure.

In this paper an accurate account of the anatomical structures and their relationships encountered during a subperiosteal endoscopic facial procedure by dissecting 20 facial halves has been provided.

ZUSAMMENFASSUNG

Chirurgische Anatomie:Endoskopische faciale "Rejuvenation"

G. L. Campiglio, P. Candiani

Diese Technik ermöglicht eine erhebliche Harabsetzung der Narben-Morbidität, insbesonders in der frontalen Gegend. Ihre weiteren Vorteile bestehen aus ihrer Einfachheit und Präzision. Dank der ausgezeichneten endoskopischen Vergrösserung, die eine bessere visuelle Darstellung der Muskeln, Nerven und Gefässend zeigt, klar die operierte Gegend. Gute Kenntnisse der Distribution des faszialen Systems in der temporo-zygomatischen Gegend, und der Beziehungen zwischen den temporalen Faszien, der zwischen ihnen liegenden Fettpolstern und dem frontalen Ast, sind von grundliegender Bedeutung sowohl für die Verhütung einer Nervenverletzung, wie auch für die guten Ergebnisse der endoskopischen Untersuchung.

Die vorliegende Mitteilung liefert einen genauen Bericht über die anatomischen Strukturen und ihre gegenseitige Beziehungen anhand von subperiosteaien endoskopischen Verfahren, die bei der Dissektion von 20 Gesichtshälften appliziert wurden.

Key words: endoscopy, anatomy, rhitidectomy, face

The role of endoscopic techniques in surgery is rapidly increasing to include many areas not previously thought to be amenable to such technique. Up to about three years ago endoscopy was used in plastic surgery only to perform carpal ligament releases or inspections and capsulotomies of breast implants (2, 10, 11, 17, 18, 43, 56). Then, the possibility to perform an endoscopic forehead and facial lift has opened up new and enthusiastic possibilities in this field of aesthetic surgery (3, 12, 20, 30, 31, 36, 50, 51). Endoscopic facial rejuvenation has been progressively refined so that a great deal of options are now available (complete endoscopic procedure or simple endoscopic corrugator/procerus resection, subperiosteal or subcutaneous procedures).

Endoscopic subperiosteal forehead and fullface lift is indicated in younger patient (late 30's-early 40's) whose primary concern is forehead wrinkles, brow ptosis, mild jowl and deep nasolabial folds without excess of skin (9, 21, 50, 51, 52, 53).

It has the advantages to minimize the scars and to prevent other possible complications of the open approach such as alopecia, numbness and itching. As the venous and lymphatic pathways of drainage are not significantly interrupted the postoperative swelling is also minimal and resolves quicker (50, 51, 52, 53).

Despite numerous detailed publications on the localization of the facial nerves and vessels and on the organization of the fascial temporal system, some controversy still persists. Opinions differ, for example, as to the relationship of the frontal branch of the facial nerve and the fascial structures in the temporal and zygomatic area (1, 6, 7, 8, 13, 19, 22-24, 26-29, 32, 33, 35, 37, 40-42, 45, 46, 48, 49, 53-55, 57, 58, 60-63, 65, 66).

The purpose of this study is to describe the fundamental anatomical structures encountered during a subperiosteal endoscopic face lift and their topographic relationships with particular regard to the temporal region. In fact, an accurate understanding of the relationships between the temporal fasciae, the interposed fat pads and the frontal branch is paramount both in the prevention of nerve injury and in the successful result of the endoscopic procedure.

MATERIAL AND METHODS

An endoscopic subperiosteal fullface lift was performed in 10 fresh cadaver specimen (20 facial halves operated).

After completion of the procedure the skin and subcutaneous fat tissue were removed and nerves, vessels as well as the fascial structures were dissected. In particular we reviewed the position of the frontal branch of the facial nerve in relation to the plane of dissection as it crosses the zygomatic arch.

A rigid 4 mm endoscope with a 30° angle and a complete set of endoscopic dissectors and scissors (straight and curved) were used to perform the endoscopic forehead and midface face lift. The endoscopic images were displayed on a high resolution colour monitor.

The endoscopic fullface lift is performed through one median longitudinal incision and two paramedial incisions made along a line passing through the external canthus and the tail of the eyebrow. Two other incisions are placed in the temporal area, parallel to the hairline and continuing a line which joints the alar base and the external canthus. The median and paramedian incisions are extended to the bone while the parietal ones reach the fascia which invests the temporalis muscle. All the incisions are placed 1 cm behind the hairline and are 1-1.5 cm long.

First of all the scalp is dissected posteriorly in the subperiosteal plane up to the parietal-occipital junction. Subsequently the frontal pericranium is elevated up to the arcus marginalis where, under endoscopic control, it is transected to expose the corrugator, procerus and depressor supercilii. These muscles are weakened preserving carefully the supraorbital and supratrochlear nerves (Figs. 1-2). Laterally in the temporal area the superficial temporal fascia is elevated from the underlying temporal fascia and the dissection plane connected with the subperiosteal forehead dissection (Fig. 3). The dissection is, then, extended subperiosteally down to the lateral orbital rim.

More laterally the endoscopic dissection is continued up to about 3 cm above the zygomatic arch. At this point the first leaflet of the investing fascia of the temporalis is entered and the dissection continues down to the superior border of the zygomatic arch where the periosteum and the superficial fascia of the masseter with some attached muscular fibers are elevated.

Fig. 1: Resection of some fibers of the corrugator muscle which is responsible of the glabellar wrinkles.

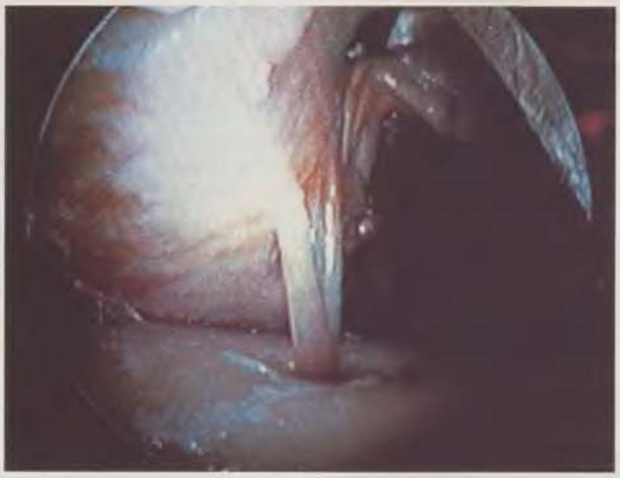

Fig. 2: Endoscopic view of the supraorbital nerve emerging from its foramen.

Fig. 3: Elevation of the superficial temporal fascia from the underlying temporalis aponeurosis.

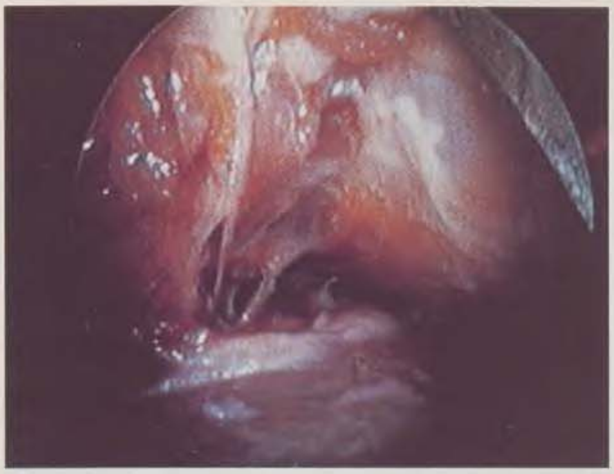

Fig. 4: Subperiosteal dissection of the malar bone which is performed from the infraciliary approach.

Figs. 6a, b: In this cadaver is showed the effect on the left nasolabial fold of the suspension of the midface to the temporal aponeurosis.

Fig. 5: Joining of the temporal and midface dissection is demonstrated by the excision of the tegument and introduction of the scissors.

6b)

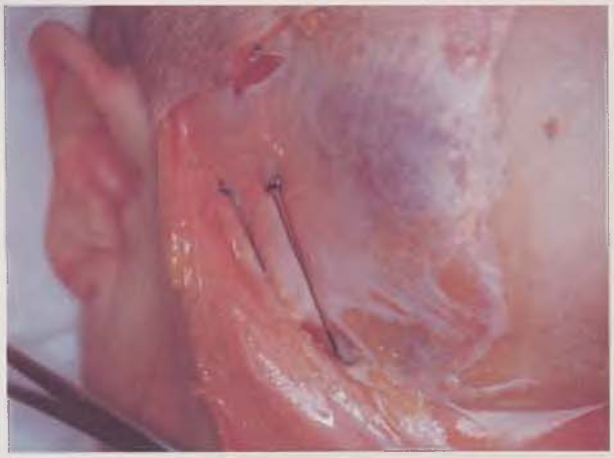

Fig. 6 c: The stitches which fix the midface to the investing fascia of the temporalis are showed.

The subperiosteal dissection of the midface is performed from the subciliary incision and continues laterally and superiorly until the periosteum of the zygomatic arch is elevated (Fig. 4). At this point with the endoscopic visualization through the temporal incision the temporal and midface dissection planes are connected with sideway movements (Fig. 5).

The lower face is approached through a submental incision and dissected in a subperiosteal plane inferiorly to mental nerve. Laterally this dissection is extended to the masseter insertion in order to transmit the upward pulling to the lower face.

Finally the midface is suspended by means of one or two stitches to the investing fascia of the temporalis (Fig. 6). The forehead is suspended with galeal/periosteal stitches anchored to micro screws while the temporal scalp is suspended with sutures applied to the superficial temporal fascia and fixed to the temporal fascia proper.

RESULTS

Temporal fascial anatomy

At the level of the temporal region, immediately deep to the subcutaneous layer, the superficial muscoloaponeurotic system (SMAS) continues with a thin highly vascularized fascia. Anteriorly it is adherent to the zygomatic arch while posteriorly is separated from the fascia investing the temporalis muscle by a layer of fatty tissue. In the undersurface of this fat pad runs the frontal branch of the facial nerve which is in close contact with the priosteum of the zygomatic arch. The fat pad inferiorly extends over the zygomatic arch while superiorly continues with the subgaleal plane. This is a layer of loose connective tissue which lies beneath the whole galea and the upper part of the superficial temporal fascia.

The superficial temporal artery and vein run over the suprazygomatic extension of the SMAS in the deep subcutaneous fat. The auricolotemporal nerve accompanies the superficial temporal vessels being located posteriorly to them.

The belly of the temporalis muscle is invested by a whitish thick connective fascial layer. Superiorly it exists as a single layer but at the level of the superior orbital margin, approximately 5 cm above the zygomatic arch, it splits in two separate sheets: the superficial one is thicker and inserts on the periosteum of the anterior surface of the zygomatic arch while the deep one reaches the periosteum of the posterior surface.

These two fascial layers are fused in their anterior and posterior third while in the middle third are separated by a fatty compartment which extends down to the zygomatic arch.

The middle temporal artery, a branch of the superficial temporal artery, arises below the zygomatic arch, enters the more superficial fascial leaflet and goes through the underlying fat pad to supply these two last anatomical structures.

Almost all the temporalis muscle is directly covered by the above mentioned fascia, except its inferior portion and tendon which are separated from the sheath by a thin layer of fat. This yellowish tissue can be considered the suprazygomatic extension of the buccal fat pad (Bichat's fat pad) and acts as a syssarcosis allowing the gliding of the temporalis from the bony prominces.

Sensitive facial nerves

The supraorbital, infraorbital and mental nerves are branches of the trigeminal nerve which supplies the sensitive innervation of the face and of the anterior scalp. These nerves exit from the cranium through three foramina or fissures which lie on a sagittal line passing along the midline of the pupil in a straight forward gaze.

The **supraorbital nerve** emerges from an orifice in 42% of cases or from a fissure in 58%. The anatomy of this nerve is quite variable being usually one large nerve and one associated nerve of approximately one third the size (Fig. 7). It courses across the forehead and under the scalp along a line placed 2-2.5 cm from the midline. In all the dissections the supraorbital nerve presents two divisions beyond the orbital rim: a superficial branch, that passes over the frontalis muscle, and a deep one which runs cephalad across the lateral forehead between the galea aponeurotica and the pericranium.

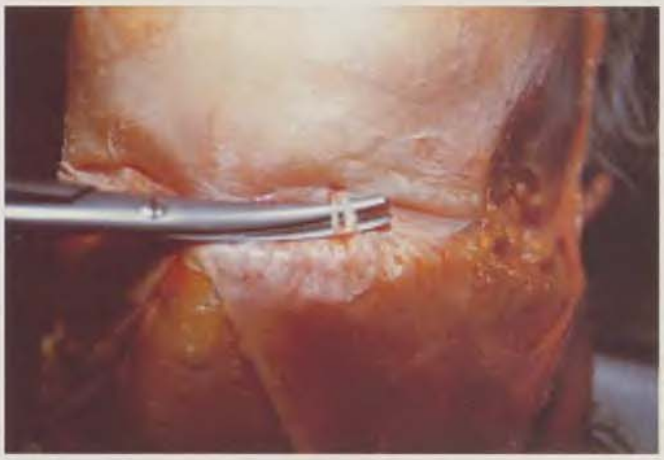

Fig. 7: The cadaver preparation shows the anatomy of the supraorbital nerve while it emerges from the supraorbital foramen.

Aproximately 1 cm more medially is located the **supratrochlear nerve** which emerges from the superomedial corner of the orbit and pierces the corrugator muscle where it divides into three or four smaller branches.

The **infraorbital nerve** exits from the infraorbital foramen 1.2-1.5 cm below the inferior orbital rim and divides into four branches: the inferior palpebral, the external nasal, the internal nasal and the superior labial nerves.

The **mental nerve** emerges from a foramen located midway between the upper and lower edge of the mandibular body approximately 1.5 cm above the mandibular edge and slightly medial to the same imaginary plane which joints the supraorbital and infraorbital formanina. It provides sensation to the lower lips, the central mucous membranes and the submental cutaneous area.

The **auricolotemporal nerve** runs just behind the superficial temporal artery and vein as they cross the zygomatic arch and lie within the suprazygomatic extension of the SMAS.

Frontal and orbital branch of the facial nerve

The innervation of the mimic muscles of the face is provided by the facial nerve. All these muscles, except the mentalis, levator anguli oris and the buccinator, are supplied from their deep surface (22).

The **frontal branch** runs obliquely upward and inward from the parotid gland to the lateral border of the frontalis muscle, crossing the zygomatic arch at a midpoint between the lateral canthus and the crus of the helix (Fig. 8). It travels in the undersurface of the superficial fat pad, being adherent to the zygomatic periosteum and covered by the SMAS, below the zygomatic arch, and by its suprazygomatic extension above it. It penetrates into the frontalis muscle above the level of the superior orbital rim and the undersurface of the superior part of the orbicularis oculi 3-4 mm medial to its free edge.

Fig. 8: The frontal branch of the facial nerve crossing the zygomatic arch is showed.

The **orbital branch** runs toward the external canthus just above the periosteum. After it has created a fine reticular anastomotic plexus, it penetrates the undersurface of the orbicularis oculi 2.0-2.2 cm from the orbital rim.

Muscles

The **frontalis muscle** is a thin paired muscle with a quadrangular shape which originates from the galea and inserts in the frontal skin interdigitating with the corrugator, procerus and orbicularis oculi. It continues posteriorly with the aponeurotic galea and laterally with the suprazygomatic extension of the SMAS.

The **supercilii corrugators** are two paired small muscles which run outward and upward from the medial supraorbital ridge to the dermis of the medial eyebrow skin.

Procerus muscle is a mimic muscle located medially to supercilii corrugators.

Depressor supercilii is formed by the medial fibers of the orbicularis oculi which originate from the nasal spine of the frontal bone to insert, after mergling with the procerus and frontalis, to the skin at the head of the eyebrow.

CONCLUSION

Facial rejuvenation is one of the most interesting field of application for endoscopy in plastic surgery.

As the facial endoscopic techniques refine a new interest in the anatomy of the face is discovered and a sound knowledge of the architecture of this region is required. In particular, being the frontal branch of the facial nerve at risk during endoscopic face lifts, a clearer understanding is needed regarding the exact plane in which it runs and its relationships with the temporal fasciae.

In the past various detailed descriptions of the relationship between the temporal fasciae at the level of zygomatic arch have been proposed, but there is still a confusing and imprecise nomenclature in the scientific literature.

Abul-Hassan named the investing fascia of temporalis "deep temporal fascia" and the suprazygomatic extension of the SMAS "superficial temporal fascia" even if he recognizes that the term "temporoparietalis fascia" would be better because it reflects its anatomic boundaries (1). He also identified a loose areolar layer below the superficial temporal fascia which he called "subaponeurotic plane".

Some months later Casanova published a paper in which he called "innominate fascia" this anatomical and surgical plane underlying the temporoparietalis extension of the SMAS (8). On the contrary, Stuzin reserved this term to the superficial layer of the covering fascia of temporalis which he called "deep temporal fascia" while the more superficial aponeurotic structure in the temporal area was named "superficial temporal fascia" (61). In the same paper Stuzin confirmed the presence of a loose areolar plane along the undersurface of the "superficial temporal fascia" which he called the "subaponeurotic plane" as Abul-Hassan. He also introduced the term "superficial fat pad" to indicate the adipose tissue which separates the two layers of the temporal fascia proper.

In 1991 Tolhurst revisited the surgical anatomy of the scalp with special attention to the loose connective tissue underlying the galea and temporoparietalis fascia and coined the name "subgaleal fascia" to indicate it (65).

According to Micheli-Pellegrini the subgaleal fascia should be considered a transformation of the deep adipose layer of the subcutaneous as in Sterzi's general concept ("tela subcutanea") (41, 42).

More recently Ramirez described this subaponeurotic plane as constituted by fatty tissue and therefore called it "the superficial fat pad" while the fat compartment between the two leaflets of the temporal fascia proper became the "intermediate fat pad" (50, 51, 52, 53).

From a practical point of view in order to overcome these semantic differences in the attribution of the names to the various fascial structures of the temporal area we suggest to adopt the nomenclature recently proposed by Ramirez for its simplicity. This terminology distinguishes three fasciae (superficial fascia or suprazygomatic extension of the SMAS or temporoparietalis fascia; intermediate fascia or superficial leaflet of the temporal aponeurosis; deep fascia or deep leaflet of the temporal aponeurosis) and three interposed fat pads (superficial, intermediate and deep) (Fig 9).

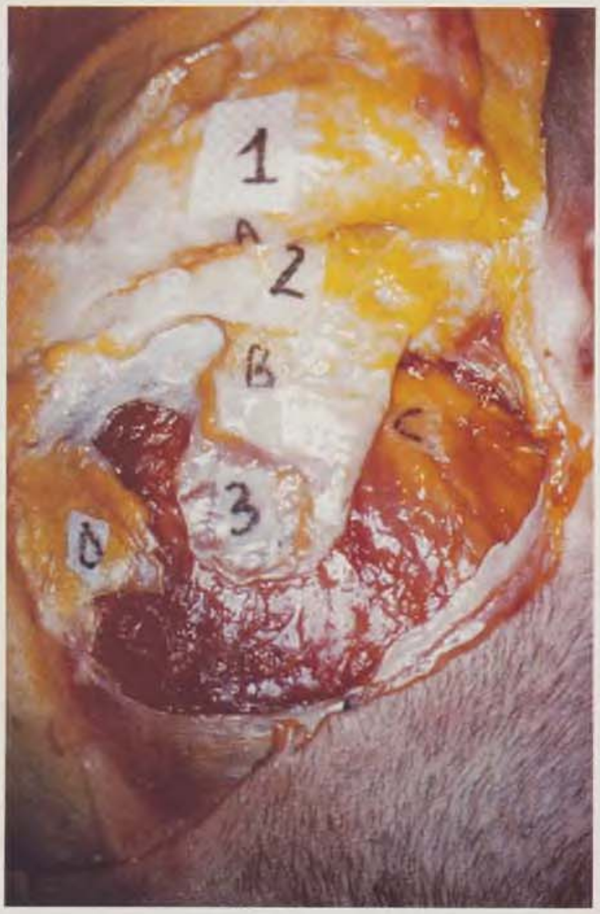

Fig. 9: Once reflected the skin and the superficial temporal fascia the anatomy of the temporal region is showed: 1. Superficial Temporal Fascia, 2. Intermediate Temporal Fascia, 3. Deep Temporal Fascia, A. Superficial Temporal Fat Pad, B. Intermediate Temporal Fat Pad, C. Deep Temporal Fat Pad, D. Retroorbicularis Oculi Fat Pad.

Our study substantiates the presence of different layers in the temporo-zygomatic area. The deepest one is the pericranium which covers the bones except at the level of insertion of the temporal muscle (8). In this zone the periosteum continues with the temporal fascia proper which blends caudally with the zygomatic periosteum and with the masseteric fascia. At a more superficial plane lies the subgaleal fascia whose thickness depends on the amount of adipose tissue present and varies with the location. There is a relatively thick adipose tissue above the middle third of the zygomatic arch where it transformes in a fat pad just over the temporalis fascia proper. In this fat compartment, beneath the superficial temporal fascia, lies the frontal branch of the facial nerve. Actually, Abdul-Hassan in 1986 already stated that "the temporal branch lies just deep to the superficial temporal fascia in a small pocket of fat which lies between the two fascial layers (the superficial and intermediate fasciae) in the zygomatic frontal corner" (1).

Also in the periorbital region the subgaleal fascia form two well differentiated fat pads which lies over the periosteum of the orbital rim. The first is the retroorbicularis oculi fat (38), a layer of fibrofatty soft tissue deep to the the deep fascia of the orbicularis oculi muscle, which extends laterally from the superior orbital nerve to a varying distance; the second is the suborbicularis oculi fat (5), a supraperiosteal suborbicularis fat excess situated over the zygoma.

Below the zygomatic arch the subgaleal fascia continues with the parotid-masseterinic fascia which covers the branches of the facial nerve. Both above and below the zygomatic arch the facial nerve runs in the same anatomical plane (under the subgaleal and parotid-masseteric fascia). Thus, we disagree with Stuzin (1992) who, considering the parotid-masseteric fascia a continuation of the temporal aponeurosis, described the frontal branch of the facial nerve as an anomaly because it lies over the temporal aponeurosis (63),

Finally, immediately below the subcutaneous fat and above the subgaleal fascia lies the galea whose temporal extension is the superficial temporal fascia.

Regarding the relationships between the temporal fascial system and the zygomatic arch we disagree with Hing who stated that "the temporoparietal fascia attaches to the zygomatic arch while the temporalis muscle fascia passes deep to the arch to insert on the coronoid..." (27). The temporal aponeurosis inserts on the zygomatic arch blending with its periosteal membrane. Stuzin stated that the superficial and deep leaflets of the temporal fascia proper attach to the superior margin of the zygomatic arch along all the lenght being separated by the fatty layer (61). On the contrary Ramirez in 1991 reported that deep and superficial layers of the temporal fascia proper fuse 1 cm above the superior margin of the arch (49). Our dissections show that the two leaflets fuse before reaching the zygomatic arch in their anterior and posterior extension while in the middle they are separated by a fat compartment up to the zygomatic periosteum.

Endoscopic face lift is a safe procedure for the excellent magnification provided by the endoscope which enhances the visualization of muscles, nerves and vessels and shows clear surgical planes thus optimizing the accuracy as well as the control of the procedure. Anyway a sound knowledge of the distribution of the fascial system at the temporal region is fundamental to understand the subperiosteal approach to the zygomatic arch and frontal nerve.

REFERENCES

1. Abul-Hassan, H., Von Drasel Ascher, G., Acland, R.: Surgical anatomy and blood supply of the fascial layers of the temporal region. Plast. Reconstr. Surg., 77:17, 1986.

2. Agee, J. M., McCarroll, H. R., Tortosa, R. D., Berry, D. A., Szabo, R. M., Peimer, C. A.: Endoscopic release of the carpal tunnel: A randomized prospective multicenter study. J. Hand Surg., 17A:987, 1992.

3. Aiache, A.: Presentation at the endoscopic plastic surgery educational seminar. Newport Beach, June 1993.

4. Aiache, A.: Endoscopic facelift. Aesth. Plast. Surg., 18:275, 1994.

5. Aiache, A., Ramirez, O. M.: The suborbicularis oculi fat pad: An anatomic and clinical study. Plast. Reconstr. Surg., 95:37, 1995.

6. Anson, B., McVay, C.: Surgical anatomy. 6th ed., Philadelphia, W. B. Saunders, 1984.

7. Bernstein, L., Nelson, R. H.: Surgical anatomy of the extraparotid distribution of the facial nerve. Arch. Otolaryngol., 110:177, 1984.

8. Casanova, R., Cavalcante, D., Grotting, J., Vasconez, L., Psillakis, J.: Anatomic basis for vascularized outer table calvarial bone flaps. Plast. Reconstr. Surg., 78:300, 1986.

9. Chajchir, A.: Endoscopic subperiosteal forehead lift. Aesth. Plast. Surg., 18:26, 1994.

10. Chow, J. C.: Endoscopic release of the carpal ligament: A new technique for carpal tunnel syndrome. Arthroscopy, 5:19, 1989.

11. Colon, G.: Endoscopic examination of intracapsular morphology. Presented at the Annual Meeting of the American Society of Aesthetic Plastic Surgery, Los Angeles, May 1992.

12. Core, G. B., Vasconez, L. O., Askren, C., Yamamoto, Y., Gamboa, M.: Coronal face lift with endoscopic techniques. Plast. Surg. Forum, 15:227, 1992.

13. Correia, P. C., Zani, R.: Surgical anatomy of the facial nerve as related to ancillary operations in rhytidoplasty. Plast. Reconstr. Surg., 52:549, 1973.

14. Daniels, R. K.: Endoscopic brow lift. Presented at the endoscopic aesthetic plastic surgery symposium, Newport Beach, January 1994.

15. De La Plaza, R., Valiente, E., Arroyo, J. M.: Supraperiosteal lifting of the upper two thirds of the face. Br. J. Plast. Surg., 44:325, 1991.

16. Dempsey, P. D., Oneal, R. M., Izenmerg, A. R.: Subperiosteal grow and midface lifts. Aesth. Plast. Surg., 19:59, 1995.

17. Dowden, R. V.: Anain, S.: Endoscopic implant inspection. Proceeding from the Annual Meeting of the American Society of Aesthetic Plastic Surgery, Los Angeles, 1992.

18. Dowden, R. V., Anain, S.: Endoscopic implant evaluation and capsulotomy. Plast. Reconstr. Surg., 91:283, 1993.

19. Dubin, B., Jackson, I., Halim, A., Triplett, W., Ferreira, M.: Anatomy of the buccal fat pad and its clinical significance. Plast. Reconstr. Surg., 83:257, 1989.

20. Eaves, F., Price, C., Bostwick III, J., Nahai, F., Jones, G., Carlson, G., Culberstone, J.: Subcutaneous endoscopic plastic surgery using a retractor mounted endoscopic system. Persp. Plast. Surg., 1:7, 1993.

21. Fuente del Campo, A.: Ritidectomia subperiostica endoscopica. Cir. Plast. IberoLatinoam., 20:393, 1994.

22. Freilinger, G., Gruber, H., Happak, W., Pechmann, U.: Surgical anatomy of the mimic muscle system and the facial nerve: importance for reconstructive and aesthetic surgery. Plast. Reconstr. Surg., 80:686, 1987.

23. Furnas, D. W.: Landmarks for the trunk and the temporofacial division of the facial nerve. Br. J. Plast. Surg., 52:694, 1965.

24. Habal, M., Maniscalco, J.: Observations on the ultrastructure of the pericranium. Ann. Plast. Surg., 6:103, 1981.

25. Hamas, R. S.: Endoscopic corrugator procerus muscle resection through the subgaleal hairline approach. Presentation at the 26th Annual Meeting of the American Society of Aesthetic Plastic Surgery, Boston, April 1993.

26. Hinderer, U. T., Urriologaoitia, F., Vildosola, R.: The blepharo-periorbitoplasty: anatomical basis. Ann. Plast. Surg., 18:437, 1987.

27. Hing, D. N., Bunke, H., Alpert, B. S.: Use of the temporoparietal free fascial flap in the upper extremity. Plast. Reconstr. Surg., 81:534, 1988.

28. Horowitz, J., Persing, J., Nichter, L., Morgan, R., Edgerton, M.: Galeal pericranial flaps in head and neck reconstruction: anatomy and applications. Am. J. Surg., 148:489, 1984.

29. Ishikawa, Y.: An anatomical study of the distribution of the temporal branch of the facial nerve. J. Cranio-Max-Fac. Surg., 18:287, 1990.

30. Isse, N. G.: Presentation at the Second International Workshop on Facial Rejuvenation: subperiosteal facelift, ancillary and alternative techniques, Baltimore, April 1993.

31. Isse, N. G.: Endoscopy assisted forehead lift. Plast. Surg. Forum, 16:104, 1993.

32. Jackson, I., Adham, M., Marsh, W.: Use of the galeal frontalis myofascial flap in craniofacial surgery. Plast. Reconstr. Surg., 77:905, 1986.

33. Kaplan, I., Gilbert, D., Terzis, J.: The vascularized fascia of the scalp. J. Reconstr. Microsurg., 5:7, 1989.

34. Knize, D.: Transpalpebral approach to the corrugator supercilii and procerus muscle. Plast. Reconstr. Surg., 95:52, 1995.

35. Liebman, E., Webster, R., Berger, A., Della Vecchia, M.: The frontalis nerve in the temporal brow lift. Arch. Otolaryngol., 108:232, 1982.

36. Liang, M., Narayanan, K.: Endoscopic ablation of the frontalis and corrugator muscles: A clinical study. Plast. Surg. Forum, 15:54, 1992.

37. Marty, F., Montandon, D., Gumener, R., Zbrodowski, A.: Subcutaneous tissue in the scalp: anatomical, physiological and clinical study. Ann. Plast. Surg., 16:368, 1986.

38. May, J., Fearon, J., Zigarelli, P.: Retroorbicularis oculi fat (roof): resection in aesthetic blepharoplasty: a 6 year study in 63 patients. Plast. Reconstr. Surg., 86:682, 1990.

39. McCord, C., Doxanas, M.: Browplasty and browpexy: an adjunct to blepharoplasty. Plast. Reconstr. Surg., 86:248, 1990.

40. McCormack, L., Caulwell, E., Anson, B.: The surgical anatomy of the facial nerve. Surg. Gynecol. Obstet., 80:620, 1945.

41. Micheli Pellegrini, V.: Surgical anatomy and dynamics in face lifts. Facial Plast. Surg., 8:1, 1992.

42. Micheli Pellegrini, V.: La scelta delle tecniche di ritidectomia. Riv. Ital. Chir. Plast., 22:237, 1990.

43. Okutsu, I., Niromiya, S., Takatori, Y., Ogawa, Y.: Endoscopic management of the carpal tunnel syndrome. Arthroscopy, 5:11, 1989.

44. Owsley, J.: Resection of the prominent lateral fat pad during upper lid blepharoplasty. Plast. Reconstr. Surg., 65:4, 1980.

45. Ozersky, D. S., Beak, S. M., Biller, F.: Percutaneous identification of the temporal branch of the facial nerve. Ann. Plast. Surg., 4:276, 1980.

46. Pitanguy, I., Ramos, A.: The frontal branch of the facial nerve: the importance of its variations in face lifting. Plast. Reconstr. Surg., 38:352, 1966.

47. Price, C.: Presentation at the Second European Endoscopic Plastic Surgery Course, Liege, June 1994.

48. Psillakis, J., Rumley, T., Camargos, A.: Subperiosteal approach as an improved concept for correction of the aging face. Plast. Reconstr. Surg., 88:227, 1991.

49. Ramirez, O. M., Maillard, G. F., Musolas, A.: The extended subperiosteal face lift: A definitive soft tissue remodeling for facial rejuvenation. Plast. Reconstr. Surg., 88:227, 1991.

50. Ramirez, O. M.: First International Workshop on Facial Rejuvenation: The subperiosteal and other deep plane techniques, Baltimore, April 1992.

51. Ramirez, O. M.: Presentation at the Endoscopic Plastic Surgery Educational Seminar, Newport Beach, June 1993.

52. Ramirez, O. M.: Endoscopic techniques in facial rejuvenation: An overview. Aesth. Plast. Surg., 18:141, 1994.

53. Ramirez, O. M.: Presentation at the Second European Endoscopic Plastic Surgery Course, Liege, June 1994.

54. Ricbourg, B., Mitz, V., Lassau, J.: Artere temporale superficielle: Etude anatomique et deductions pratiques. Ann. Chir. Plast., 20:197, 1975.

55. Robbins, T. H.: The protection of the frontal branch of the facial nerve in face lift surgery. Br. J. Plast. Surg., 34:95, 1980.

56. Rosemberg, P., Lombardo, A., Williams, M., Bessler, M., Treat, M.: Endoscopic capsulotomy. Proceeding from the Annual Meeting of the American Society of Aesthetic Plastic Surgery, Los Angeles, 1992.

57. Ruess, W., Owsley, J.: The anatomy of the skin and fascial layers of the face in aesthetic surgery. Clin. Plast. Surg., 14:677, 1987.

58. Schwember, G., Rodriguez, A.: Anatomic surgical dissection of the extraparotid portion of the facial nerve. Plast. Reconstr. Surg., 81:183, 1988.

59. Serra Renom, J., Vila Rovira, R.: Endoscopia en cirurgia plastica y estetica. Masson, Barcelona 1995.

60. Stock, A., Collins, H., Davidson, T.: Anatomy of the superficial temporal artery. Head Neck Surg., 2:466, 1980.

61. Stuzin, J., Wagstrom, L., Kawamoto, H., Wolfe, S.: Anatomy of the frontal branch of the facial nerve: The significance of the temporal fat pad. Plast. Reconstr. Surg., 83:265, 1989.

62. Stuzin, J., Wagstrom, L., Kawamoto, H., Baker, T., Wolfe, S.: The anatomy and clinical applications of the buccal fat pad. Plast. Reconstr. Surg., 85:29, 1990.

63. Stuzin, J., Baker, T., Gordon, H.: The relationship of the superficial and deep facial fascias: Relevance to the rhytidectomy and aging. Plast. Reconstr. Surg., 89:441, 1992.

64. Toledo, L.: Video-endoscopic face lift. Aesth. Plast. Surg., 18:149, 1994.

65. Tolhurst, D., Carstens, M., Greco, R., Hurwitz, D.: The surgical anatomy of the scalp. Plast. Reconstr. Surg., 87:603, 1991.

66. Williams, P., Warwick, R. (Eds): Gray's anatomy. 36th Ed., Philadelphia, W. B. Saunders, 1985.

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TISSUE EXPANDERS IN SYNDACTYLY: A BRIEF REVIEW

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SUMMARY

Tissue expansion has been advocated as a method of obtaining enough skin to correct syndactyly without using skin grafts. However, results have been disappointing, indications are unclear, and complication rates are still relatively high. We review the published cases of syndactyly treated with tissue expansion, acknowledging the lack of data and guidelines for its use in such condition. After more than 10 years since its introduction in the treatment of syndactyly, its use is still not as widespread as one would have been led to expect.

ZUSAMMENFASSUNG

Gewebsexpansions-Apparat in der Behandlung der Syndaktylie: ein kurzer Bericht

M. d'Arcangelo, N. Maffuli

Ein Bericht über die Anwendung der Methode der Hautexpansion zur Korrektion der Syndaktylie, ohne einer Hauttransplantation. Die Ergebnisse blieben jedoch unbefriedigend, die Indikationen wurden soweit nicht genau bestimmt und die die Komplikationsrate war relativ hoch. Es folgt eine Übersicht der Ergebnisse der Hautexpansion in der Behandlung von Patienten mit der Syndaktylie.

Unterstrichen wird der Mangel von Angaben und Richtlinien für die Applikation dieser Methode bei der Syndaktylie. Mehr als 10 Jahre nach ihrer Einführung in die Praxis hat sich dieses Verfahren in der Behandlung der Syndaktylie nicht so weit verbreitet wie erwartet wurde.

Key words: tissue expansion, complications, congenital hand deformities

Tissue expansion (TE) has been advocated as a promising method of correcting syndactyly without using skin grafts (Argenta 1988; Aubert, Paulhe and Magalon 1993; Morgan and Edgerton 1985; Van Beek and Adson 1987). However, indications and complication rates are still unclear, and published results are lacking. We review the published cases of syndactyly treated using TE, acknowledging the lack of data and clear quidelines for the use of this valuable treatment tool.

Except in very mild cases, syndactylised fingers never have enough skin to achieve primary closure following release (Argenta 1988; Hentz and Littler 1977; Flatt 1977). Skin grafts, flaps or a combination of the two are necessary in almost every surgical method described for their correction (Eaton and Lister 1990; Flatt 1977). For toes syndactyly, subcutaneous pedicled advancement grafts have recently been described (Itoh and Arai 1995), but their application to hand surgery could be more problematic.

TE in hand surgery has received enthusiastic support since its use in a single case of syndactyly (Morgan and Edgerton 1985). It was regarded as a relatively simple technique able to provide straight forward solutions to difficult traumatic hand conditions and to syndactyly (Morgan and Edgerton 1985; Mackinnon and Gruss 1985; Van Beek and Adson 1987).

In syndactyly, theoretically TE should be able to provide sufficient local expanded skin with colour, texture and sensitivity matching the web space and the side of the fingers to be reconstructed, without skin grafting and its associated morbidity (Aubert, Paulhe and Magalon 1993; Ogawa, Kasai, Doi and Takeuchi 1989). It should also be able to give a better cosmetic result then skin grafts and flaps.

In 1985, the use of TE in breast reconstruction, in head and neck surgery and in the thorax was well established, but it was still little used in the upper limb (Mackinnon and Gruss 1985).

Mackinnon and Gruss (1985), in a preliminary communication, stated that, although they did not have direct experience at that time, they could anticipate trauma and syndactyly as the future likely indications for TE in the hand.

Van Beek and Adson (1987) reported 11 patients in whom TE had been used in the upper limb for traumatic conditions and syndactyly. Of these, three patients had a syndactyly succesfully corrected.

Therefore, TE in the hand was considered a technique of great promise with many advantages. Percival and Sykes (1989) stated that "the application of tissue expansion techniques in simple and complex multiple syndactyly ... may further reduce the need for secondary surgery, but these methods have yet to gain widespread acceptance".

Argenta (1988) described the use of TE in syndactyly. Subsequently, Argenta and Austad (1990) stated that expanders have been used successfully "in a significant number of patients to correct single and multiple syndactyly". However, they gave no data to support this statement.

Alternative strategies based on the principles of tissue expansion have been described. Ogawa, Kasai, Doi and Takeuchi (1989) reported 4 cases of syndactyly treated with an extra-tissue expander consisting of a U shaped spring pincer. The device was applied for 2 months to the interdigital groove of the syndactylized digits exerting pressure sufficient to stretch and expand the skin allowing correction of syndactylised fingers with local flaps only.

Gudushauri and Tvaliashvili (1991) designed a distraction apparatus using external fixation of the phalanges with wires to produce gradual stretching of the interdigital skin. They treated 60 cases of syndactyly without using skin grafts.

Eaton and Lister (1990) recognised that, ... "although skin grafts may be avoided by using tissue expansion before release of complete syndactyly, the indications, complications and long term results of this approach in children are unknown". Aubert, Paulhe and Magalon (1993) reported three cases of syndactyly succesfully treated with TE.

Recently, Ashmead and Smith (1995) reported on their experience with TE in the treatment of syndactyly in Apert's syndrome. They released 41 web spaces using TE, and compared them with 70 web spaces treated by local flaps and grafts. An average 2.9 procedures were performed per each web space released using TE, more than double than the number of procedures necessary using traditional techniques (1.2 per web). Flaps and grafts were revised in 10% of cases, while tissue expanded grafts were revised in 35% of the instances when they were used.

After an extensive electronic search on Medline, and manual search on the Index Medicus and on the references of the published papers identified through Medline and Index Medicus, the published results of TE for the treatment of syndactyly are surprisingly few. No long term results are available, even though it is likely that more than the cases reviewed here have been operated on worldwide.

It can only be hypothesised that, after ten years of use, indications, complications and long term results of TE in syndactyly are still uncertain.

A high rate of complications, mainly consisting of implant exposure, implant failure, infection, haematoma, ischemic and necrotic flaps, intractable pain and neurapraxia, has been reported in the first ten years of use of TE (Antonyshyn, Gruss and Mackinnon 1988). Probably, this is to be ascribed to the steep initial learning curve and to the widespread use of the technique (Anthonyshyn, Gruss and Mackinnon 1988; Austad 1987). Complication rate of TE in children remains high (Iconomou, Michelow and Zuker 1993). Although most complications do not interfere with completion of the procedure and do not compromise the final result (Argenta and Austad 1990; Iconomou, Michelow and Zuker 1993), the authors with extensive experience in the use of TE in hand syndactyly feel that complication rate is unacceptably high, and have planned not to use TE for the treatment of syndactyly (Ashmead and Smith 1995).

Complication rates vary with the site expanded, being particularly high in the head, neck and lower extremity (Antonyshyn, Gruss and Mackinnon 1988). However, the tissues of the upper extremity, and especially the dorsum of the hand, seem to be able to tolerate TE particularly well (Van Beek and Adson 1987; Antonyshyn, Gruss and Mackinnon 1988), and the complication rate in the hand has been reported to be significantly less than that observed in other areas (Antonyshyn, Gruss and Mackinnon 1988; Mackinnon and Dellon 1987).

At present, some questions still need to be answered before TE can be recommended as a routine technique for syndactyly:

1. TE prostheses are inflated at weekly or biweekly intervals over a period of 4 to 6 weeks (Van Beek and Adson 1987; Argenta 1988). Can effective expansion of the syndactylized fingers be safely achieved within this time span?

2. Can TE reliably produce adequate and good quality tissue to reconstruct the web space and cover the lateral aspects of the released fingers without using skin grafts?

3. Is the incidence of web-creep and post-operative contracture deformities reduced with TE?

4. Can secondary surgery be reduced?

In conclusion, can TE be considered a reliable, simple, effective and safe technique for the treatment of syndactyly, or should it be said instead that it has failed to live up to expectations? The present evidence would suggest that, although interesting, its use for syndactyly should not be recommended.

REFERENCES

1. Antonyshyn, O., Gruss, J. S., Mackinnon, S. E.: Complication of soft tissue expansion. Br. J. Plast. Surg., 41:239-250, 1988.

2. Argenta, L. C.: Tissue expansion. In: Mustarde J. C., Jackson I. T. (ed.), Plastic Surgery in Infancy and Childhood. 3rd ed. Edingurgh, Churchill Livingstone, 739-757, 1988.

3. Argenta, L. C., Austad, E. D.: Principles and technique of tissue expansion. In: McCarthy J. G. (ed.), Plastic Surgery. Philadelphia, W.B. Saunders, 457-507, 1990.

4. Ashmead, D., Smith, P. J.: Tissue expansion for syndactyly. J. Hand Surg., 20B:32-330, 1995.

5. Aubert, J. P., Paulhe, P., Magalon, G.: L'expansion cutanee au membre superieur. Ann. Chir. Plast. Esthet., 38:34-40, 1993.

6. Austad, E. D.: Complications in tissue expansion. Clin. Plast. Surg., 14:549-550, 1987.

7. Eaton, C. J., Lister, G. D.: Syndactyly. Hand Clinics, 6:555-575, 1990.

8. Flatt, A. E.: Webbed fingers. In: Flatt A. E. (ed.), The Care of Congenital Hand Anomalies. St. Lois, C. V. Mosby, 170, 1977.

9. Gudushaury, O. H., Tvaliashvili, L. A.: Local epidermoplasty for syndactyly. Int. Orthop., 15:39-43, 1991.

10. Hentz, V. R., Littler, J. W.: The surgical management of congenital hand anomalies. In: Converse, J. M. (ed.), Reconstructive Plastic Surgery. 2nd ed. Philadelphia, W. B. Saunders, 3306-3349, 1977.

11. Iconomou, T. G., Michelow, B. J., Zuker, R. M.: Tissue expansion in the pediatric patient. Ann. Plast. Surg., 31:134-140, 1993.

12. Itoh, Y., Arai, K.: A new operation for syndactyly and polysyndactyly of the foot without skin grafts. Br. J. Plast. Surg., 48:306-311, 1995.

13. Mackinnon, S. E., Dellon, A. L.: Soft tissue expansion in hand reconstruction. J. Hand Surg., 12B:73-77, 1987.

14. Mackinnon, S. E., Gruss, J. S.: Soft tissue expanders in upper limb surgery. J. Hand Surg., 10A:749-754, 1985.

15. Morgan, R. F., Edgerton, M. T.: Tissue expansion in reconstructive hand surgery: Case report. J. Hand Surg., 10A: 754-757, 1985.

16. Ogawa, Y., Kasai, K., Doi, H., Takeuchi, E.: The preoperative use of extra-tissue expander for syndactyly. Ann. Plast. Surg., 23:552-559, 1989.

17. Percival, N. J., Sykes, P. J.: Syndactyly: A review of the factors which influence surgical treatment. J. Hand Surg., 14B:196-200, 1989.

18. Van Beek, A. L., Adson, M. H.: Tissue expansion in the upper extremity. Clin. Plast. Surg., 14:535-542, 1987.

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CONSIDERATION ON CLASSIC METHODS AND FREE FLAPS IN FACE AND NECK RECONSTRUCTION

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SUMMARY

The authors describe the sequence of the reconstructions within the region of face and neck. They provide a short assessment of the advantages and drawbacks of individual procedures and underline the need for an individual approach in each patient on the basis of a close co-operation of the whole teams of specialists.

ZUSAMMENFASSUNG

Die Erwägung der klassischen Methoden und Anwendung von der freien Lappen in der Rekonstruktion des Gesichtes und des Halses

R.. Königová, M. Tvrdek

Die Autoren beschreiben die Sequenz der Anwendung von klassischen Verfahren in der Rekonstruktion in der Gegend des Gesichtes und des Halses. Es folgt eine kurze Bewertung der Vorteile und Nachteile einzelner Verfahren mit der Unterstreichung der Notwendigkeit einer individuellen Behandlung der einzelnen Patienten anhand einer engen Zusammenarbeit des gesamten Teames von Spezialisten.

Key words: burn injury-face and neck reconstruction

Medicine today is in the middle of an Intellectual revolution. The assumption that physicians or surgeons instinctively know the right thing to do has been severely challenged in the last few years. This assumption -called the "art of medicine" - presupposes that everyone is doing the right thing, but in decision-making process is a wide range of uncertainty. Studies of inappropriate care have shown vastly different perceptions of the outcomes of different practices. Developing a guideline for treatment of any medical problem requires retrieving all the evidence that exists about the effectiveness of different treatments. Studies of variations in practice patterns have been published for almost a century. But the force that has pushed the issue into public eye affecting the practice of medicine, is the extraordinary increase in health care costs. Procedures today have become more complicated and outcomes have been more difficult to track. Many studies estimate the intermediate outcome which can occur and be satisfactory, but the long-term outcome is disappointing (1).

Apart from salvaging the lives of patients there should be evaluated methods of repair especially of face and neck.

The sum of the experience of the Prague Burn Center and of the others from the literature has been used to develop an algorithm for large reconstruction of severe scar deformities. The algorithm for the analysis of the complex problem of facial burn scar deformity derives from the so called "facial triangle" (Fig. 1) which determines priority and method used for special areas (esthetic units). Eye lids are prior to lips, lips and chin are prior to nose and cheeks. For full-thickness skin loss there has been used full-thickness skin graft (Figs. 2-5). For reconstruction of nose and for deeper losses exposing facial bones, there has been used arm tube pedicle flap (Figs. 6-13).

Fig. 1: "Facial triangle".

Fig. 2: A 4-year old girl after early necrectomy and grafting (2 months after accident).

Fig. 3: Upper lip and lower lip reconstructed with full-thickness skin grafts.

Figs. 4, 5: 13 years later after the reconstruction of both cheeks, neck and nose with full-thickness skin grafts.

Figs. 6, 7: A 21-year old electrician with the destruction of the right supraorbital and temporal region, glabella and ethmoidal sinuses, frontal sinus was exposed.

Algorithm for the management of severe anterior neck burn scar contractures derives from the necessity to release contracture, to restore contour, to prevent recurrence - considering the age, sex and particularly the organ complications in extensive burns and electrical injuries.

Methods for neck and face - besides the "facial triangl" are as follows: free flaps (Figs. 14-17), tissue-expanded transposition flaps, prefabricated flaps which have been carried out by the Microsurgical Center, and the conventional techniques used by the Burn Center - split-thickness skin grafts (Figs. 18-21), full-thickness skin grafts, tube pedicle flaps.

The algorithm takes into consideration not only the advantages of grafts and flaps, but also the disadvantages related to these methods:

- split-thickness skin graft (meshed or in sheet) has a good take, provides good contour, but requires long-term uninterrupted physiotherapy comprehending massage and splinting,
- full-thickness skin graft accomplishes good contour, good colour and texture match, but there is always a threat of haematoma developing and following necrosis of the area, regarding physiotherapy there is required massage of the margins of the graft and application of elastic pressure,


Figs. 8, 9: Arm tube pedicle flap prepared and transferred to the glabella and temporal region.


Figs. 10, 11: The tube pedicle flap divided and after modelling.


Figs. 12, 13: Osteocartilagenous alloimplant inserted in the saddle nose.

Fig. 14: Defect of the forehead after electrical burn injury with frontal bone exposed a frontal sinus opened.

- tube pedicle flap has a good take, detailed modelling is possible which is particularly important in the face, no special technical equipment is necessary, no general anesthesia is required, single stages may be carried out under local anesthesia, no antibiotics are applied if careful and meticulous approach is secured. The greatest disadvantage pointed out by many surgeons is the multiple stages procedure, but on the other hand, allowing discharge from the hospital and reassuming professional activities (in the meantime) (Figs. 22-25),

- free microsurgical flaps are prepared by single stage technique and have also potential for growth with patient, some appear bulky and modelling is also necessary, though sometimes it

Fig. 15: Six months follow-up after the reconstruction by free radial forearm flap.

Fig. 16: A severe scar contracture of the chin and neck.

Fig. 17: An extensive scar was excided and defect reconstructed by free groin flap transfer - four months follow-up.

Figs. 18, 19: A 9-year old girl suffering 67% T.B.S.A. full-thickness burn, 2 months later all grafting was accomplished, but severe neck contracture developed.

Fig. 20: Split-thickness skin grafts taken from healed donor areas were used for neck reconstruction.

Fig. 21: 12 years later she got married.

Figs. 22, 23: A 20-year old soldier with postburn scar deformity. Reconstruction of both eyelids on both sides with full-thickness skin grafts.

Figs. 24, 25: Double tube pedicle flap from the lower abdomen transferred to glabella and above the left mandibule. 3 years later after modelling of nose; upper and lower lip and chin were finished in stages.

Figs. 26, 27: An 18-year old girl with a very deep contact burn reaching to the bone. The double tube pedicle flap from the lower abdomen transferred to the neck and the right preauricular region.

may be risky. The principle disadvantage is prolonged anesthesia in patients with complications following extensive burns and electrical injuries (pancreatitis may not be clinically recognized, only biochemical examination in the 3-4 weeks post burn may show hyperamylasemia or hyperlipasemia, cardiac arrest, neurological sequelae - EP).

CONCLUSIONS

To analyse the "PROS" and "CONS" of different strategies we must learn who our patients are, what problem they get, what we do to them, what outcomes occur and what it all costs.

Procedures today have become more complicated and outcomes have become more difficult to track. The intermediate outcome can occur when the log-term outcome does not.

Without information about the benefits and harms of different treatments, there is no rational basis for choosing between them.

Several psychological and demographic variables using certain Scales and Inventories may predict decisions (Table 1) regarding the surgery, as reported at the A. B. A., 1994 (2), but in our practice indication is based on the close personal cooperation of the surgeon, psychologist and physiotherapist with the patient under permanent surveillance of the internist and pediatrician con-

Figs. 28, 29: The third tube pedicle flap was transferred to the retroauricular region to model the scarred area between the previous tube pedicle flaps. She is married and has two children.

trolling patient's general condition continually (3).

Table 1.

PSYCHOLOGICAL FACTORS PREDICTING DECISIONS CONCERNING RECONSTRUCTIVE SURGERY	
- PAIS	Psychosocial Adjustment to Illness Scale)
- BDI	Beck Depression Inventory)
- MCMI-II	(Millon Clinical Multiaxial Inventory-II)
+ demographic variables (insurance type)	

L. S. Heinberg, J. A. Fauerbach, R. J. Spense, F. Hackerman A. B. A., 1994

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REFERENCES

1. Eddy, D. M.: Medicine, money, and mathematics. Medical Audit News, Vol. 3, No. 8:115-123, 1993.

2. Heinberg, L. S., Fauerbach, J. A., Spense, R. J., Hackerman, F.: Psychological factors predicting decisions concerning Reconstructive Surgery. American Burn Association Meeting, 1994.

3. Wood, F. M.: Quality assurance in burn patient care. Burns, Vol. 21, No. 8:563-568, 1995.

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OUR EXPERIENCE WITH OPERATIVE TREATMENT OF MALIGNANT MELANOMA

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SUMMARY

The result of studies of the series of patients with a malignant melanoma operated on radically and non-radically in our region was extended to include the time period from 1975 to 1983 and the new findings confirmed the results of our first study from 1983. No difference in the survival rate was found between the groups of radically and non-radically operated patients. The radicalness of the excision of a primary tumour does not influence the time of survival of the patients. This was also confirmed by the evaluation of the series of patients operated only with the non-radical method at our department during the recent years.

On the basis of the results obtained within these 29 years in a series of 1800 patients with a malignant melanoma we recommend to perform the surgical treatment of a primary malignant melanoma with the use of a non-radical excision.

ZUSAMMENFASSUNG

Erfahrungen mit der operativen Behandlung der bösartigen Melanome

V. Bursa, K. Pizinger, J. Šolc, A.. Stuchlová, K. Šormová

Die Untersuchungsergebnisse eines Krankengutes von Patienten mit bösartigen Melanomen nach einer radikalen, bzw. nich-radikalen Operation wurden durch die Untersuchungen einer weiteren Zeitperiod von 1975-1983 erweitert. Die neuen Ergebnisse bestätigten die Angaben der ersten Studies aus dem Jahre 1983. Es bestanden keine Unterschiede in der Überlebungsrate zwischen den radikal und nicht-radikal operierten Gruppen. Die Radikalität der Exzision der primaren Geschwulst hatte keinen Einfluss auf das Überleben der Kranken. Dies bestätigte auch die Untersuchung der Patienten-gruppe, die an unsere Abteilung mit dem nicht-radikalen Verfahren während der letzten Jahre operiert wurden.

Anhand dieser Ergebnisse bei einem Krankengut von 1800 Patienten mit bösartigen Melanomen, die im Laufe von 29 Jahren behandelt wurden, geben die Verfasser den Vorzug der Anwendung des nicht-radikalen Verfahrens.

Key words: malignant melanoma, radical excision, non-radical excision, survival rate

In 1983 we carried out a study of the survival rate of patients after the performance of radical and non-radical excision of a primary malignant melanoma in the interval of two, five and eight years after the operation. After a lapse of 12 years we complemented our study, increased the number of patients in groups with both radical and non-radical surgery and accomplished a comprehensive evaluation dating back to 1983.

The group of patients with radical surgery included patients in whom the tumour was excised with a margin of at least 6 cm of normal tissue and as deep as to the fascia (including an excision of the fascia) and the defect was subsequently covered with a skin graft or by a transposition of local flaps. For the most part these people were operated on in general anaesthesia at the Department of Plastic Surgery in Plzeň.

The group of patients with non-radical surgery consisted of those in whom simple excision was performed, that is the tumour was totally excised with an incision mostly only a few mm from the margin of the defect and was subsequently closed with a linear suture. These excisions were performed in local anaesthesia without any selection mostly at surgical or other outdoor departments. Many a time the surgeon even did not know that a malignant melanoma was present.

Only patients in clinical stage I were included in the evaluation. Patients in clinical stages II or

III who died for some other reason than a generalization of a malignant tumour, patients with a melanoma of the eye, conjunctiva or mucosa were not included in the evaluation. Further those in whom a primary malignant melanoma was not found and patients who moved away and were transferred to some other file were excluded as well.

According to the results of the 1983 study, since 1984 we have performed only non-radical surgeries in patients with a malignant melanoma, in collaboration with the Department of Dermatovenerology of the University Hospital in Plzeň. We carried out an evaluation of the survival rate in patients operated on for a malignant melanoma 2 and 5 years after surgery.

In this discourse we present the results of the survival rate in patients operated on for a malignant melanoma in our region from 1960 to 1989.

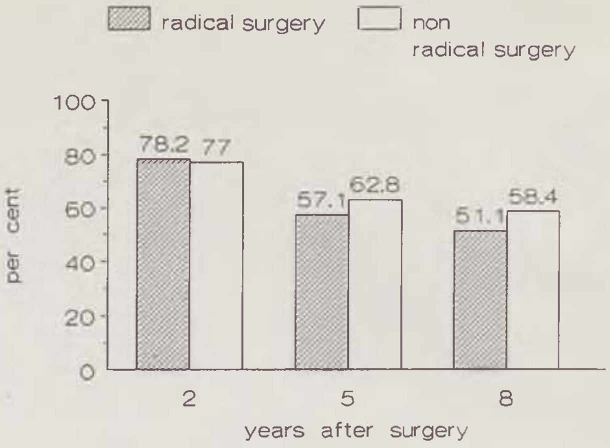

Fig. 1: The percentage of patients surviving 2, 5 and 8 years after radical or non-radical surgery (series of patients in 1960-1974).

RESULTS

The first study carried out in 1983 dealt with the evaluation of the group of patients operated on in the time period from 1960 to 1974. Altogether during this period were evaluated 246 patients. Radical surgery was performed in 133 and non-radical operation in 113 patients with a malignant melanoma. In the group of patients operated on with the radical method were 104 patients (78.2%) surviving 2 years after surgery, 76 patients (57.1%) surviving 5 years after surgery and 68 patients (51.1%) surviving 8 years after surgery. In the group of patients operated on with the non-radical method there were 87 patients (77%) surviving 2 years after surgery, 71 patients (62.8%) surviving 5 years after surgery and 66 patients (58.4%) surviving 8 years after surgery (Tab. 1, Fig. 1).

The present evaluation was carried out in a group of patients operated on for a malignant melanoma in the time period from 1960 to 1983. There were 582 patients included in this evaluation. Out of 305 patients operated on radically there were 226 patients (74.1%) surviving 2 years after the operation, 165 patients (54.1%) surviving 5 years after surgery and 150 patients (49.2%) surviving 8 years after surgery.

Tab. 1. Series of patients in 1960 - 1974.

surgery - total	455
excluded[1]	209
assessed	246
radical	133
non-radical	113

excluded[1]: 2nd and 3rd clinical stage, dead from other causes than generalised MBL, MBL of the eye or conjunctival mucosa, absence of primary tumour, moved away etc.

Out of 277 non-radically operated patients were 216 patients (78%) surviving 2 years after surgery, 175 patients (63.2%) surviving 5 years after surgery and 157 patients (56.7%) surviving 8 years after surgery (Tab. 2, Fig. 2).

Tab. 2. Series of patients in 1960 - 1983.

surgery - total	889
excluded[1]	307
assessed	582
radical	305
non-radical	277

excluded[1]: not convenient for follow-up

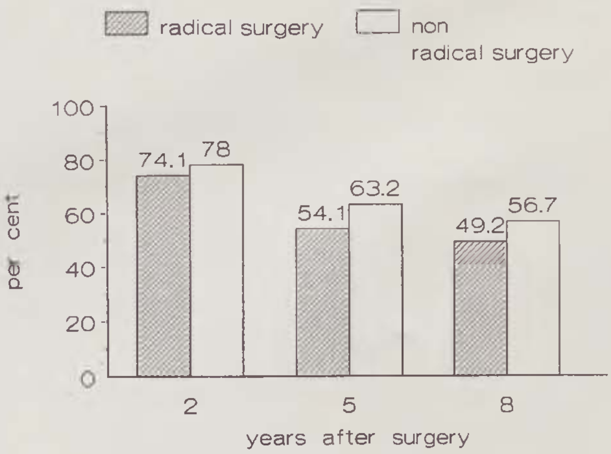

Fig. 2: The percentage of patients surviving 2, 5 and 8 years after radical or non-radical surgery (series of patients in 1960-1983).

The evaluation of the period from 1984 to 1989 comprised altogether 238 patients all of whom were operated with a non-radical method. There were 204 patients (87.5%) surviving 2 years after surgery and 157 patients (66%) surviving 5 years after surgery (Tab. 3, Fig. 3).

Tab. 3. Series of patients in 1984-1989.

surgery - total	292
excluded	54
assessed	238

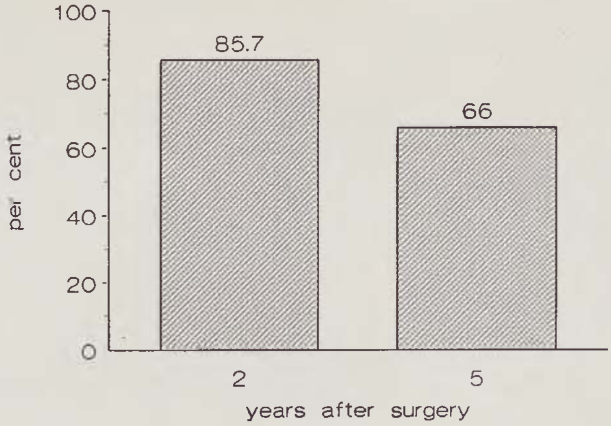

Fig. 3: The percentage of patients surviving 2 and 5 years after surgery (series of patients in 1984-1989).

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MICROSURGICAL RECONSTRUCTION OF A STIFF JOINTLESS THUMB AFTER AN AVULSION INJURY

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SUMMARY

We demonstrate three types of reconstruction of a stiff jointless thumb after an avulsion injury.

In the first type, the skeleton of the thumb was harvested from the iliac crest or from a rib, the cutaneous cover was formed from a forearm flap on the a. radialis.

In the second type, the preserved skeleton of the thumb from crushed tissues was transferred to the forearm and from there subsequently used for reconstruction together with the forearm flap. These two types of reconstruction were carried out if the amputation line reached the metacarpophalangeal (MP) joint of the thumb.

In an amputation proximally from the MP joint, the skeleton of the thumb was reconstructed with a graft from the fibula on a vascular pedicle. The fibula with the vascular pedicle was transferred to the forearm and sutured in an Y-shape suture to the a. radialis. The tissue block of the forearm flap together with the fibula were subsequently transferred for the reconstruction of the thumb.

The fundamental prerequisite for the reconstruction of a stiff jointless thumb were freely mobile three-phalangeal digits which could form a functional unit with the stiff thumb. The reconstructions were performed in 7 patients. The advantages and disadvantages of these particular operation schemes are discussed postoperatively after 2 years.

ZUSAMMENFASSUNG

Mikrochirurgische Rekonstruktion eines steifen Daumens, ohne Gelenk, nach traumatischer Amputation

V. Smrčka, J. Hrbatý, P. Holuša

Beschrieben werden drei Typen der Rekonstruktion eines steifen Daumens, ohne Gelenk, nach traumatischer Amputation. Beim ersten Typ bildet das Skelett des Daumens ein Knochenstückchen aus dem iliakalen Knochen bzw. aus einer Rippe. Den Hautmantel bildet ein Unterarmlappen an der A. radialis. Beim zweiten Typ wird der nach einer Gewebskontusion erhaltener Daumenknochen in den Unterarm übertragen und dann mit einem Unterarmhautlappen zur Rekonstruktion des Daumens angewandt. Diese zwei Typen der Rekonstruktion konnten für die Rekonstruktion in denjenigen Fällen angewandt werden, wenn die Amputationslinie bis zum karpophalangealen Gelenk reichte. Bei einer proximalen Amputation von dem Karpophalangealen Gelenk erfolgte die Rekonstruktion des Daumensskelettes mit einem Knochenstückchen aus der Fibula an einem vaskulären Stiel. Die Fibula mit dem vaskulären Stiel wurde an den Unterarm übertragen und in der Form von Y an die A. radialis angenäht. Der Gewebsblock des Unterarmlappens mit der Fibula wurde dann zur Rekonstruktion des Daumens übertragen. Die Rekonstruktion des steifen Daumens ohne ein Gelenk kann nur in denjenigen Fällen erfolgen in welchen Finger mit drei Gliedern mit dem steifen Daumen die Graiffähigkeit besitzen und daher eine funktionelle Einheit bilden können. Insgesamt wurden die Rekonstruktionen bei 7 Patienten durchgeführt. Zwei Jahre nach der Operation wurden die Vorteile und Nachteile dieses Operationsverfahrens erörtert.

Key words: microsurgery, free tissue transfer, reconstruction of jointless thumb

The loss of the thumb is the most severe loss that can afflict a hand from the point of view of its function. The grip unit of the thumb and the index and middle fingers looses its function. The loss of the thumb can be almost fully compensated by increased mobility of the three-phalangeal digits according to Matev's scheme when it extends as far as to the IP joint of the thumb and partially as far as to the middle of the basal phalanx (Matev 1990).

The amputated part of the thumb can be also replaced by microsurgical reconstruction of a stiff thumb without a joint. The stiff thumb consists of a bone skeleton and a soft cover, transferred separately or in a tissue block to the reconstruction site.

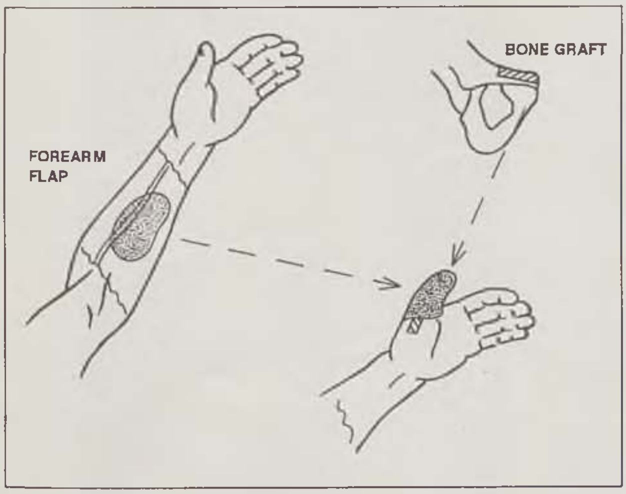
MATERIAL

There were seven patients with microsurgically reconstructed stiff thumb operated on in 1993 with a follow-up of two years. They could be divided into three groups according to the operation scheme. The major injury mechanism was a circular saw accident (Fig. 1). The skeleton of the thumb was formed from a rib (1x), from the iliac crest (4x), from the fibula on a vascular pedicle (1x) or even from the preserved skeleton of the thumb itself (1x). The cover was formed from a forearm flap harvested always with a nerve to ensure sensitivity. The reconstructions where a lateral arm flap or a flap on the a. dorsalis were used have not been included in the assessed series.

Fig. 1: The major cause of a thumb amputation - a circular saw. An amputated thumb in sawdust.

METHOD AND RESULTS

Scheme I (Figs. 2-5)



Scheme I: Reconstruction of the thumb by a simultaneous transfer of the thumb skeleton formed from a bone graft from the iliac bone and soft cover formed from a forearm flap on the a.radialis.

Fig. 2: A thumb skeleton was obtained in this case from a rib, however most frequently it is harvested from the iliac crest.

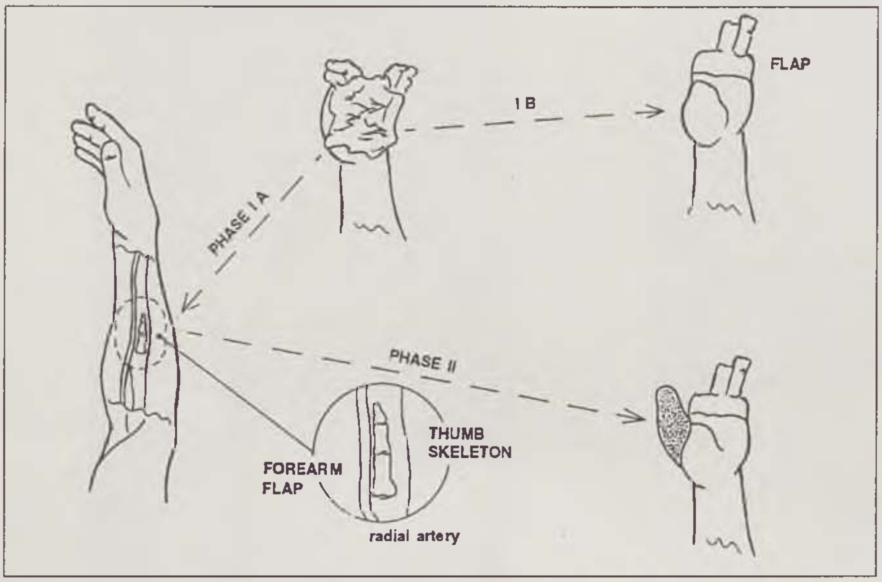
Fig. 3: The reconstructed thumb in postoperative period.

Fig. 4: The reconstruction of the thumb two years after the surgery.

Fig. 5: The flap is sensitive, the grip function of the index finger is satisfactory.

There were 5 patients included within the first operation scheme. The bone graft for the thumb skeleton was harvested in one stage from the iliac crest or from a rib simultaneously with the transfer of a free antebrachial flap. The thumb of the other hand served as a model. We usually harvest the flap and prepare the reconstruction site in an axillary block and bloodlessness. We harvest the bone graft under general or epidural anaesthesia according to the donor site. The skeleton of the thumb is fixed with two wire loops and with K-wire. The transferred flap is sutured in an arterial anastomosis usually to a dorsal branch of the a. radialis with two venous anastomoses. A plaster splint is applied postoperatively. Anticoagulant therapy comprised the following combinations: Heparin, Fraxiparin or Rheodextran, Fraxiparin, in two cases only Acylpyrin preparate.

Scheme II (Figs. 6-9)



Scheme II: A thumb skeleton "located" on the forearm, imposible to be replanted. The skeleton elevated for a reconstruction with the forearm flap on the a. radialis in the next operation stage.

Fig. 6: A severe crush injury of both soft tissues and skeleton of the hand.

Fig. 7: Defects on the left hand covered with a flap. The skeleton of the thumb implanted on the right forearm.

Fig. 8: The thumb skeleton marked on the forearm flap before the transfer for reconstruction.

Fig. 9: The reconstructed thumb in the postoperative period.

As a modification of the above mentioned type of reconstruction, the skeleton of the thumb was implanted from the tissues crushed in an injury to the forearm at close quarters of the artery radialis. After the debridement of this severe trauma it was necessary to carry out a plastic repair with a flap.

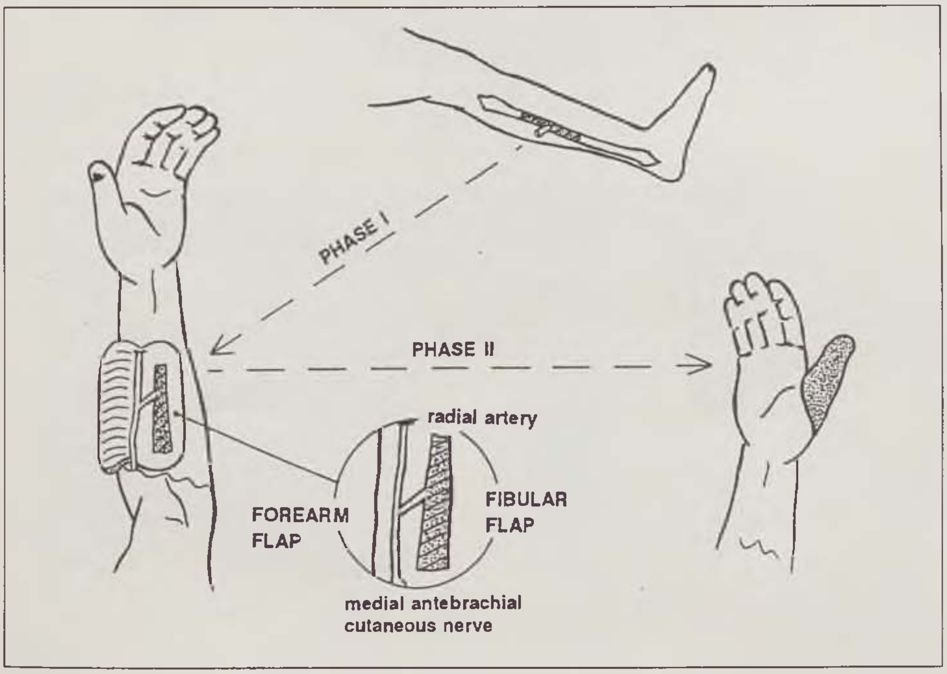
In the second operation stage six months later the skeleton of the thumb together with the forearm flap were transferred for the reconstruction of the thumb and sutured at the reconstruction site to the dorsal branch of the a. radialis.

Scheme III (Figs. 10-17)

The problems of a reconstruction are more marked in an amputation at the level of the metacarpus base where the loss of the thumb is irreplaceable. In this case no thenar was available. The skeleton of the thumb was sometimes of an extensive length over 10 cm. The freely mobile three-phalangeal digits were an advantage (Fig. 11).

We harvested a bone graft from the fibula on a vascular pedicle. We sutured the pedicle of the bone graft to the a. radialis of the contralateral forearm and at the same time we mobilized the forearm flap.

Six months later we transferred the fibula graft together with the forearm flap at that time on a different vascular pedicle and we carried out the reconstructive surgery. The skeleton was fixed with two loops in opposite planes and the suture of radial artery, the vena concomitans and the suture of one cutaneous vein were performed. The exposed vascular bundles were covered with a flap from the dorsum of the hand.



Scheme III: The reconstruction procedure consisted of the transfer of a bone graft from the fibula on a vascular pedicle, its suture tho the a. radialis of the forearm flap and subsequently in the next operation stage the transfer of this tissue block for the reconstruction of the thumb.

Fig. 10: The right hand after an amputation of the thumb including the thenar.

Fig. 11: Reconstruction of a stiff thumb can be functionally successful only provided that the other three-palangeal digits are well mobile.

Fig. 12: Schematic representation of the harvesting of a bone graft from the fibula.

Fig. 13: It was necessary to harvest a bone graft longer than 10 cm - the vascular pedicle is elevated.

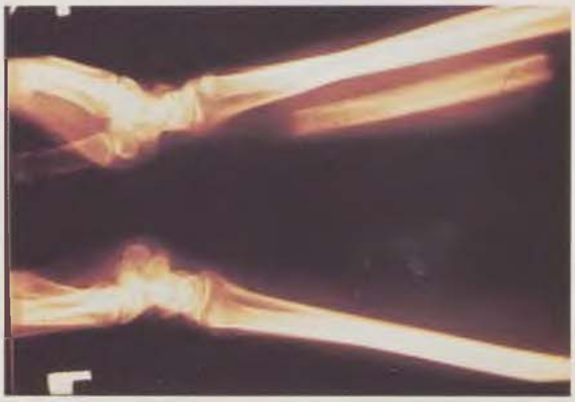


Fig. 14: The fibula on the forearm after the first operation stage.

Fig. 15: The reconstructed thumb in the postoperative period.

Fig. 16: The reconstruction 2 years after the operation. The flap moulded at present.

Fig. 17: Test of the grip function.

DISCUSSION

In spite of the fact that a series of small numbers is at issue we would like to underline some facts concerning the reconstruction schemes.

1. Restoration of sensitivity of forearm flaps

All flaps were harvested with a lateral antebrachial cutaneous nerve. Tested with filaments, sensitivity was restored up to one half or three quarters of the flap within the first year. Only during the next year it was restored completely.

2. Porosity of bone grafts

The skeleton of the transfered thumb in scheme II turned out to be cancellous. A fracture of the basal phalanx occurred after one year and it was necessary to reinforce it with another graft. From the point of view of the quality of bone structure, the graft from the fibula on a vascular pedicle proved the best on an X-ray check-up examination.

3. Site of forearm flap harvesting

We harvested the forearm flaps from the contralateral forearm, which does not have to be taken as a rule. But we apprehended spasms on the reconstructed a. radialis and further we took account of the patient's wish (scheme II).

4. Mobility of three-phalangeal digits

If the mobility of the other three-phalangeal digits is perfect the reconstruction is successful and the patient goes back to work. But even with a small restriction of mobility (in our case in scheme II) the reconstruction is of less value.

CONCLUSION

The reconstruction of a stiff thumb has its indications but it can be functionally successful only provided that the other three-phalangeal digits are perfectly mobile and the sensitivity of the reconstructed thumb is restored.

REFERENCES

1. Manktelow, R.: Microvascular Reconstruction. Springer - Verlag, Berlin, 1986.

2. Matev, I.: Thumb Reconstruction by Bone Lengthening. In: Mc Carthy J. G. (ed.) Plastic Surgery, Philadelphia. W. B. Saunders, Vol. 8, pp. 5195-5212, 1990.

3. Nejedlý, A., Tvrdek, M., Kletenský, J.: Thumb reconstruction using free flap transfer. Acta Chir. Plast., 32:225-238, 1990.

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FACIAL DEVELOPMENT IN UNILATERAL CLEFT LIP AND PALATE PRIOR TO THE ERUPTION OF PERMANENT INCISORS AFTER PRIMARY BONE GRAFTING AND PERIOSTEAL FLAP SURGERY

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SUMMARY

Roentgencephalometric studies were carried out at the age of five years in 27 boys with unilateral cleft lip and palate after primary bone grafting, as well as in 25 boys with the same type of cleft after primary periosteoplasty and in 27 normal boys who served as a group of controls. Both series with clefts differed from the group of controls by a reduced upper face height, maxillary dentoalveolar retroinclination, posterior position of the maxilla and by the shortening of mandibular body and ramus. There was a slight reduction of maxillary depth only in the series with bone grafts. The other skeletal deviations were secondary. The soft profile showed in both series with clefts a reduction of the upper lip height and of the nasal prominence, in patients with bone grafts was recorded in addition a reduced prominence of the upper lip. A comparison of both series with clefts disclosed that primary bone grafting reduced the vertical growth of the upper face and increased the dentoalveolar retroinclination of the maxilla resulting in a larger impairment of overjet and in a more marked retrocheilia. A better prominence of the nose in the series with periosteal flap surgery was produced by the primary reposition of the nasal septum, which was not performed during osteoplasty.

ZUSAMMENFASSUNG

Gesichtsentwicklung nach einer primären Osteoplastik und Periosteoplasik bei einseitigen Lippen-, und Gaumanspalten vor der Eruption der permanenten Schneidezähne

Z. Šmahel, Ž. Müllerová, I. Horák

Röntgenzephalometrische Untersuchungen erfolgten im Alter von 5 Jahren bei 27 Jungen mit einseitigen Lippen-, und Gaumenspalten, 25 Jungen mit demselben Typ der Spaltmissbildung nach einer primären Periosteoplastik, und bei 27 gesunden Kontrolljungen. Die beide Gruppen mit Spaltmissbildungen unterschieden sich von der Kontrollgruppe durch eine niedrigere Höhe das oberen Gesichtes, maxillare dentoalveolare Retroinklination, Posteroposition der Maxilla, und eine kürzere Länge des Körpers und Astes des Unterkiefers. Eine kleine Verkürzung der Oberkiefertiefe war nur in der Gruppe nach einer Knochentransplantation vorhanden. Die anderen skelettalen Abweichungen werden also sekundär betrachtet. Am weichen Profil bestand bei beiden Gruppen der Spaltmissbildungen eine Verkürzung der Oberlippenhöhe, eine geringere Prominenz der Nase und bei Patienten nach einer Osteoplasik auch der Prominenz der Oberlippe. Ein Vergleich der beiden Gruppen mit Spaltmissbildungen zeigte, dass die primäre Knochentransplantation eine Herabsetzung das Wachstums des oberen Gesichtes in die Grösse und eine stärkere dentoalveolare Retroinklination des Oberkiefers verursachte, die zu einer weiteren Störung der Okklusion und einer grösseren Retroinklination führte. Eine günstigere Prominenz der Nase in der Gruppe nach der Periosteoplastik wurde durch die primäre Reposition des Nasenseptum erreicht, die während der Osteoplastik vorläufing noch nicht durchgeführt wurde.

Key words: unilateral cleft lip and palate, bone graft, periosteal flap, facial development, early childhood

A follow-up of facial development in clefts after the use of various surgical methods provides the possibility to assess the effects of individual methods on craniofacial growth and on the outcome of treatment. These studies should disclose as early as possible any drawbacks of individual methods applied. This allows an early substitution of the applied therapeutic method, in the case of an unfavorable development, though a continuous follow-up of the patients up to adult age is indispensable for definite conclusions.

Though primary bone grafting failed to provide the anticipated therapeutic benefits and its use was actually discarded there are only a few cephalometric data on the growth of the face after this surgical procedure and there are differences between the results reported by individual departments. A highly unfavorable effect of a primary bone graft was recorded there were the graft extended into the hard palate (Friede and Johanson, 1982), in certain other situations it was less marked (Robertson and Jolleys, 1983) or only slight (Larson, 1983) or it was not demonstrated (Rosenstein et al., 1982). In spite of this defferences which were due to the varying approaches to this surgical method and to the other therapeutic procedures it was shown that the anterior and vertical growth of the upper jaw was more inhibited after primary bone grafting than after other surgical procedures (Ross, 1987). The main aim of this study was to ascertain whether after primary bone grafting an impairment of facial development could be observed, as early as during deciduous dentition and to assess the development of facial skeletal framework after two types of surgical techniques, i.e. primary osteoplasty and periosteal flap surgery.

MATERIAL AND METHOD

Into our seris were assigned 27 boys with unilateral complete cleft lip and palate without any other associated malformations, who were born in 1966-1969. At the time of X-ray studies their me-

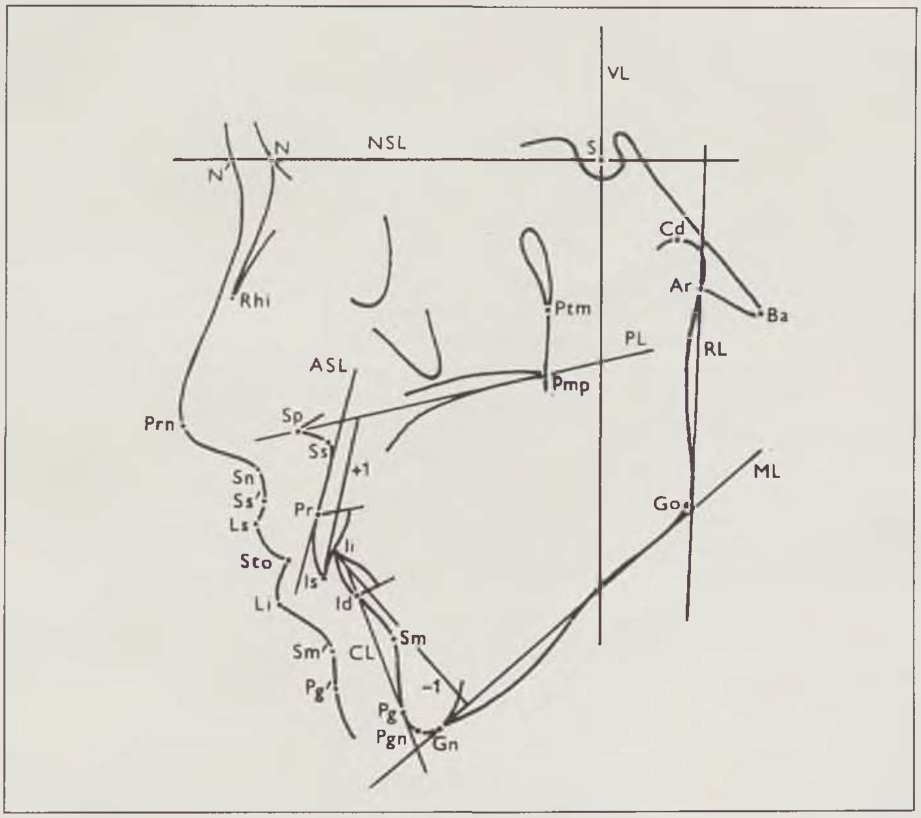

Fig. 1: Cephalometric points and reference lines used in the present study: Ar (articulare) = intersection of inferior contour of the clivus and posterior contour of the ramus mandibulae; Ba (basion) = most posteroinferior point on the clivus; Cd (condylion) = most superior point on the condylar head; Gn (gnathion) = lowest point of the mandibular symphysis; Go (gonion) = point on the angle of the mandible determined by the axis of ML/RL angle; Id (infradentale) = point of the gingival contact with lower central incisor; Ii (incision inferius) = incisal tip of the lower central incisor; Is (incision superius) = incisal tip of the upper central incisor; Li (labrale inferius) = margin of the vermilion of the lower lip; Ls (labrale superius) = margin of the vermilion of the upper lip; N (nasion) = most anterior point on the frontonasal suture; N' (soft nasion) = intersection between NSL and soft profile contour; Pg (pogonion) = most anterior point on the bony chin; Pg' (soft pogonion) = most anterior point on the soft tissue chin; Pgn (prognathion) = point on the mandibular symphysis farthest from Cd; Pmp (pterygomaxillare palatinum) = intersection of palate line PL with the fissura pterygomaxillaris; Pr (prosthion) = point of gingival contact with upper central incisor; Prn (pronasale) = point on the top of apex nasi; Ptm (pterygomaxillare) = most inferior point of fossa pterygopalatina where fissura pterygomaxillaris begins; Rhi (rhinion) = most inferior point on the nasal bone; S (sella) = center of sella turcica; Sm (supramentale) = deepest point on the anterior contour of the mandibular symphysis; Sm' (soft supramentale) = deepest point on the soft contour of the lower jaw; Sn (subnasale) = point at which columella merges with the upper lip; Sp (spinale) = tip of the anterior nasal spine; Ss (subspinale) = deepest point of the subspinal concavity; Ss' (soft subspinale) = deepest point of the upper lip; Sto (stomion) = point of contact of the upper and lower lip; NSL = line through N and S; VL = perpendicular to NSL through S; PL = line through Sp and most posterior point of the palatal processes; CL = line through Pg and Id; ML = tangent to the mandibular body through Gn; RL = tangent to the mandibular ramus through Ar; ASL = tangent to the upper alveolar process through Pr; +1 = axis of the upper central incisors; -1 = axis of the lower central incisors.

an age was 5 years and 3 months (ranging from 4.5 to 6 years). Lip suture was carried out according to Tennison, at the mean age of 7.2 months, primary palatoplasty consisting of a pushback and of pharyngeal flap surgery at the mean age of 4.4 years. A bone graft from the rib was applied simultaneously with lip suture. It was implanted only into the alveolar process and did not extend into the hard palate.

The second series included 25 boys with unilateral cleft lip and palate without any associated malformations, born in 1973-1976. Fifteen individuals had a complete cleft, ten had within the threshold of the nostril a soft bridge (Simonart's band). The patients were examined on admission for primary palatoplasty at a mean age of 5 years and 3 months (ranging from 4.5 to 6 years). Primary lip suture, according to Tennison supplemented by a narrow periosteal flap (5 mm) was performed at a mean age of 8 months. All patients within both series still had deciduous incisors. Presurgical jaw orthopedics was not used and only a few individuals were subjected to a limited orthodontic therapy with removable appliances. All patients were treated surgically at the Department for Plastic Surgery in Prague. The series of controls included 27 normal boys matched in age and selected at random in Kindergartens of Prague. Their mean age was 5 years and 2 months. All of them had deciduous incisors and none of them required orthodontic treatment.

X-ray films were made under standard conditions during centric occlusion with the head fixed in a cephalostat. Cephalometric points and reference lines used in our study are presented in Figure 1. The perpendicular distance of a point from the reference line is marked e.g. Pmp-NSL, an angle Ss-N-Sm (i.e. ANB) or as a fraction of the pertinent reference lines (ML/RL). The inclination of the axis of upper central incisors to the palatal plane is marked +1/PL, of lower incisors to the mandibular line -1/ML. The overjet (Is-Ii) was measured between the edges of upper and lower incisors parallel to the occlusal plane. The prominence of the upper lip (Ls+Li) shows how far the upper lip protrudes in the above mentioned point anteriorly over the lower lip (measured perpendicular to the connecting line N'-Pg'). In the case of double contours the midpoint between both contours (both sides) was used.

All measurements were carried out by one of the authors and the measurement errors were reported in our earlier papers (Šmahel and Škvařilová, 1988; Šmahel et al., 1994). The reliability coefficients exceeded in most characteristics the value of 0.95, but for the dimensions including point Cd and in the ASL/PL angle where the values were within the range of 0.90-0.95. This provides evidence of the high reliability of our measurements.

The results were analysed with routine procedures and the differences between individual series were tested with the t-test. Since the series treated with primary periosteoplasty included also patients with soft bridges all significant differences were re-examined after the exclusion of individuals with bridges. Some significant differences in patients with primary bone grafts recorded one year after palatoplasty as compared to the "preoperative" series with periosteal flap surgery could represent the sequelae of palatal surgery. In order to exclude or confirm this possibility the findings were compared with those obtained in patients with bone grafts prior to palate surgery, aged four years. This series included 23 boys with the same type of cleft. These patients could not be matched in age with the series treated with periosteal flap surgery because of the differences of their age at the time of palate surgery during the periods of the application of these methods.

RESULTS

As compared to controls (Table 1, Fig. 2) both series with clefts showed similar changes. Main deviations of the facial skeletal framework included a reduction of anterior and posterior upper face height (N-Sp, Pmp-NSL), maxillary dentoalveolar retroinclination (ASL/PL, +1/PL), a posterior displacement of the maxilla (Ptm-VL, Pmp-VL) and a shortening of the mandibular body and ramus (Pgn-Go, Cd-Go). On these deviations are based most of the other skeletal changes: the retrusion of both jaws (S-N-Ss, S-N-Pr, S-N-Id, S-N-Sm, S-N-Pg), the posterior rotation of the mandible (ML/NSL, RL/NSL, N-S-Pgn) with a compensatory increase of its anterior height and of the lower face height (Ii-Gn, Id-Gn, Sp-Pg) associ-

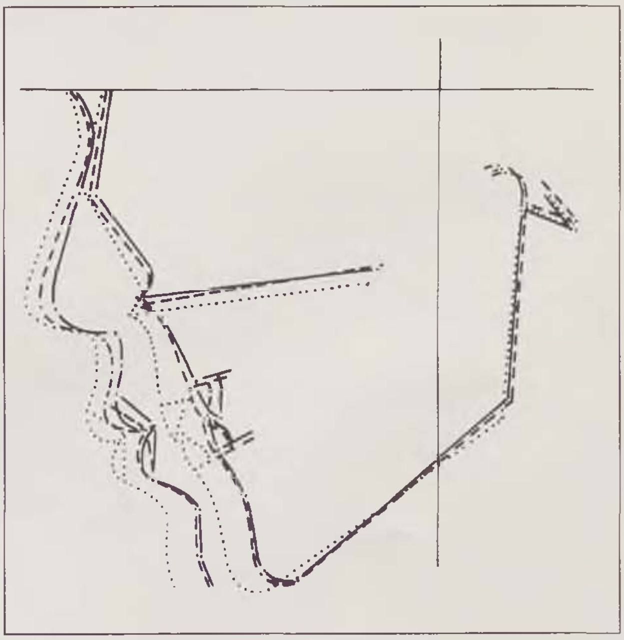

Fig. 2: Faciograms in boys aged 5 years with unilateral cleft lip and palate treated with primary bone grafting (full line) or primary periosteoplasty (dashed line) as compared to controls (dotted line).

Tab. 1. Mean values and standard errors of X-ray cephalometric characteristics in patients with primary periosteoplasty and primary bone grafting at the age of 5 years.

Variable	Control		Flap		Graft		dif. F-G
Cranial base							
N-S	65.81	0.44	64.08^{x}	0.54	63.19^{xxx}	0.47	NS
S-Ba	38.59	0.55	36.96^{x}	0.51	37.44	0.45	NS
N-S-Ba	134.78	0.90	137.28^{x}	0.77	134.37	0.76	0.010
N-S-Ar	125.56	1.02	128.44^{x}	0.84	126.89	0.95	NS
Upper Face							
N-Rhi	19.19	0.42	21.04^{xx}	0.43	20.67^{x}	0.48	NS
N-Sp	43.52	0.57	42.04$^{(x)}$	0.51	40.26^{xxx}	0.51	0.017
N-Pr	61.44	0.73	60.20	0.71	58.74^{xx}	0.51	NS
Pmp-NSL	37.44	0.45	34.24^{xxx}	0.45	34.56^{xxx}	0.38	NS
Sp-Pmp	47.81	0.36	47.48	0.63	46.19^{x}	0.52	NS
Ss-Pmp	44.22	0.36	43.84	0.48	42.85^{x}	0.54	NS
Sp-Is	25.30	0.38	26.12	0.35	27.04^{xx}	0.38	0.082
Ptm-VL	13.44	0.35	11.20^{xxx}	0.33	11.48^{xxx}	0.42	NS
Pmp-VL	13.52	0.41	10.92^{xxx}	0.37	11.81^{xx}	0.44	NS
S-N-Rhi	101.52	1.03	100.68	0.95	100.74	1.07	NS
S-N-Ss	79.07	0.72	76.72^{x}	0.66	77.93	0.73	NS
S-N-Pr	79.07	0.74	74.76^{xxx}	0.66	73.96^{xxx}	0.63	NS
PL/NSL	6.89	0.52	8.76^{xx}	0.42	6.81	0.46	0.003
ASL/PL	89.19	1.17	83.00^{xxx}	0.98	73.63^{xxx}	1.52	0.000
+1/PL	93.33	1.51	84.95^{xxx}	1.43	80.12^{xxx}	1.98	0.057
Mandible							
Pgn-Go	58.56	0.75	56.48^{x}	0.67	56.41^{x}	0.53	NS
Cd-Go	46.33	0.56	43.32^{xxx}	0.58	42.89^{xxx}	0.68	NS
S-Pgn	102.74	1.10	99.64^{x}	1.03	98.74^{xx}	0.70	NS
Ii-Gn	34.11	0.37	35.44^{x}	0.35	35.52^{x}	0.38	NS
Id-Gn	26.67	0.37	28.56^{xxx}	0.31	28.89^{xxx}	0.40	NS
S-N-Id	75.96	0.74	73.00^{xx}	0.66	73.41^{xx}	0.60	NS
S-N-Sm	74.74	0.66	72.08^{xx}	0.57	72.22^{xx}	0.57	NS
S-N-Pg	74.63	0.62	72.28^{xx}	0.48	72.33^{xx}	0.56	NS
N-S-Pgn	68.89	0.67	71.76^{xxx}	0.40	72.15^{xxx}	0.60	NS
ML/NSL	35.22	0.82	39.36^{xxx}	0.80	40.44^{xxx}	0.86	NS
RL/NSL	84.19	0.85	86.28$^{(x)}$	0.79	86.67^{x}	0.85	NS
ML/RL	130.78	1.01	132.96	1.15	133.44 $^{(x)}$	1.08	NS
CL/ML	74.74	0.67	71.28^{xx}	1.05	71.78^{xx}	0.87	NS
-1/ML	86.44	0.93	79.75^{xxx}	1.35	78.52^{xxx}	1.12	NS
Face as a whole							
N-Gn	100.33	1.12	101.28	0.89	100.63	0.66	NS
S-Go	62.96	0.73	61.12	0.84	59.30xxx	0.69	NS
Sp-Pg	52.85	0.87	54.88$^{(x)}$	0.73	57.26^{xxx}	0.63	0.017
Ss-N-Sm	4.33	0.39	4.64	0.42	5.70^{x}	0.56	NS
PL/ML	28.33	0.80	30.96^{x}	0.96	33.63^{xxx}	0.83	0.040
N-Ss-Pg	171.70	0.73	170.96	0.86	168.81^{x}	1.06	NS
Is-Ii	1.98	0.26	0.04^{xxx}	0.36	-1.33^{xxx}	0.35	0.009
Soft Profile							
N'-Prn	41.44	0.66	42.68	0.45	42.30	0.48	NS
N'-Sn	47.96	0.63	48.72	0.57	47.59	0.48	NS
N'-Sto	67.48	0.74	67.08	0.93	66.33	0.53	NS
N'-Pg'	92.74	1.07	92.72	1.09	93.04	0.75	NS
S-N'-Ss'	83.41	0.74	80.96^{x}	0.67	80.37^{xx}	0.76	NS
S-N'-Sm'	76.37	0.70	73.04^{xxx}	0.54	73.44^{xx}	0.60	NS
S-N'-Pg'	77.19	0.64	74.44^{xx}	0.53	74.78^{xx}	0.53	NS
Ss'-N'-Sm'	7.04	0.36	7.92	0.45	6.93	0.46	NS
N'-Prn-Pg'	140.07	0.74	141.52	0.89	143.85^{xx}	0.84	0.062
N'-Sn-Pg'	164.48	0.85	164.56	1.04	167.37^{x}	1.11	0.072
Prn-Sn	14.07	0.24	13.00^{xx}	0.26	12.52^{xxx}	0.19	NS
Prn-Sp	20.07	0.27	18.56^{xx}	0.38	16.85^{xxx}	0.32	0.001
Sn-Ls	14.19	0.42	12.12^{xxx}	0.35	11.78^{xxx}	0.45	NS
Sn-Sto	20.11	0.36	19.32	0.45	19.07^{x}	0.36	NS
Ls-Li	14.48	0.43	17.08^{x}	0.89	17.04^{xx}	0.81	NS
Ls+Li	4.04	0.33	3.88	0.39	2.22^{xxx}	0.35	0.003
n	27		25		27		

Table 1 - continued. Mean values in patients with periosteoplasty after exclusion of individuals with soft bridges (n=15).

Variable	$\bar{x}$	SE	dif. F-G
N-S-Ba	136.73	1.14	0.083
N-Sp	42.20	0.71	0.030
Sp-Is	25.67	0.44	0.029
PL/NSL	8.93	0.44	0.004
ASL/PL	85.21	1.05	0.000
+1/PL	85.00	2.45	NS
Sp-Pg	54.20	0.68	0.004
PL/ML	28.20	0.91	0.000
Is-Ii	0.20	0.48	0.013
N'-Prn-Pg'	141.13	1.37	0.081
N'-Sn-Pg'	164.20	1.59	NS
Prn-Sp	18.60	0.51	0.004
Ls+Li	3.87	0.57	0.013

Appendix:
ASL/PL in patients with bone graft before palate surgery at the age of 4 years
n=23 $\bar{x}$=78.13 SE=1.31 vs. Flap 5 years before palatoplasty $\bar{x}$=83.00 d=4.87 t=3.008 p=0.004
vs. Graft 5 years after palatoplasty $\bar{x}$=73.63 d=-4.50 t=2.202 p=0.033
^{x} significant differences as compared to controls at $p < 0.05$, ^{xx} $p < 0.01$, ^{xxx} $p < 0.001$, $^{(x)}$ $p < 0.1$
dif. F-G = differences between patients with periosteal flaps and with bone grafts - p value
NS = not significant ($p > 0.1$)

ated with dentoalveolar retroinclination (-1/ML, CL/ML) and the impaired vertical jaw relations (PL/ML), and overjet (Is-Ii). Independent, yet clinically unimportant deviations are the shortening of the anterior base (N-S) and a prolongation of nasal ossicles (N-Rhi). A significant shortening of maxillary depth occurred only in the series with bone grafts (Sp-Pmp, Ss-Pmp, $p < 0.05$). However, because of a larger shortening of the anterior cranial base (N-S) this series of patients had not a significant retrusion of the maxilla (S-N-Ss) and the convexity of the face (N-Ss-Pg) as well as the sagittal jaw relations (Ss-N-Sm) showed a slight increase ($p < 0.05$). In the series with periosteal flap surgery was recorded a slight flattening of the cranial base (N-S-Ba, N-S-Ar).

The parameters of the soft facial profile confirmed in both series with clefts the presence of a retrusion of both jaws (S-N'-Ss', S-N'-Sm', S-N'-Pg'). There was also a reduction of the depth (prominence) of the nose (Prn-Sn, Prn-Sp) and of the height of the upper lip, especially of its skin portion (Sn-Ls, Sn-Sto). There was, on the contrary an increase of the height of the vermilion of the lips (Ls-Li). The convexity of the face was reduced only in patients with bone grafts (N'-Prn-Pg', N'-Sn-Pg') and it was associated with a reduction of the prominence of the upper lip (Ls+Li). This was due to a slighter prominence of the nose and to the higher dentoalveolar retroinclination in these patients, as compared with individuals with periosteal flap surgery.

The differences between patients with bone grafts and individuals with periosteal flap surgery concerned three main characteristics: the series with bone grafts showed a higher reduction of the anterior upper face height (N-Sp), a markedly higher dentoalveolar retroinclination of the maxilla (ASL/PL, +1/PL) and slighter prominence of the nose (Prn-Sp). The above mentioned deviations form again the basis of the other differences: a higher dentoalveolar retroinclination of the maxilla in bone grafts results in a more marked impairment of overjet (Is-Ii), a reduced prominence of the upper lip (Ls+Li) and a prolongation of the Sp-Is distance; the smaller anterior upper face height is associated with a slighter slope of the palatal plane (PL/NSL) which is consistent with controls, a larger prolongation of the lower face (Sp-Pg) and a more marked impairment of vertical jaw relations (PL/ML); the slighter prominence of the nose results in larger flattening of the facial profile (N'-Prn-Pg'). The difference between the curvature of the cranial base in these two series of clefts did not attain the significance level when individuals with soft bridges were excluded from the series treated with periosteal flap surgery. Therefore the recorded difference was designated as accidental. The exclusion of individuals with soft bridges from the series with periosteal flap surgery confirmed that the presence of this type of bridge exerted no effects on the results obtained, but for the curvature of the cranial base (Table 1 - continued). The differences from patients with bone grafts showed no changes. Some nonsignificant differences (+1/PL, N'-Sn-Pg') were caused by smaller numbers of patients.

DISCUSSION

The deviations of facial configuration in patients with periosteal flap surgery prior to palate surgery were discussed in our earlier study (Šmahel and Müllerová, 1986). The above mentioned series included also individuals with a bony bridge who were excluded from our present study. This did not result in more marked changes of the results obtained and thus confirmed that prior to palate surgery were already present four of the five main skeletal deviations visualized in lateral projection of the face in clefts, i.e. reduction of the upper face height, dentoalveolar retroinclination of the maxilla, posterior displacement of the maxilla, and a shortening of the mandibular body and ramus, while the depth of the upper jaw was not yet significantly changed. The other skeletal deviations (retrusion of both jaws, posterior rotation of the mandible, changes of proportions, impairment of jaw relations and of overjet a.s.) are secondary and are due to the above mentioned primary changes. Primary deviations of the soft profile which were not related to skeletal changes consisted of the reduction of nasal depth and of the upper lip height, while lip prominence was at this age still satisfactory.

The same changes were recorded equally in patients with osteoplasty one year after palate surgery, however three primary deviations were significantly larger: a more marked reduction showed the upper face height, the dentoalveolar retroinclination of the maxilla was more pronounced and the prominence of the nose was slighter. While the better prominence of the nose in patients with periosteal flap surgery was due to changes of therapeutic procedures when primary lip suture was combined with a simultaneous reposition of caudal part of the nasal septum (Šmahel, 1987), this raised the question whether the more marked development of the first two deviations in patients with osteoplasty was due to bone grafting or to the applied palate surgery. However our previous study (Šmahel et al., 1993) showed that the reduction of the anterior upper face height prior to palatoplasty was indentical with that in adult age. Therefore in our opinion, the main reason for the more marked reduction of upper face height after osteoplasty was caused by the implantation of a bone graft. This fact was confirmed by a comprehensive comparative study performed by Ross (1987) who demonstrated that the earlier a bone graft is implanted the more it inhibits the vertical growth of the upper jaw. The same holds true, to a lesser degree, for an ossified periosteal flap, however in our series periosteal flaps showed only very slight signs of ossification. Friede (1978) suggested that this was produced by the blocking of growth in the vomero-premaxillary suture. This is in agreement with the fact that there were no differences between the posterior upper face height in both series (Pmp-NSL). These observations were also confirmed by our results obtained at the age of ten years (Šmahel and Müllerová, 1988) when patients with osteoplasty had a less steep slope of the palatal plane and a lower ratio of the upper face height to the total height of the face than individuals with periosteal flap surgery (40.3% vs 41.9%).

In patients with osteoplasty prior to palate surgery at the age of four years (Table 1, Appendix) maxillary dentoalveolar retroinclination was significantly larger (by 5°) than in patients with periosteal flaps prior to palate surgery at the age of five years. This situation was recorded in spite of the shorter duration of increased pressure exerted by the upper lip after its suture which represents the main cause of dentoalveolar retroinclination. This confirmed the unfavourable effect of bone grafts on the inclination of the alveolar process. Ross and Johnston (1972) stated that it was caused by retroalveolar cicatrization after the implantation of bone grafts. Yet the above described retroinclination was simultaneously slighter by 4.5° than in the series with bone grafts at the age of five years and one year after palatoplasty. A difference can be due to the prolonged action of increased tension by the upper lip, yet it is not possible to exclude a certain action of the applied palate surgery.

A large impairment of overjet and a less favourable prominence of the upper lip in patients with osteoplasty is the result of a larger dentoalveolar retroinclination. Equally the other differences as compared to individuals with a periosteal flap were secondary and due to the above mentioned primary differences between both series. To the slighter retrocheilia after periosteal flap surgery contributes also the use of a primary reposition of the nasal septum which results in an anterior shift of the nasolabial transition and which was not yet used during bone grafting (Fig. 2).

Numerous authors mention also the unfavourable effect of bone grafting on the anterior growth of the maxilla (Rehrmann et al., 1970; Friede and Johanson, 1982; Robertson and Jolleys, 1983, a.o.) yet this effect was only very slight in our series. However Ross (1987) showed, that the inhibition of anterior growth, can be recorded only after a longer interval of time i.e. later than in vertical direction. Thus we were able to observe a larger retrusion of the maxilla after bone grafting only as late as at the age of ten years (Šmahel and Müllerová, 1988), while it was clearly obvious in adult age (Šmahel et al., 1992).

Our results showed that the unfavourable effect of primary bone grafting on the development of the maxilla was recorded in the studied series already in early childhood before the eruption of permanent incisors. It consisted of a larger dentoalveolar retroinclination and in a reduction of the vertical growth of the upper face. Though the retroinclination decreased after the eruption of permanent incisors (Šmahel et al., 1993) and was further controlled by orthodontic therapy its sequelae persisted for a long period of time. After primary bone grafting the proclination of upper incisors was associated with increased difficulties e.g. between 10 and 15 years (Šmahel and Müllerová, 1994). Later could be observed also a reduction of the anterior growth of the maxilla (Šmahel et al., 1992). However, some authors reported good results provided that bone grafting was performed alone and not combined with other procedures (Dado, 1990). However, none of these studies provided evidence of an improvement in the development of the jaws after bone grafting which would justify to continue in the use of this method, regardless of its numerous drawbacks (the dissection of the bone graft, the duration of the surgical procedure and thus also its cost etc.).

REFERENCES

1. Dado, D. V.: Early primary bone grafting. In: Kernahan, D. A., Rosenstein S. W., (eds.), Cleft lip and palate. A system of management. Baltimore, Williams and Wilkins, 1990:182-188.

2. Friede H.: The vomero-premaxillary suture. A neglected growth site in mid-facial development of unilateral cleft lip and palate patients. Cleft Palate J., 15:398-404, 1978.

3. Friede, H., Johanson, B.: Adolescent facial morphology of early bone-grafted cleft lip and palate patients. Scand. J. Plast. Reconstr. Surg., 16:41-53, 1982.

4. Larson, O.: Early bone grafting in complete cleft lip and palate cases following maxillofacial orthopedics. Akademisk Avhandling, Stockholm 1983.

5. Rehrmann, A. H., Koberg, W. R., Koch, H.: Long-term postoperative results of primary and secondary bone grafting in complete clefts of lip and palate. Cleft Palate J., 7:206-221, 1970.

6. Robertson, N. R. E., Jolleys, A.: An 11 years follow-up of the effects of early bone grafting in infants born with complete clefts of the lip and palate. Br. J. Plast. Surg., 36:438-443, 1983.

7. Rosenstein, S., Monroe, S., Kernahan, D., Jacobson, B., Griffith, H., Bauer, B.: The case for early bone grafting in cleft lip and cleft palate. Plast. Reconstr. Surg., 70:297-309, 1982.

8. Ross, R. B.: Treatment variables affecting facial growth in complete unilateral cleft lip and palate. Part 3: Alveolus repair and bone grafting. Cleft Palate J., 24:33-44, 1987.

9. Ross, R. B., Johnston, M. C.: Cleft lip and palate. Baltimore, Williams and Wilkins, 1972.

10. Šmahel, Z.: Effects of primary osteoplasty and periosteoplasty on the configuration of the nose in unilateral cleft lip and palate. Acta Chir. Plast., 29:201-208, 1987.

11. Šmahel, Z., Müllerová, Ž.: Craniofacial morphology in unilateral cleft lip and palate prior to palatoplasty. Cleft Palate J., 23:225-232, 1986.

12. Šmahel, Z., Müllerová, Ž.: Effects of primary periosteoplasty on facial growth in unilateral cleft lip and palate - 10 year follow-up. Cleft Palate J., 25:356-361, 1988.

13. Šmahel, Z., Škvařilová, B.: Roentgencephalometric study of cranial interrelations. J. Craniofac. Genet. Dev. Biol., 8:303-318, 1988.

14. Šmahel, Z., Müllerová, Ž.: Facial growth and development in unilateral cleft lip and palate during the period of puberty: Comparison of the development after periosteoplasty and after primary bone grafting. Cleft Palate Craniofac. J., 31:106-115, 1994.

15. Šmahel, Z., Müllerová, Ž., Horák, I.: Principal changes in craniofacial development after differing therapeutic procedures in UCLP treated during the postwar period in Prague. Abstracts of International symposium on plastic surgery. Prague, 18-21 Oct. 1992, pp. 63-64.

16. Šmahel, Z., Betincová, L., Müllerová, Ž., Škvařilová, B.: Facial growth and development in unilateral cleft lip and palate from palate surgery up to adulthood. J. Craniofac. Genet. Dev. Biol., 13:57-71, 1993.

17. Šmahel, Z., Müllerová, Ž., Škvařilová, B., Stránská, P.: Development of overjet and dentoskeletal relations in unilateral cleft lip and palate before and during puberty. Cleft Palate Craniofac. J., 31:24-30, 1994.

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DENTAL CARE IN PATIENTS WITH FACIAL CLEFTS

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SUMMARY

The dental care in patients with facial clefts is discussed. In addition to the routine dental care these patients should be submitted to a long-term complex orthodontic therapy and in some of them is required a prosthesis or dental surgery.

ZUSAMMENFASSUNG

Zahnärztliche Behandlung bei Patienten mit fazialen Spaltmissbildungen

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Bei Patienten mit fazialen Spaltmissbildungen muss ausser der üblichen zahnärztlichen Behandlung, zusätzlich eine langzeitige komplexe orthodontische Behandlung angewandt werden. Bei machen ist ausserdem eine prothetische und eine stomatochirurgische Behandlung erforderlich.

Key words: cleft lip and palate, child, dental care, orthodontic therapy

Dental care, inclusive of prevention, represents an essential component of the treatment of children with congenital facial malformations. They consist mainly of facial clefts. Into this group of malformations can be also included patients with hemifacial microsomia and related syndromes.These malformations are conspicuous as early as immediately after birth and if left untreated they are characterized by subsequent progression within the first and second decade of life. Facial malformations or their sequelae lead often to severe deformations of soft tissues and of the facial bony framework, inclusive of the jaws and dentoalveolar arches.

The management of affected individuals is time consuming. It is initiated in the first decade of life and continues up to adulthood. During its course alternate periods of active and passive treatment. Satisfactory therapeutic results require a close co-operation of orthodontists with plastic surgeons, foniatrists and specialized paediatricians. The therapy should include also a regular thorough dental and parodontal care, inclusive of prevention, dental surgical procedures, the use of prosthetic appliances and in particular a long-term orthodontic therapy.

In these malformed children dental care should be complex and it should continue throughout the period of growth in the first and second decade of life. It is mandatory to provide a regular check-up of the teeth and of their supporting tissues and to follow-up their development during the period of growth. Paediatric dentists should use all available means for the prevention of caries. An already present caries should be treated early and expertly. Before every extraction it must be considered whether it is actually necessary. If it concerns teeth of the second dentition it could have highly unfavourable sequelae for the patient, since in some cases it could prohibit the use of a fixed prosthesis.

Multiple extractions of permanent teeth lead to a mutilation of the patient. In orthodontic view the treatment of malformations should be aimed at a prevention and limitation of the development of severe malformations, which can accompany inborn facial anomalies. As an example could serve a repair of lateral deviations in hemifacial microsomia, the correction of the position of lower jaws and the restoration of an overjet which prevent the development of pseudoprogenia in patients with cleft.

We believe that at the present time dental care, both during the first and second dention is not sufficient. In preschool age the parents often underestimate the need for an adequate care of deci-

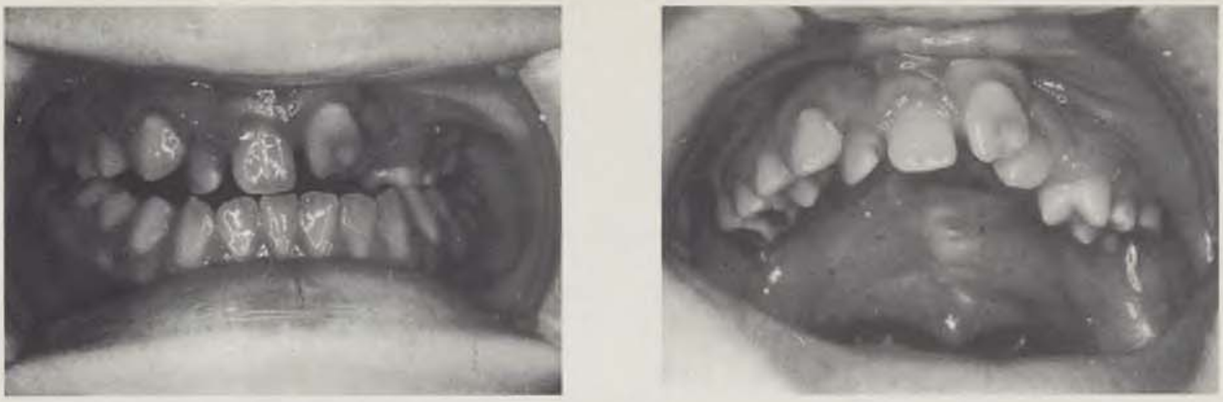

Fig. 1 a, b: Patient V. H., unilateral cleft lip and palate, before orthodontic therapy.

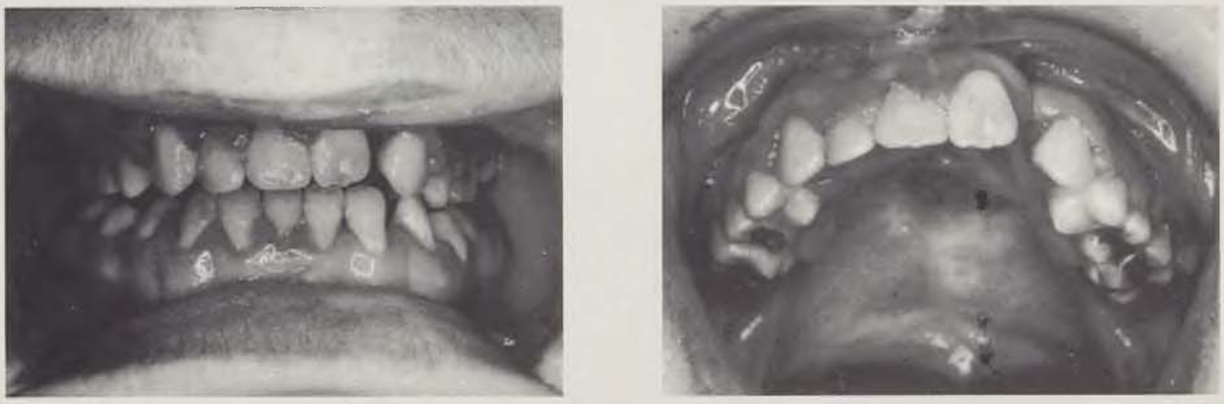

Fig. 2 a, b: Patient V. H., unilateral cleft lip and palate, after orthodontic therapy.

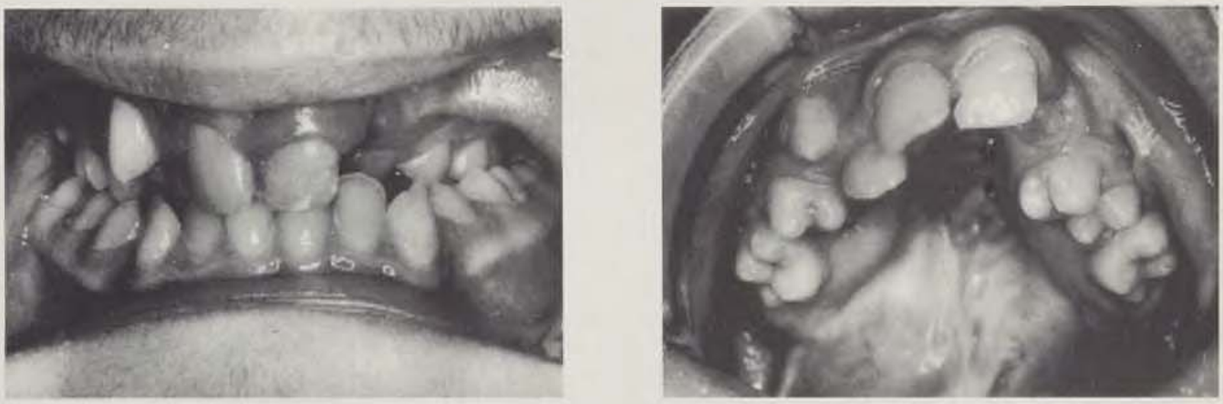

Fig. 3 a, b: Patient M. P., unilateral cleft lip and palate, before orthodontic therapy.

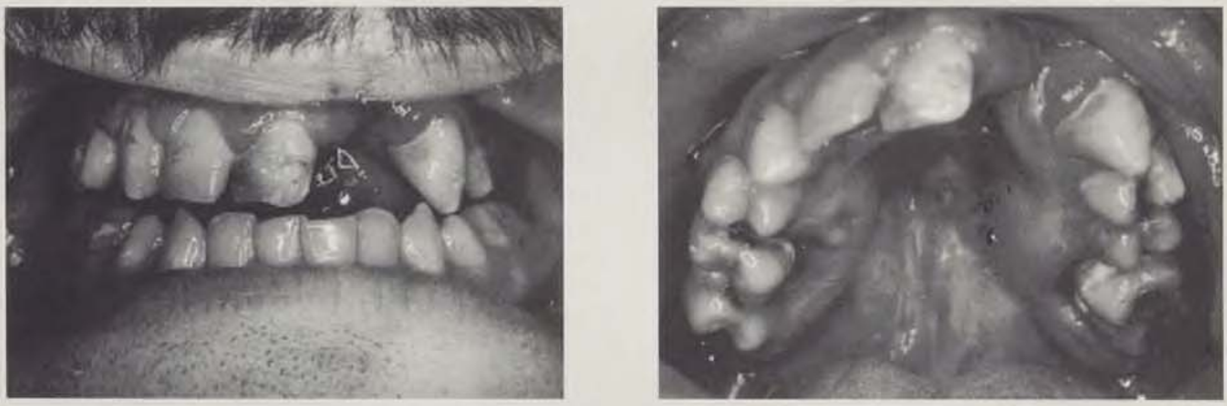

Fig. 4 a, b: Patient M. P., unilateral cleft lip and palate, after orthodontic therapy.

duous teeth and they believe that at the time of mixed dentition the care provided at school is actually satisfactory.

Dental care at home is at a very low level. A poor dental hygiene and the development of caries and of parodontitis complicate orthodontic therapy, which cannot be delayed.

Therefore we recommend a close interdisciplinary co-operation of the specialized department with the family dentist who would be willing to take charge of the long-term treatment of patients with facial clefts.

The long-term treatment of patients with complete clefts (i.e. cleft lip, jaw and palate) requires also great experience. A dentist who has no sufficient experience with these therapeutic measures often treats insignificant details, he either hesitates to perform an extraction or on the contrary extracts too many teeth and in an attempt to obtain the best possible results overburdens the patient with an aimless therapy which does not bring any beneficial effects. Severe skeletal malformations of the middle or lower face which can be in a lesser or greater degree compensated within the dentoalveolar region have the predominant number of individuals. The degree of this compensation shows a direct relationship to the changes of the face due to its growth, as well as to their intensity and direction. An important role plays also the co-operation of the patient and the co-operation within the team consisting of an orthodontist, a prostetician and dental surgeon.

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