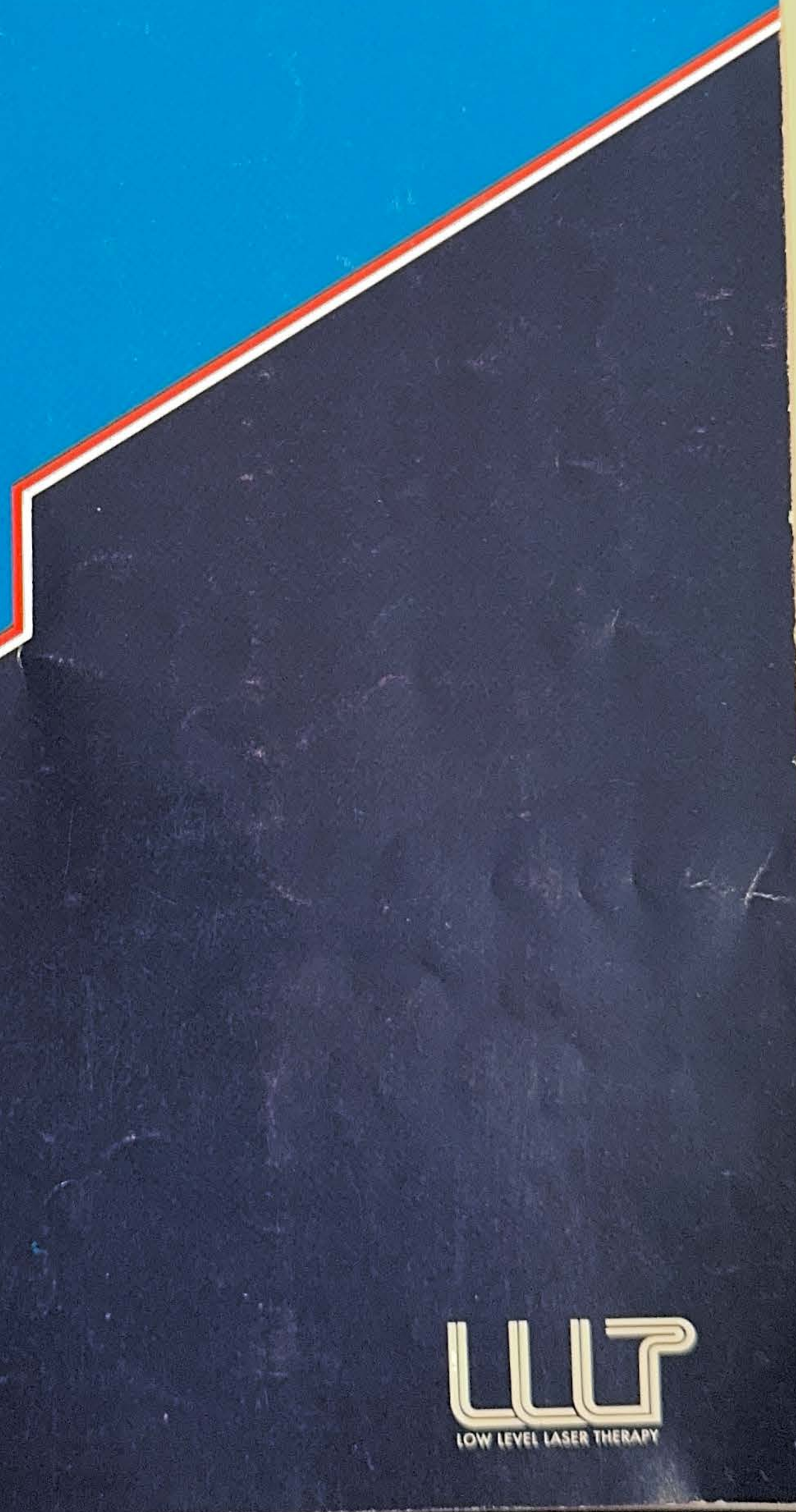
JUNE 1993
LATHE5 49 - 96 (1993)

Volume 5 No. 2
ISSN 0898 - 5901

LASER THERAPY

AN INTERNATIONAL JOURNAL OF
LOW LEVEL LASER THERAPY AND
PHOTOBIOACTIVATION



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LLT
LOW LEVEL LASER THERAPY

HELIUM NEON AND DIODE LASER THERAPY IS AN EFFECTIVE ADJUNCTIVE THERAPY FOR FACIAL PARALYSIS

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This study presents our six-year experience in laser therapy for rehabilitation of facial paralysis.

Mixed laser irradiation using a 904 nm diode GaAs and 632.8 (HeNe) was utilized.

Laser irradiation was performed on the range of facial nerve ramifications in eight different places, 5 min on each place, four times a week. No other medicine was used if the patient arrived 48 h after having the lesion. When the patient arrived after the first week, meticorten was utilized as a supplement, a dosage of 40 mg per day, for seven days.

Based on our experience, the patients who are more inclined to attend treatment sessions are those who have been suffering from paralysis for more that a month and who have submitted to other kinds of treatments with negative results. They were even offered surgery. For these patients, we have required up to a maximum of 30 sessions and we have achieved 100% recovery, even with patients who have had the lesion for three or six months.

Patients who attended therapy within two weeks after suffering the paralysis recovered 100% with no additional medication—only laser therapy. With these patients we needed a maximum of 15 sessions.

LLLT is presented as a safe, noninvasive, easy to apply and comparatively side-effect-free modality offering a complementary and effective tool in the treatment of facial paralysis.

KEY WORDS Facial paralysis Trigeminal nerve Bell's palsy LLLT

Introduction

Low level laser therapy (LLLT) irradiation has been used for more than a decade in clinical practice in biostimulation. There are numerous examples where this method has been successful in dermatology, gynecology, otorhinolarynogology and other medical areas.[1–5]

We have found that laser irradiation directly affects the compound action potential of the nerve. Its effect is both prophylactic and therapeutic, non-thermal and is limited to certain wavelengths and specific energy range.[5] A major problem, tackled by many researchers but with no conclusive results, is the question of how LLLT affects living tissue. Olson believes that there is a primary absorption of light by mitochondrial enzymes, resulting in local heating following an immediate change in membrane conductivity.[6] Karu suggests that at doses causing biostimulation, visible light is absorbed by the respiratory chain components such as flavine and cytochrome, causing an acceleration of the electron-transfer in the redox pairs in some sections of the respiratory chain.[7]

A great deal of interest in the biological effects of laser light has been aroused ever since the first works of Mester in the early 1970s. The problem appears to stem from the lack of properly controlled experiments and clinical trials, and also the lack of standardization of equipment and treatment regimes. Even so, laser and light therapy machines can now be found in many physiotherapy departments and are being used routinely for pain relief and to accelerate tissue repair. In the interest of safety and efficacy, it is therefore important that we fully understand the biological effects and mechanisms of action of exposure to light. What we must be sure of is to use first-class LLLT equipment which comes up to international standards, though above all it should be a doctor who directs the treatment and, indeed, one whose ethics are above reproach and has studied laser treatment extensively.

Paralysis of the facial nerve is one of the conditions that is seen to benefit from LLLT. The facial nerve (7th cranial pair) originates in the lower border of the pons, and crosses the cerebelo-pontine angle to enter into the internal auditory canal, along with the auditory nerve (8th cranial pair). Then it passes through the facial conduit to the geniculate ganglion, from where it returns to pass over the middle wall of the inner ear above the oval window and then

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0898-5901/93/020079-09$09.50

Accepted 2 May 1993

goes directly down the inner wall of the mastoid process to the stylomastoid foramen. The facial nerve sweeps around the styloid process posteriorly, then laterally, and as it passes forward in the substance of the superficial lobe of the parotid gland divides into two main branches, temporofacial and cervicofacial, from which, in turn, it divides into various branches, supplying motor innervation to the five regions of the face: Temporal, zygomatic, buccal, maxillary and cervical.

Facial paralysis can be central due to supranuclear injuries or peripheral due to an injury to the peripheral motor neurons (Bell's palsy). The term 'Bell's palsy' is used to describe peripheral facial paralysis of unknown origin.

Exposure to cold and emotional tension have been associated with this condition, but this varies so much that no simple cause can be proven. It is most common in women and is usually on one side, though it can affect both. Paralysis results from ischemic inflammation of the nervous trunk, generally in the mastoid region. It is said that ischemia is due to vasospasm, to edema or to inflammation, and so a vicious circle is set off.

The diagnosis is based on exclusion of other possible diseases and on the compiled clinical history. In the majority of the cases, we find tearing, there is flaccidity of the affected side and all the facial muscles for expression on the affected side are paralysed. Some patients complain of pain, 75% of the patients recuperate spontaneously within a month because it was a reversible nerve blockage (neuropraxia). Another 10% need up to three months and frequently do not recuperate completely because some nerve fibres have degenerated. The other 15% do not recuperate because the degeneration of the nerve is almost complete. A differential diagnosis must be made to exclude middle ear illness, middle ear tumours, trauma of the eustachian tube or a tumour of the VIII cranial pair. Otological, neurological and radiographic studies must be made, as well as electromyographies and audiometry.[8–11]

The Traditional treatment varies depending on the doctor who attends the case. The most conservative wait, without using any type of medication, to see if the patient is one of the 75% who would recuperate spontaneously. The majority follow textbook treatments based on massages, high doses of vitamin B1 and high doses of corticosteroids such as prednisone, and stimulation with electric current (TENS). Some consider surgical decompression of the nerve after six weeks with no muscular movement response.

Material and Methods

Patients, Material and Methods

The work is based on six years of experience in the use of low incident energy laser rays in the Vital Clinic, and the author has chosen the histories of 17 patients who suffered paralysis of the facial nerve.

I have divided the study into three groups of patients who came for laser therapy within 15 days after the lesion, and I have subdivided this group into two groups: Those who received previous treatment with another doctor or another method; and those who arrived for laser therapy without having received medical treatment of any kind, making the laser therapy the only treatment they received.

The second group of patients are those who came for laser therapy more than 15 days after the facial paralysis and who had thus logically received another type of therapy without any result.

The third group of patients chosen were patients who came to us 2 years after the lesion. Another patient had facial paralysis as a result of surgery on a parotid tumour with almost complete denervation. Another patient chosen for his medical history, was a patient with an exceptional situation, this was the sixth time that he had paralysis, and the world literature indicates that it is very rare that the lesion recurs.

All the patients who came for treatment within 15 days of the occurrence of the lesion had electromyography to show and record the innervation of the damaged muscles, audiometry and no complementary therapy was given.

Those patients who came to our office more than 15 days after the lesion did not have electromyography, because they had already received most types of concomitant treatment such as massage, electric stimulation, high doses of corticotherapy, acupuncture and some had even tried witchcraft. These patients were tired from so many treatments and their economic situation would not allow them to pay more. These patients came for our treatment as a last resort. The majority of the patients in this group were those whom the world literature and traditional therapy consider within the 25% who will not recuperate spontaneously from this condition.

Laser Equipment Used. We used a combined HeNe (helium-neon) and diode laser system, Mix-5, from Space (Torino, Italy).

Laser He-Ne. One He-Ne source, wavelength 632.8 nm, maximum output power 15 mW, beam diameter 0.8 mm.

Laser I.R. Five I.R. sources, situated around the HeNe source, wavelength 904 nm, maximum output peak power 27 W each, collimated laser beam.

When patients presented within 15 days after having suffered the first signs of paralysis, the laser was applied five times per week. If they arrived

more than 15 days after the onset the laser was applied three times a week. In all cases the method used was the same, the laser in direct contact on the superficial roots of the facial nerve on the affected side (Figure 1) for 4 min on each point. We protected the eyes of all of our patient with a damp cotton bandage and special glasses.

For those patients who presented within 15 days of contracting the lesion, we did not administer any complementary therapy, except in three cases in which they had already received medication. To another patient, we administered vitamin B1 with placebo effect.

All patients were allowed to receive gentle manual massage, applied by a family member, and were encouraged to make 'faces' in front of a mirror (such as frowning, showing their teeth, opening and closing their eyes, etc.).

Results

The results of the present study are summarized in Table 1. The percentage of recovery was based on the ability of the patient to move their facial muscles in a organized manner, the ability to open and close the eyes and the absence of a deviation in the commissure of the mouth. The latter parameter was the most difficult to correct and was basically the reason for extending the number of sessions until total recovery was achieved. The ability to close the eyes is the first that the patient recovers. The recovery of the innervation of the facial muscles of all the patients was confirmed with electromyography.

In some cases after 15 sessions, the patients demonstrated an 80–90% recovery, with the only problem being the deviaiton of the commissure of the mouth. With these patients, we started to reduce the sessions to two per week for three weeks and later one per week to maintain the stimulus of the laser light, until they achieved 100% recuperation.

None of the patients complained of pain or any other side-effect. Within the group of patients who were over 50 years old, the majority were hypertensive and two were diabetics. For the patients who arrived more than 15 days after the onset of paralysis, their recovery was slower, much slower than those who arrived within the first week after the paralysis occurred.

The patient's profession was an important factor, because it is related to the probable cause of the illness. For example, executives and students complained of stress and anxiety, and housewives tended to complain of abrupt changes in temperature, the change always being from hot to very cold and related to having spent a certain time ironing clothing in a closed environment and sudden exposure to open air or to a cold environment of a fridge. The patients who received therapy based on polyvitamins, steriods and physiotherapy before coming for the laser treatment did not respond to these treatments and for this reason they came for the laser therapy.

The number of sessions was correctly estimated if the patient was in the group who started the laser therapy within 15 days after the onset and we calculated from 15 to 20 treatment/sessions. When the patient arrived more than two weeks after the lesion, we do not calculate the number of sessions, neither do we promise recovery from the lesion. For this reason, some patients come for up to 40 sessions, as a maximum. For the patients who do not achieve 100% recovery, we have given them follow-up treatments every three months and we have noted that their recovery progresses because the patient has been given facial exercises to do in their home.

Treatment is halted for patients who do not respond after 30 sessions, because there was little possibility of response—due to the fact that too much time had passed since the lesion and that there was too much muscular atrophy and probably an irreversible lesion on the nerve.

Those patients who arrived to receive the laser treatment more than 30 days after onset of paralysis

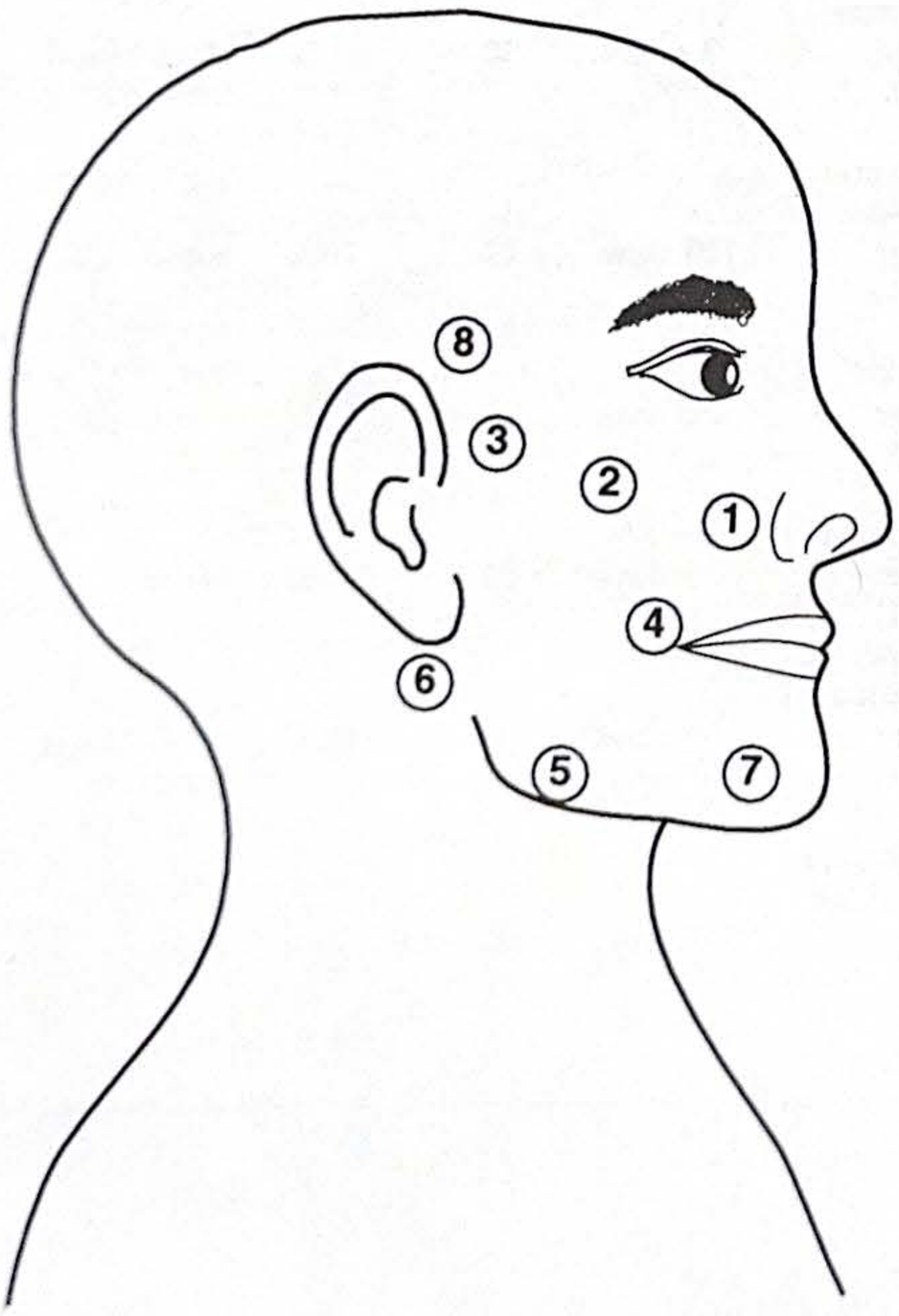

Figure 1. Points for LLLT application in therapy for facial paralysis, shown in order of application

Table 1.

Patient	Age	Sex	Profession	Episode	Cause as per case history	Previous treatment	Begining laser therapy	Laser sessions	Percentage recovery	Concomitant illness
1	16	M	Student	I	Stress	None	2 days	8	100%	Epilepsy Diabetes
2	65	F	Housewife	II	Change in temperature	None	1 day	30	100%	High blood pressure
3	30	M	Executive	I	Stress	None	3 days	18	100%	None
4	40	M	Executive	I	Stress	None	10 days	15	100%	None
5	80	M	Politician	I	Stress	None	10 days	20	100%	High blood pressure
6	61	F	Housewife	I	Stress	None	5 days	12	100%	None
7	20	M	Student	I	Stress	None	11 days	12	100%	None
8	36	M	Executive	I	Stress	Massage Vit. B1 TENS Acupuncture Witchcraft Prednisone	15 days	30	100%	None
9	15	M	Student	I	Stress	Massage Vit. B1 TENS Prednisone	15 days	30	100%	None
10	79	F	Housewife	I	Change in temperature	Massage Vit. B1 TENS Acupuncture Prednisone	15 days	24	80%	High blood pressure
11	53	M	Bus driver	I	Change in temperature	Massage Vit. B1 TENS Acupuncture Prednisone	15 days	25	100%	None
12	69	F	Housewife	I	Change in temperature	Massage Vit. B1 TENS Acupuncture Prednisone	2 years	30	0%	High blood pressure
13	43	F	Teacher	I	Change in temperature	Massage Vit. B1 TENS Prednisone	120 days	27	70%	None
14	39	F	Nun	VI	Change in temperature	Massage Vit. B1 TENS Prednisione	60 days	35	70%	None
15	33	M	Executive	I	Change in temperature	Massage Vit. B1 Acupuncture Prednisone	30 days	15	100%	None
16	84	F	Housewife	I	Change in temperature	Massage Vit. B1 TENS Acupuncture Predensione	90 days	30	80%	High blood pressure
17	38	M	Electronic Engineer	I	Secondary a surgery	Massage Vit. B1 TENS Prednisone	150 days	40	80%	None

needed more sessions. They were given treatment three times per week and we tried to avoid more than 30 sessions—as a maximum. If there was no response, the treatment was halted because the patient had waited too long after the lesion, as well as having received many types of therapy. However, in all patients of this type a very important recovery was achieved, mainly with regard to closing the eyes and, in the majority, in the deviation of the commissure of the mouth.

An exceptional case was that of the patient who suffered facial paralysis as a result of parotid glandular surgery where the electromyography showed total denervation of the innervated muscles of the upper roots of the right side of the face (Case 17). This patient was given a therapeutical test of 20 laser sessions to begin with and the improvement was slow. For this reason, the treatment was continued, giving a rest of 30 days without laser, then a new cycle of 20 sessions which resulted in an 80% recovery with a last electromyograph which showed slight, partial denervation of the right facial nerve in relation to the original electromyography: Great improvement in the right facial nerve was recorded.

Three representative case reports are now presented:

1. Case No. 8

This 36-year-old male, a business executive, presented with his first episode of right facial paralysis 15 days after onset of the attack. Figure 2 shows the pretherapy condition when smiling (a) and with the eyes closed (b). Clear distortion of the affected side is seen with lagophthalmos. He had received other therapies elsewhere such as massage, TENS, vitamin B1, acupuncture, high doses of prednisone and even witchcraft, but there was no effect. Figure 3a and b show the condition after 30 LLLT sessions, with a 100% recovery, and a satisfied patient.

2. Case No. 14

This 39-year-old female, a nun, presented with her 6th episode of severe left facial paralysis. Such recurrence of this disease is not common in the literature. She came to our clinic 60 days after onset of the episode, and the pretherapy condition is seen in Figure 4. Previous therapies elsewhere such as massage, TENS, vitamin B1, acupuncture and high doses of prednisone had no effect at all on this attack. Figure 5 shows the result after 35 LLLT sessions, with a 70% recovery.

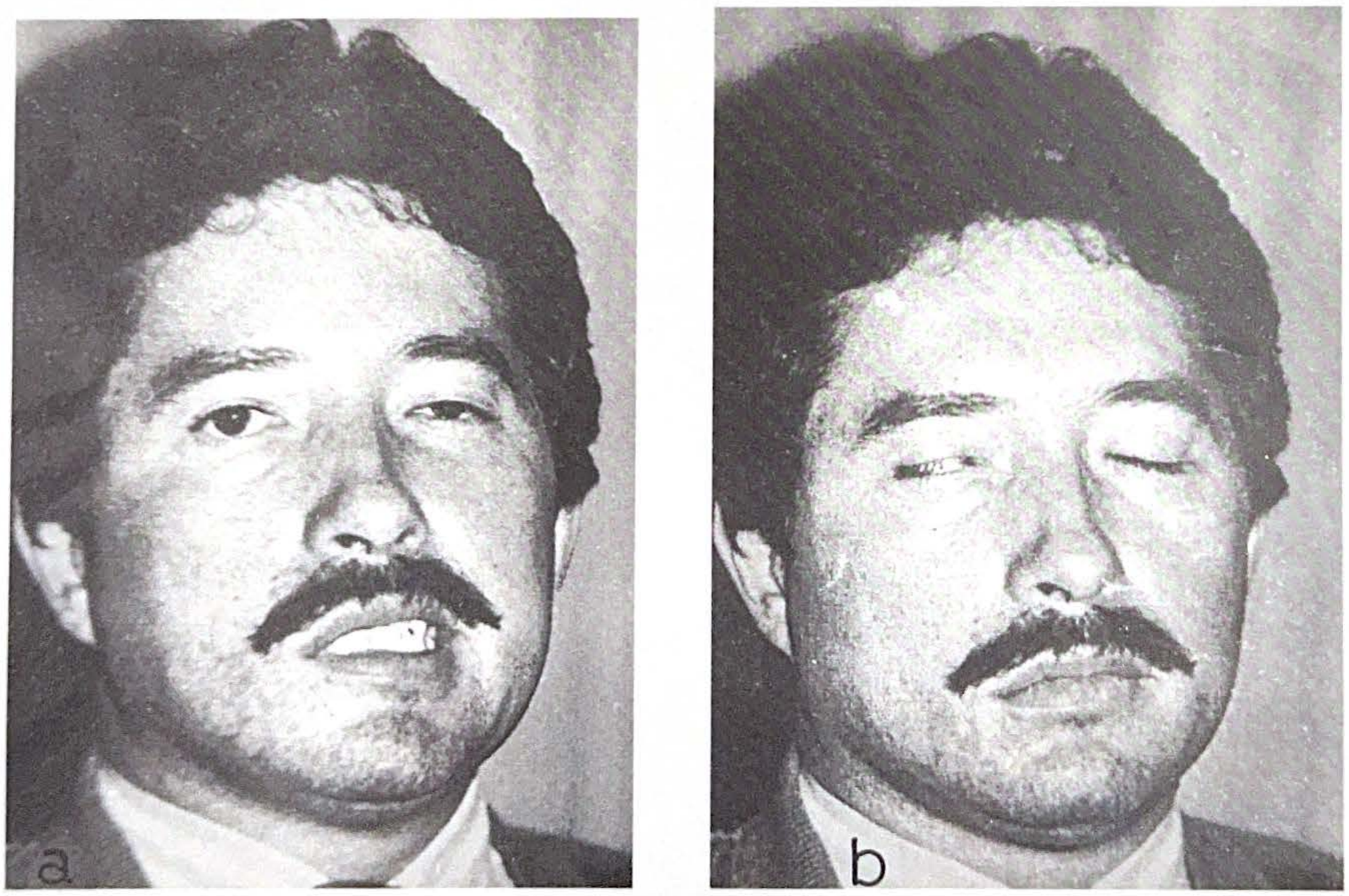

Figure 2. (Case 8 in Table 1) 36-year-old male, pretherapy finding 15 days after onset of first episode of right facial paralysis

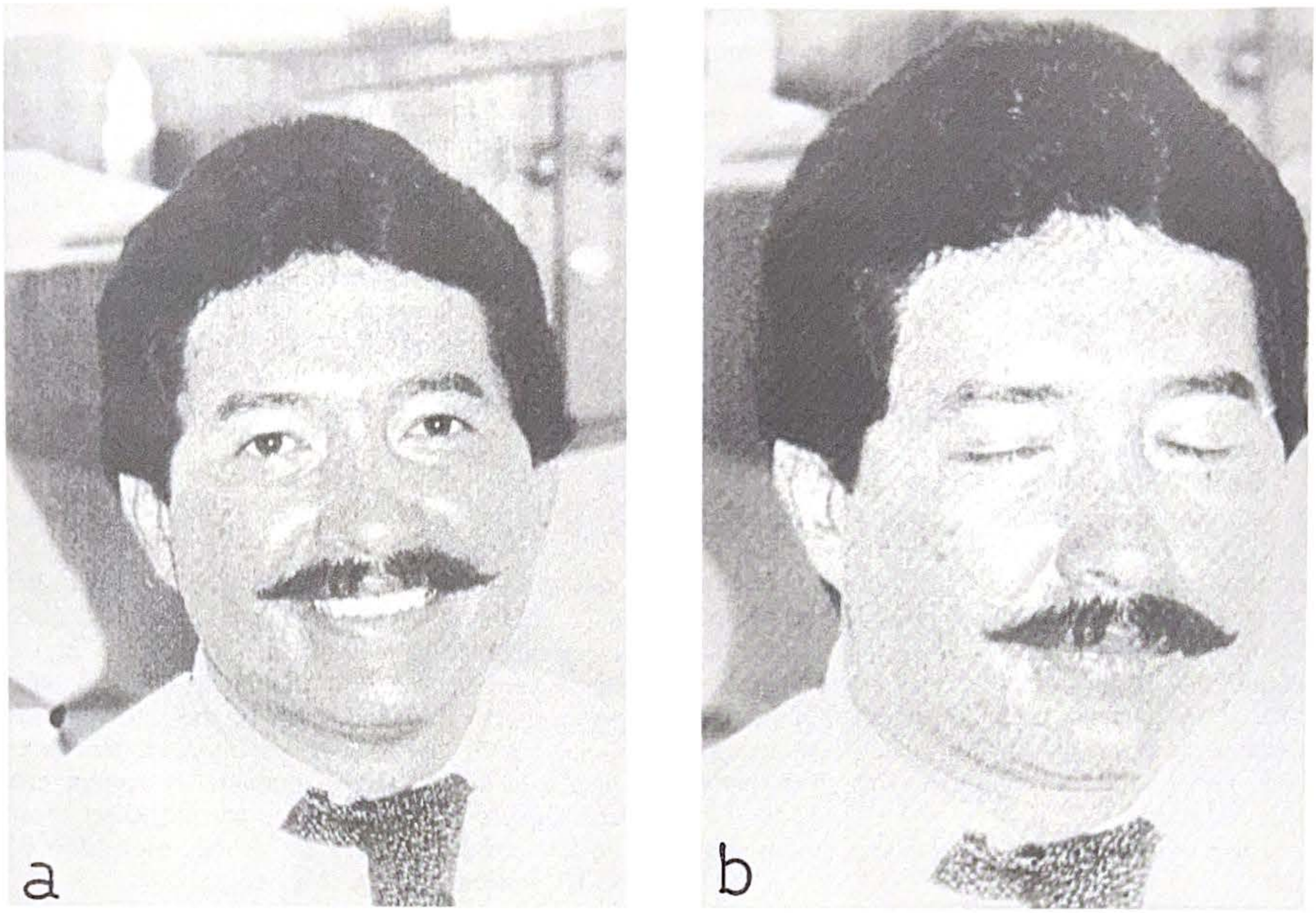

Figure 3. (Case 8) Same patient as in Figure 2, after 30 LLLT sessions: 100% recovery

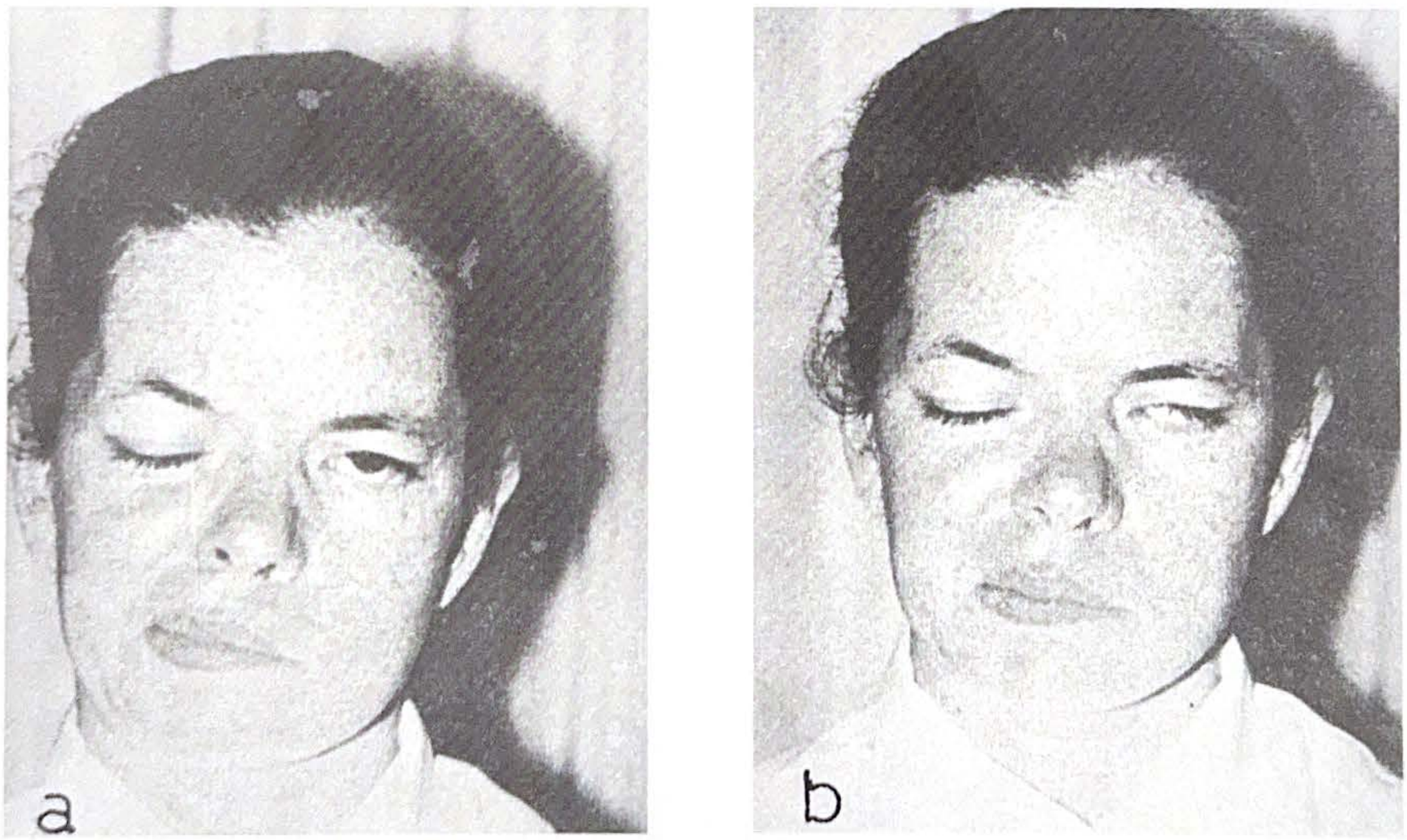

Figure 4. (Case 14 in Table 1) 39-year-old female, pretherapy finding 60 days after onset of her 6th attack of severe left facial paralysis

Figure 5. (Case 14) Same patient as in Figure 4, after 35 LLLT sessions: 70% recovery

3. Case No. 17

This 38-year-old male, an electronics engineer, presented with right facial paralysis resulting from surgery on the parotid gland, 150 days after onset of the episode. Figure 6 shows the pretherapy finding. Previous treatment sessions with massage, vitamin B1, TENS, acupuncture and high doses of steriod were completely ineffective. Figure 7 shows the post-therapy finding after 40 LLLT sessions, with a recovery assessed at 80%.

Conclusions

Our experience is based on positive effects in more than 50 cases treated, however we present these 17

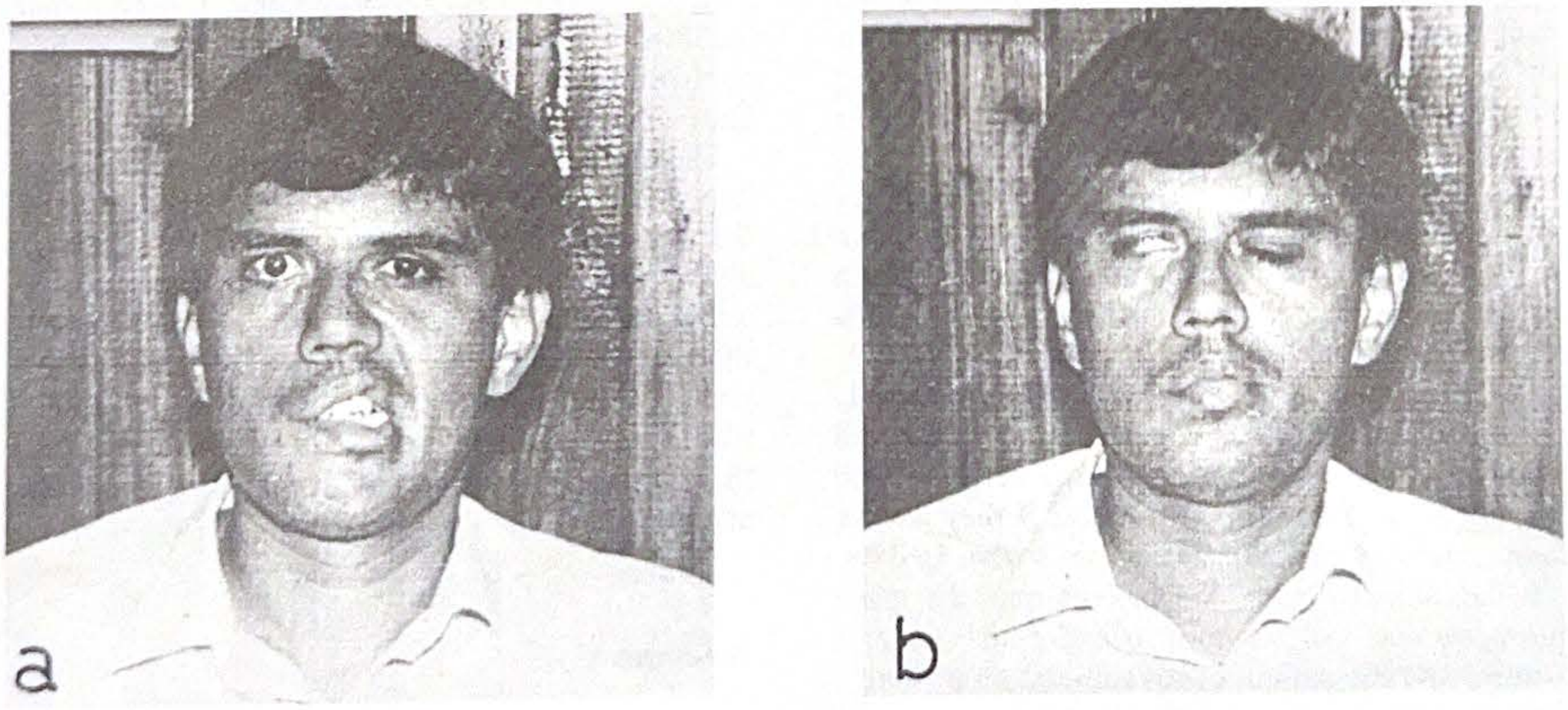

Figure 6. (Case 17 in Table 1) 38-year-old male, pretherapy finding 150 days after onset of iatrogenic right facial paralysis following surgery on parotid gland

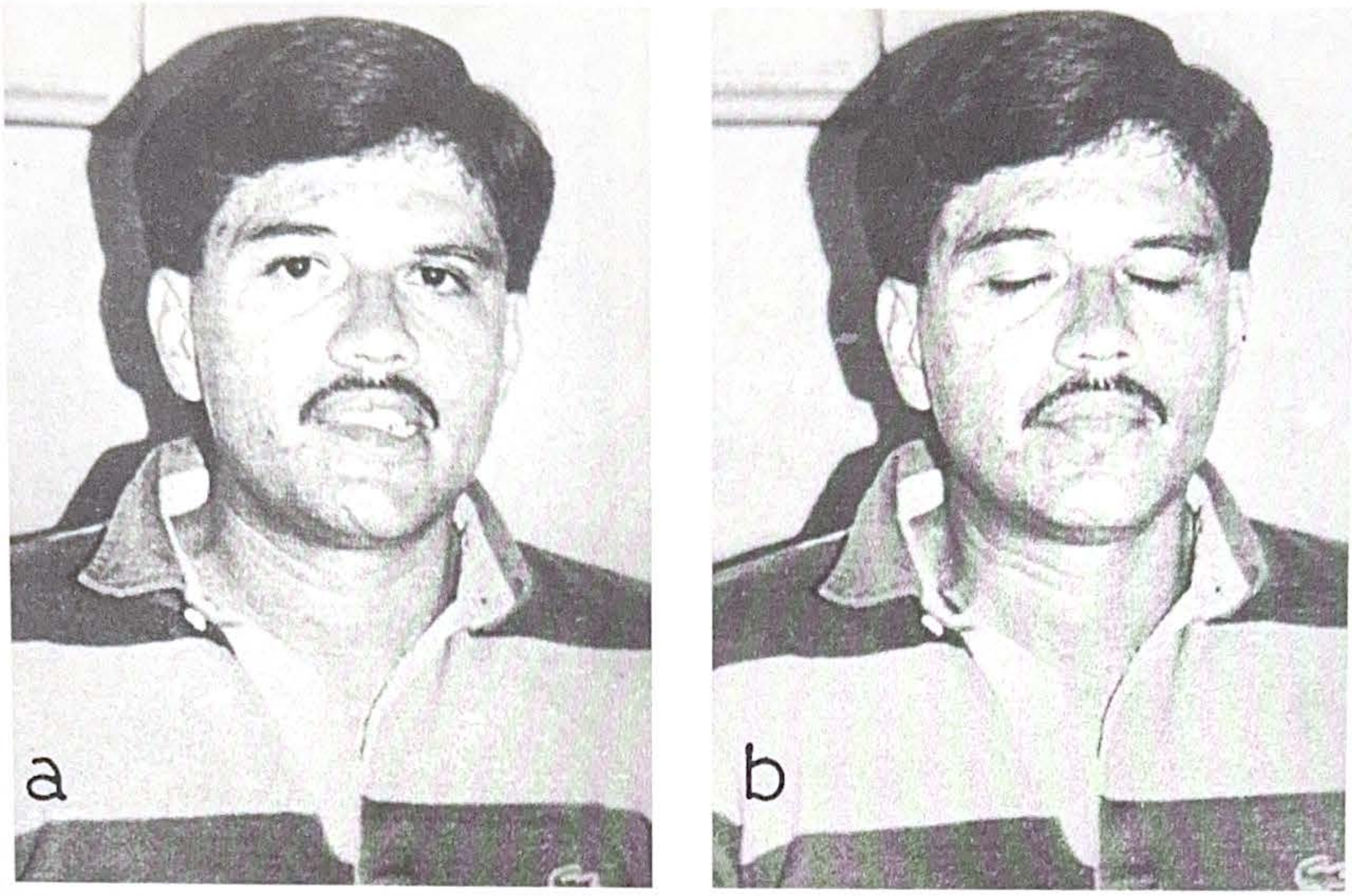

Figure 7. (Case 17) Same patient as in Figure 6, after 40 LLLT sessions: 80% recovery

cases because in our opinion they are the most representative of starting treatment within two weeks of the onset of the symptoms, having complementary studies such as electromyography, etc. and because we could do the necessary follow-up control with these patients. Our studies have shown us that low level laser light is anti-inflammatory, regenerative and produces cellular stimulation, and that it is an excellent complementary medium for the recovery of facial paralysis, an excellent and painless therapeutic alternative without side-effects which can be used for any type of patient, including those who cannot use corticosteriods, such as diabetics and hypertensive patients.

We also consider it very important that there are no rules with regard to this illness and that spontaneous recovery should not be expected for a patient even though the literature referes to 75% recovery within two weeks, because it is precisely this 25%, which does not recover spontaneously with traditional medicines and therapies, that will retain a notable consequence of their paralysis, and that might have had a total recovery if they receive complementary treatment with laser within 15 days.

In addition to laser, the patient must be given massages and polyvitamins because the laser is painless and the patient needs stimulation or simply needs to feel 'something' so that he does not abandon the therapy. We consider that the alternative therapy to low level laser exists, but that the patient must first be well diagnosed and he should have had all the corresponding complementary studies because the treatment must be directed by a doctor and should not be given to any patient with facial paralysis without treatment waiting to see if he is among the 75% who will recover spontaneously.

The purpose of this presentation is not to prove that low level laser on its own is highly effective in the recovery from facial paralysis, rather to justify its use as a complementary therapy, meaning that it allows for the reduction of the medication, mainly corticosteroids and increases the safety margin for the patient's recovery.

Therefore we consider that the laser must be taken into account as an excellent physical complementary therapy which allows recovery from facial paralysis, diminishing the possibility of side-effects due to corticosteriods, the actual results of the paralysis which are handled only with traditional therapy and above all the possibility of applying it to patients who cannot use corticosteroids. It also allows for the reduction in the time for recovery in a noticeable manner.

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