British Journal of Plastic Surgery (1980), 33, 195–201 0007-1226/80/00450195802.00

CROSS-FACIAL NERVE ANASTOMOSIS IN THE TREATMENT OF FACIAL PARALYSIS: A PRELIMINARY REPORT ON 10 CASES

By ALAIN GARY-BOBO M.D., JEAN MARC FUENTES M.D., and BERNARD GUERRIER M.D.
Department of Maxillofacial Surgery and Stomatology,
Department of Neurosurgery and the Department of ENT Surgery,
Centre Hospitalier Universitaire de Montpellier, France

The technique of cross-facial nerve anastomosis for persistent facial palsy was introduced by Smith (1971) and later developed by Anderl (1973 and 1976) and Samii (1976). With recent advances in microsurgical technique and the appreciation of the value of inter-fascicular nerve grafting (Millesi 1977), several plastic surgery centres are now gaining experience in cross-facial nerve anastomosis.

This paper presents our experience in the treatment of 10 patients with facial palsy using cross-facial nerve anastomosis. The technique is based on that described by Pialoux *et al.* (1976) with one important difference in the micro-dissection of the facial nerve branches, namely a "centrifugal" or anterograde dissection of the nerve fascicles on the normal side of the face and a "centripetal" or retrograde dissection on the paralysed side. The work presented in this paper and our observations on the first six cases in the series formed the basis for a thesis for the degree of Doctor of Medicine in the University of Montpellier. (Gary-Bobo, 1978).

Existing methods of treating persistent facial palsy by static or kinetic tendon slings, fascial grafts or muscle transplants are often disappointing both to the patient and the surgeon (Converse, 1974; Gillies and Millard, 1957). So too are autogenous nerve anastomoses such as the hypoglossal to the facial, though a recent paper by Conley and Baker (1979), describes a remarkably successful series and makes the point that this technique is most effective when used as an integral part of a primary ablative operation for the treatment of cancer of the head and neck.

If the facial nerve has been damaged or removed at a site where interfascicular grafting is not possible, the alternative procedure of cross-facial nerve anastomosis should be considered using autogenous grafts taken from the sural nerve.

The justification for using the facial nerve on the intact side of the face as the "motor unit" rests on the knowledge that:

1. The brain contains a nerve control centre involving *both* sides of the face.
2. Surgical division of 50 per cent of the peripheral nerve branches of the facial nerve to a single muscle or group of muscles does not paralyse that particular side of the face.
3. Interfascicular nerve suture and grafting is now a safe and satisfactory technique in trained hands.
4. Even if cross-facial nerve anastomosis proves unsuccessful, it does not prejudice the use of other different operative techniques (Morel-Fatio, 1976).

Cadaveric dissections and clinical practice have indicated quite clearly the need to approach the facial nerves at the level of the trunk and dissect the branches peripherally before starting any micro-dissection. It is wise to dissect the paralysed side first to

Address for reprints: Dr Alain Gary-Bobo M.D., 16, Rue Louis Frédéric Rouquette, Montpellier 34000. France.

display the size and site of the nerve fascicles that will be required to reinnervate the "priority muscles" that need re-animation on the paralysed side. Experience shows that the "priority muscles" are:

1. the orbicularis oculi;
2. the orbicularis ori;
3. the "tensors" of the cheek. These include the buccinator, levator anguli oris, major and minor zygomaticus, levator labii superioris alaeque nasi.

We no longer consider it necessary to re-animate the frontalis muscle or the triangularis labii. For this reason we only insert two nerve grafts across the face, routed through the upper lip, in our surgical correction of facial paralysis.

Surgical Technique

With the surgical teams working simultaneously, the total operating time varies from 5 to 7½ hours. All the patients have been operated upon under general anaesthesia using the regime described by Du Cailar *et al.* (1975).

On the paralysed side of the face, a McIndoe type of face-lift incision is used to display the facial nerve trunk and all its branches (Fig. 1A). This allows the surgeon to examine carefully the size and distribution of the various branches before exposing the facial nerve on the healthy side. A Redon type of incision is now made on the healthy (normal) side of the face to expose the facial nerve and its branches, using a Yasargil pattern nerve stimulator (Fig. 1B). A "centrifugal" (or anterograde) dissection is carried out to separate the fascicles and permit deliberate selection of the fascicles that will be required and division of 50 per cent (never more than 50 per cent) of those fascicles (Fig. 2A).

In the meantime, the second surgical team have exposed and removed both sural nerves, taking a total length of 28-34 cm. Our usual technique is to remove the sural nerve from the calf through 3 to 5 separate transverse incisions across the path of the nerve (Fig. 3 A and B).

Fig. 1. A. Exposure of the facial nerve and its branches on the paralysed side using a "face-lift" approach. B. Exposure of the facial nerve and its branches on the healthy side using a modified Redon incision.

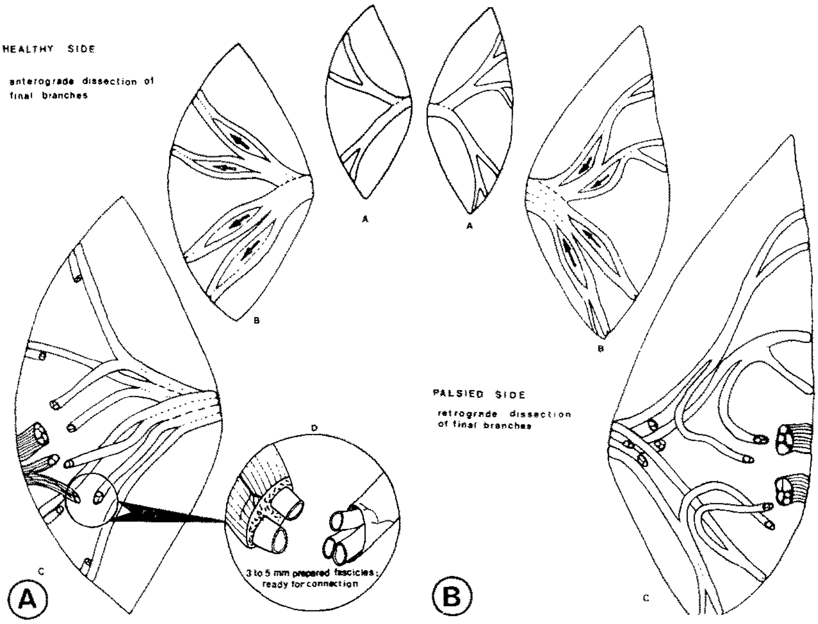

FIG. 2. A. "Centrifugal" or anterograde micro-dissection of the facial nerve on the healthy (normal) side of the face. B. "Centripetal" or retrograde micro-dissection of the facial nerve on the paralysed side.

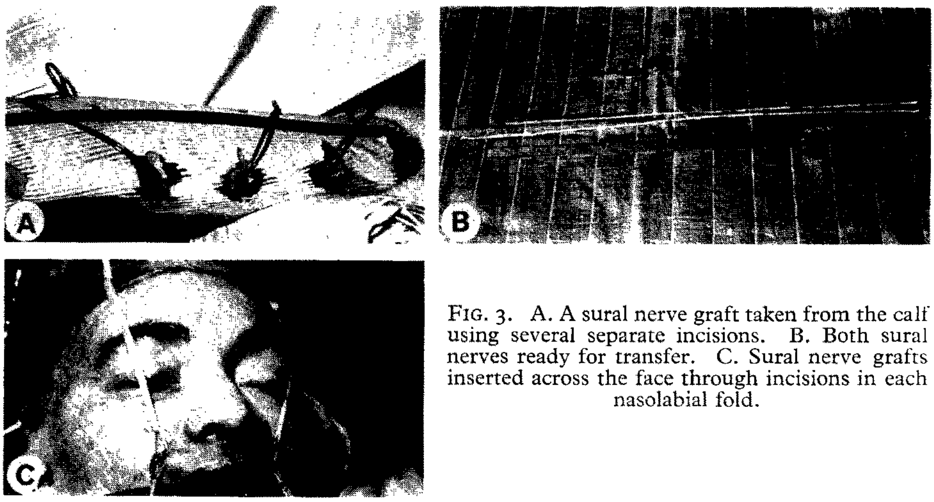

FIG. 3. A. A sural nerve graft taken from the calf using several separate incisions. B. Both sural nerves ready for transfer. C. Sural nerve grafts inserted across the face through incisions in each nasolabial fold.

The sural nerve grafts are then dissected at each end over a distance of 3-5 mm under the operating microscope and then laid across the face by dissection of two separate tunnels in the upper lip made through a nasolabial incision on each side. (Fig. 3C). The "upper" and "lower" sural grafts are colour-coded to avoid any mistake in their connections.

The nerve grafts are now connected firstly on the healthy side to the selected fascicles and the skin wound closed. On the paralysed side a "centripetal" (or retrograde) dissection allows the surgeon to select the fascicles he wishes to use by comparing them with the size of the fascicles available in the graft (Fig. 2B).

The importance of this "retrograde" dissection is seen in the different approach that should be adopted in "medical" facial palsies (such as Bell's palsy) where there is no definite proof that the integrity of the facial nerve has been completely destroyed and the "surgical" facial palsies in which complete destruction of the facial nerve is established.

In the former group, we divide only 50 per cent of the fascicles on the palsied side in order that the advantage of late unexpected spontaneous recovery of nerve function is not lost. In the latter group, *all* the fascicles are divided and connected by interfascicular anastomosis with the sural nerve graft.

The nerve micro-anastomosis is performed in a "polar" fashion by inserting 4 sutures to each fascicle (or group of 2-3 small fascicles) at the 4 "points of the compass" (Fig. 4B). This manoeuvre in our hands gives better interface contact than the well known "triangulation" technique.

After completion of the anastomosis on the paralysed side (Fig. 4A), the wound is closed after removing the excess skin in "face-lift" fashion.

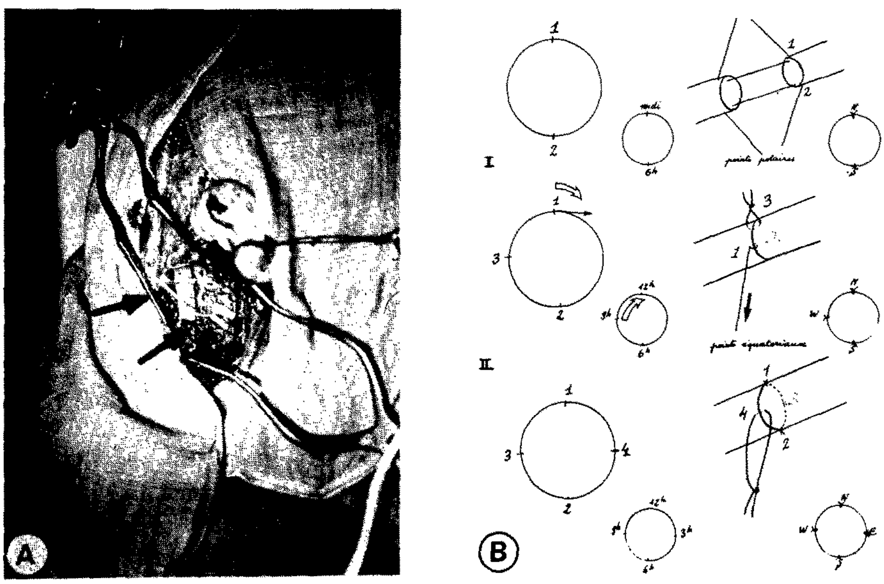

FIG. 4. A. Nerve anastomosis completed on the paralysed side. B. "Compass point" or "Polar" technique of fascicular micro-anastomosis.

POSTOPERATIVE MANAGEMENT

A carefully prepared regime of physiotherapy is used as a routine and has been designed by Lorenzo (1977) in the University of Montpellier. This includes careful charting of muscle function, re-education exercises and electromyographic assessment of muscle re-innervation. The pre-operative and immediate post-operative records provide a base line to assess progress.

ANALYSIS OF RESULTS

We have assessed our results on the basis of:

1. the electrical myographic response to stimulation;
2. the clinical appearance and function.

The first signs of recovery have been the electrical "re-innervation spikes" seen on the EMG tracing and appear usually within 5 to 6 months of the operation in the lower part of the face. Clinical signs of muscle function are usually discernible within 8 to 10 months of the operation. Our preliminary results, in ten cases are listed in Table I, and the clinical details of these cases are given in Table II. Three of our "good" results are illustrated in Figures 5, 6 and 7.

TABLE I

Summary and results of cross-facial nerve anastomosis

Result		EMG assessment	Clinical assessment
Good	4 cases	All +	All +
Potentially good	2 cases	One and in lower part of face only	One and in lower part of face only
Failure	3 cases	—	—
Insufficient follow-up	1 case	—	—

TABLE II

Clinical details of 10 cases treated by cross-facial nerve anastomosis

Age	Sex	Cause of facial paralysis	Time interval before surgery	Duration of follow-up	Present condition
57	F	Surgery for acoustic neuroma	2 months	18 months	Failure
35	F	Surgery for acoustic neuroma	6 months	16 months	Good
65	M	Surgery for acoustic neuroma	15 months	15 months	Failure
28	M	Surgery for benign tumour of middle ear	16 months	14 months	Failure
44	F	Surgery for acoustic neuroma	4 months	13 months	Good in lower part of the face
29	M	Compound fracture of petrous temporal bone	2 months	13 months	Good
45	M	Closed fracture of petrous temporal bone with immediate complete facial palsy	2 months	12 months	Good
41	F	Surgery for acoustic neuroma	6 months	8 months	Potentially good
53	F	Bell's Palsy	8 months	7 months	No recovery but insufficient follow-up
48	F	Millard-Gubler syndrome (arterial thrombosis)	7 months	8 months	Potentially good

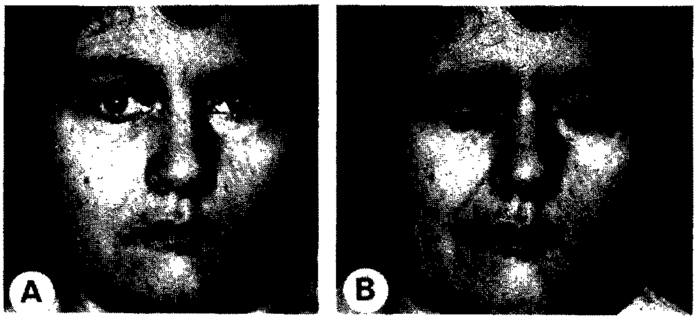

FIG. 5. Case 2. A. Postoperative view with face at rest. B. Postoperative view, closing the eyelids.

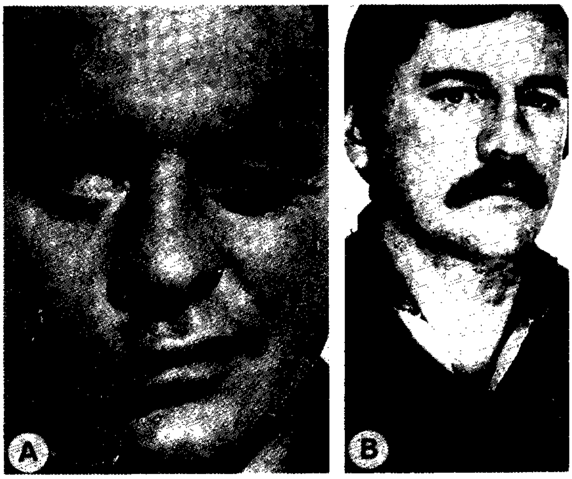

FIG. 6. Case 6. A. Postoperative view. B. Present condition 10 months later.

FIG. 7. Case 7. A. Postoperative view. B and C. Present condition 12 months later.

COMPLICATIONS

Two patients developed a temporary paresis on the healthy (normal) side of the face. This recovered completely and was probably the result of too prolonged or too vigorous use of the nerve stimulator at operation. This has also been reported by Anderl (1976).

Two patients had delayed healing of the wounds due to infection, but this did not prejudice the final result.

One patient had a temporary parotid salivary fistula which closed spontaneously and one patient developed a haematoma in the calf which required evacuation.

CONCLUSION

This preliminary communication describes our early experiences with one-stage cross-facial nerve anastomosis in the treatment of complete and recent facial paralysis. We submit that this technique can offer the patient a better result than that obtained by the other methods in current use.

Since this paper was submitted for publication, four more cases have been treated and these will be reviewed in due course along with those described in this article. This should allow one to critically review the long term effects of this surgical technique.

REFERENCES

ANDERL, H. (1973). Reconstruction of the face through cross face nerve transplantation in facial paralysis. *Chirurgia Plastica*, **2**, 17.

ANDERL, H. (1976). Cross-face nerve transplantation in facial paralysis: principle and further experience. Transactions of the VIth International Congress of Plastic and Reconstructive Surgery, edited by Marchac, D. and Hueston, J. T. Paris: Masson, p. 337.

DU CAILAR, J., DE SCHODT, L. BESSOU, D. and CABANEL, P. (1975). Anésthésie à débit constant par l'association Alfatésine-Fentanyl. *Annales d'Anesthésiologie Française* **16**, 331.

CONLEY, J. and BAKER, D. C. (1979). Hypoglossal-facial nerve anastomosis for re-innervation of the paralysed face. *Plastic and Reconstructive Surgery*, **63**, 63.

CONVERSE, J. M. (1974). Facial Paralysis, in "Surgical Treatment of Facial Injuries", by Kazanjian, V. K. and CONVERSE, J. M. 3rd edition. Baltimore: Williams & Wilkins Co., Vol. 2, 27.

GARY-BOBO, A. (1978). Anastomose transfaciale de la VIIe paire cranienne: technique et indications. Thesis, Faculté de Médecine. Université de Montpellier.

GILLIES, H. D. and MILLARD, D. R. (1974). Facial paralysis, in "The Principles and Art of Plastic Surgery". London: Butterworth, Vol. 2, p. 600.

LORENZO, S. (1977). Les Paralysies Faciales. Mémoire. Faculté de Médecine. Université de Montpellier.

MILLESI, H. (1977). Facial nerve suture, in "Facial Nerve Surgery", edited by Fisch, U. Amstelveen and Birmingham (Alabama). Edition Kügler Aesculapius p. 209.

MOREL-FATIO, D. (1976). Surgery of the lids in facial palsy. Round table discussion, in "Transactions of the VIth International Congress of Plastic and Reconstructive Surgery, edited by Marchac, D. and Hueston, J. T., Paris: Masson, p. 330.

PIALOUX, P., JOST, G., FREYSS, G., REY, A. and COPHIGON, J. (1976). Notre technique d'anastomose facio-faciale hétérolatérale par autogreffe nerveuse dans le traitement des paralysies faciales périphériques definitives. Annales d'Oto-Rhinologie 93.7.471.

SAMII, M. (1976). Facio-facial anastomosis through nerve transplantation. *Fortschritte der Kiefer und Gesichts-chirurgie*, **20**, 115.

SMITH, J. W. (1971). A new technique of facial animation, in "Transactions of the Vth International Congress of Plastic and Reconstructive Surgery". Melbourne: Butterworth (Australia), p. 83.