Facial nerve decompression

By Roger McNeill (London)*

Introduction

Idiopathic paralysis of the facial nerve (Bell's palsy) has attracted much controversy. Ever since the work of Ney, Ballance, Duel (1, 2, 3, 51) and others, surgical decompression of the facial nerve has been widely accepted in the treatment of facial paralysis secondary to chronic ear infections and in selected cases of traumatic intra-temporal facial nerve injury. What has not been widely accepted, however, is the efficacy of surgical decompression in cases of idiopathic facial paralysis. The advocates of surgical decompression have been many (4–19, 33, 38) and have constituted largely specialists in the field of Otolaryngology. Miller (1967) (20), however, stated that to that time there had been no scientifically valid evidence of the efficacy of surgical treatment in Bell's palsy. A similar view was later expressed by Taverner (21), and Amiri (1970) (22) questioned the value of facial nerve decompression in late cases of Bell's palsy.

In fact, literally every aspect of Bell's palsy has been the subject of a continuing dispute in the literature for many years.

The most popular theory regarding the etiology of Bell's palsy is that of a constricting compression by edema of the nerve within the confines of the Fallopian canal. Hilger (19, 29) believes the sequence of events to be triggered by an autonomic imbalance leading to constriction of the perineural vessels with subsequent ischemia, increased vascular permeability and edema fluid formation. Thus, a vicious cycle is set up resulting in further vascular compromise of the nerve within the facial canal. The effects of ischemia on peripheral nerves have previously been well described by Denny-Brown in his classic article (27). In this original work he showed that within limits the primary effect of compression on peripheral nerves was due to ischemia rather than a direct mechanical effect upon the nerve fibres. The compression theory of Bell's palsy has also been proposed by Sullivan, Smith, Cawthorne, Blunt, and others (13, 14, 15, 18, 31). Korkis (1962) (48) also presented evidence to support the concept of a primary autonomic imbalance as suggested by Hilger. Bunnel (32), however, felt that the primary factor leading to swelling of the nerve within the facial canal was some form of trauma, for example, exposure to heat or cold.

Recently newer concepts regarding the etiology of Bell's palsy have

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appeared in the literature. Sadé (30) *et al.*, presented evidence disputing the vaso-spastic theory and raised the possibility of a viral mononeuritis. McGovern and Konigsmark (24) also recently proposed the possibility of an immunologic etiology.

Current concepts regarding the etiology and treatment of Bell's palsy have evolved from a combination of surgical findings and experimental work. The turgid hemorrhagic appearance of the nerve at the presumed site of injury has been described by Ney (51), Sullivan and Smith (13), Cawthorne (18), Sullivan (14), and Jongkees (6). These authors have described bulging and herniation of the nerve fibres on splitting the nerve sheath in the area of injury which, in most cases, has been said to be in the region of the lower end of the Fallopian canal and stylomastoid foramen. However, bulging of the nerve fibres on opening the perineum of normal nerves has previously been well documented by Ney (51), Sunderland (45), and Jain and Sharma (25).

Contrary to the findings of these and most other authors, Fisch and Esslen (38) found pathology proximal to the geniculate ganglion in eleven of twelve patients with Bell's palsy who underwent total intra-temporal decompression of the facial nerve. In contrast to this, Zilstorff-Pedersen (46), on the basis of quantitative measurement of the naso-lacrimal reflex, found evidence of supra-geniculate involvement in only four of sixty-four patients with idiopathic facial paralysis. Similarly, Jepsen found 146 patients out of a total of 149 with Bell's palsy in whom the injury was confined to that part of the nerve distal to the level of the geniculate ganglion.

Experimentally, attempts have been made to simulate idiopathic facial paralysis by injecting saline and vaso-constrictors into the lower end of the facial canal (17, 24, 25, 26). More recently, Boyle (23) has utilized ultrasound. Results of surgical decompression in these instances have again been conflicting. McGovern (17) was able to demonstrate a faster rate of recovery of the paralysis on the decompressed side. Boyle (23), however, found that decompression neither helped nor hindered the rate of recovery of function. Dramethasone was also noted to have little influence on the outcome. An excellent review of the experimental aspects of idiopathic facial paralysis was published by McGovern in 1968 (28).

According to Hilger (29) approximately 85 per cent of patients with Bell's palsy will recover completely or almost completely without any treatment. Similarly, Laumans and Jongkees (42) have found that the chance of full recovery is 0 per cent when the paralysis remains complete at the end of one week and conversely the chance of full recovery is in the region of 85 per cent if the paralysis is only partial at the end of the second week. Most proponents of surgical decompression urge that if this is to be successful treatment should be carried out at an early stage before the

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injury has progressed from a simple conduction block (neuropraxia) to that of axonal death and peripheral Wallerian degeneration (axonotmesis). It is a well-known fact that after sectioning a peripheral nerve the distal end will continue to conduct an electrical impulse normally for 48 to 72 hours (19). Nevertheless, most centers continue to rely on electrical tests for prognostication regarding surgery despite the fact that, by the time these findings appear, permanent damage to the nerve has already occurred. According to Taverner (21) electromyographic studies do not usually demonstrate evidence of denervation before the seventh day and it may not appear for two or three weeks. We have also found marked fibrillations on electromyography in the presence of full or near full recovery following Bell's palsy.

Other tests utilized to detect early denervation have been the percutaneous threshold (PCT), conduction latency, and strength duration curves (4, 5, 6, 10, 18, 36). The percutaneous stimulation test has gained most popularity primarily because of its simplicity and ease of performance in the clinic. May (37), however, recently described some limitations of this test. The major ones are a 72-hour delay, the possibility of mechanical failure, the reliance on the co-operation of the patient and the inability to compare the two sides in cases of bilateral facial paralysis or previous contralateral facial paralysis. Others have found evoked electromyography (11) and intensity duration studies (44) to be more accurate. Taverner (43) also has found that the percutaneous stimulability test, which depends upon the appearance of a visible twitch in the facial muscles, is occasionally unreliable.

In view of these apparent shortcomings of electrical testing, particularly in detecting early denervation, various workers have come to depend on evaluation of Chorda tympani function as determined by electrogustometry (12, 21, 39, 40, 41) and submandibular gland secretion (34). Taverner (21) found a 95 per cent rate of complete recovery in patients with normal taste thresholds. In his patients with subjective taste disturbance, even in the presence of normal taste thresholds, the prognosis was somewhat poorer. Pain has also been said to be indicative of a poor prognosis (13, 14, 19) although other investigators have not confirmed this (10, 41). Jongkees (7) has not found aural pain, loss of taste, hyperacusis, decreased lacrimation or nasal-palpebral reflexes helpful in determining prognosis.

It is in the area of the treatment of Bell's palsy that the greatest controversy exists. Since the work of Taverner *et al.* (21, 39, 52) and Adour *et al.* (49) it is evident that steroid therapy is here to stay. Taverner (39) found that ACTH reduced the overall incidence of denervation by 66 per cent. In a well-controlled double-blind study, Adour and his coworkers (49) found no cases of complete denervation in a group treated

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with prednisone as compared with 24 per cent denervation in the untreated group. Very few controlled studies have been done to evaluate the results of surgical decompression, and the opinions expressed by most authors favoring this form of treatment have been mainly subjective. Giancarlo and Mattucci (1970) (10), however, presented a series of twenty-seven patients nineteen of whom underwent surgical decompression while eight were treated conservatively. They found that the patients undergoing surgery experienced much better recovery of function. Yanagihara and Kishimoto (1972) (11) were also able to demonstrate a statistically better outcome in patients who underwent surgery as compared with those who did not. In contrast to this Mechelse and his co-workers (1971) (50) found no significant difference in the two groups of patients in their series.

Materials and methods

The charts of all patients seen at the University of Michigan Medical Center from 1 January 1960 to 31 December 1969, in whom a diagnosis of Bell's palsy was made, were reviewed. Thirty patients who were accepted to this study satisfied all of the following criteria: (1) The facial paralysis was complete; (2) progressing or established denervation was present as evidenced by elevation of the Percutaneous Stimulation Threshold on the affected side to a level of 3·5 milliamperes or more above the threshold on the unaffected side; (3) no etiology for the facial paralysis was evident in spite of complete otorhinolaryngologic and neurologic examinations. Excluded from this study were patients who were felt to have had an inadequate examination and in whom electrical testing was not performed. An additional six patients were excluded because they received steroids some time during the course of their illnesses. Surgical decompression was advised for all patients in whom electrical testing showed progressive denervation and when performed was carried out through the standard trans-cortical approach with exposure and lysis of the nerve sheath from the geniculate ganglion to the stylomastoid foramen in most cases. Patients in this series who did not undergo surgery either refused operative therapy or were advised against it because of other medical problems which would have contraindicated elective surgery.

All patients were followed for at least one year post-onset of paralysis. End results were divided into two main groups, acceptable and unacceptable. Patients placed in the acceptable group consisted of those in whom recovery was complete or very minimal facial weakness was evident on smiling. These patients were judged to have 80 per cent or more recovery. In the unacceptable group were included patients who had a more than mild facial weakness on smiling, moderate to severe asymmetry at rest easily apparent to the casual observer and/or in whom functional disability was present, such as weakness at the corner of the mouth, epiphora or poor

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eye closure. In this group of patients were those who were generally dissatisfied with the outcome of their disease and were self-conscious about their facial weakness. Patients in this group were judged to have less than 80 per cent recovery.

Results

Table I shows the overall results of therapy. Nineteen patients underwent surgical decompression of whom ten (53 per cent) were judged to

TABLE I.
BELL'S PALSY, 1960–70.

	Decompressed	Not decompressed
Acceptable	10 (53%)	8 (73%)
Unacceptable	9 (47%)	3 (27%)
Total	19 (100%)	11 (100%)

have an acceptable outcome. Of eleven patients who were not decompressed, only three (27 per cent) were felt to have had an unacceptable outcome. Paradoxically, therefore, it appears that in this series patients who underwent surgical decompression had a poorer outcome.

Age: Figure 1 shows the relationship between patients' ages and outcome of their diseases. All of the unacceptable results were found in patients who were in the fourth decade or older. A similar pattern is

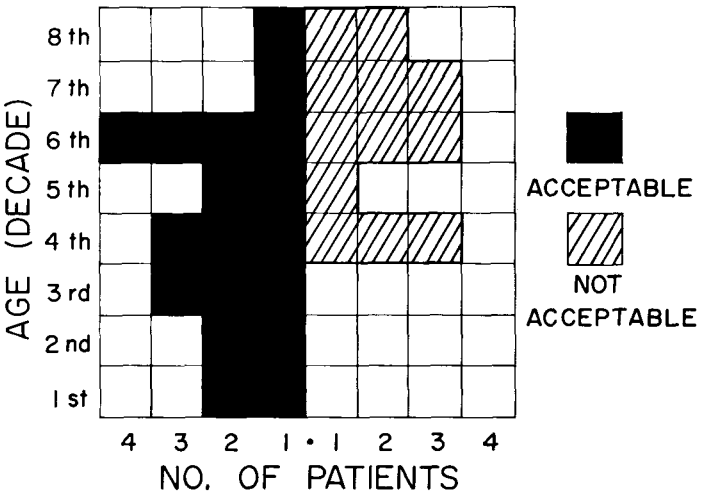


FIG. 1.

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evident in Figure 2 which shows only those patients who underwent surgical decompression. Here again it is seen that all of the unacceptable results occurred in patients who were in their fourth decade or beyond. Patients in the first three decades of life all had an acceptable outcome regardless of whether surgical treatment was carried out or not.

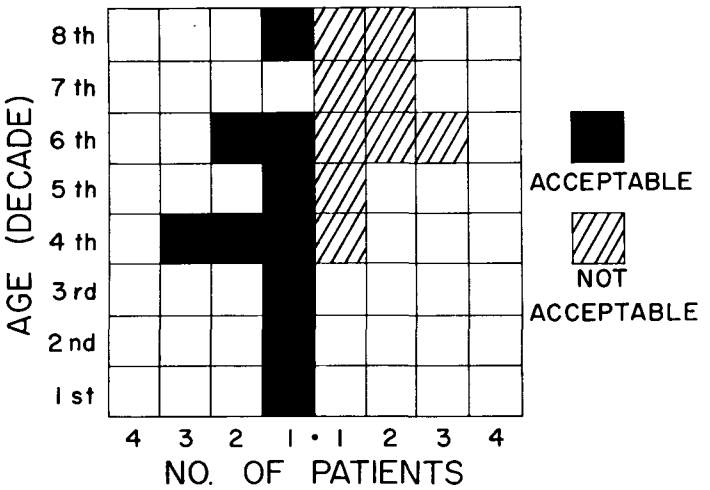


FIG. 2.

Sex: Figure 3 shows the relationship between sex and the outcome of disease. In this figure it is seen that the prognosis is somewhat worse in females in whom the chances of attaining an acceptable result were only slightly better than 50 per cent. Almost two-thirds of the male patients, however, had an acceptable outcome.

TABLE II.

	Tearing +	Tearing −
Acceptable	10 (66%)	4 (57%)
Not acceptable	5 (34%)	3 (43%)
Total	15 (100%)	7 (100%)

Tearing: In Table II the relationship of greater superficial nerve function to outcome of the facial paralysis is shown. Tearing was assessed in twenty-two patients and was found to be markedly decreased in seven. Of these, three (43 per cent) had an unacceptable outcome. In those patients whose tearing was normal or near normal, poor results were obtained in slightly less (34 per cent). Although the absence of tearing appeared to worsen the prognosis slightly; it did not, however, necessarily

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predict a poor outcome as 57 per cent of these patients had an acceptable result.

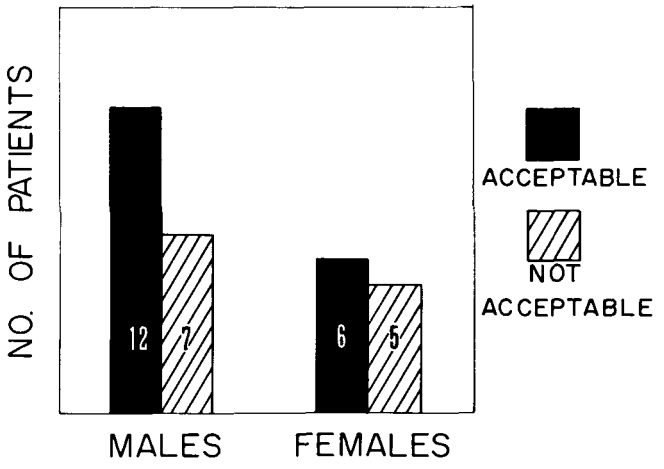


FIG. 3.

Taste: Chorda tympani function was assessed in fifteen patients and in this study, although the figures are small, no relationship was found between the presence or absence of taste and the eventual outcome (Table III).

TABLE III.

	Taste +	Taste −
Acceptable	3 (43%)	4 (50%)
Not acceptable	4 (57%)	4 (50%)
Total	7 (100%)	8 (100%)

Timing of surgery: Figure 4 shows the relationship between the time that surgery was performed and the outcome of the paralysis. It should be noted that in this series, no patients were decompressed within the first week after the onset of the paralysis. From the second week onwards, however, the timing of surgery did not appear to influence the end result.

Hearing loss: Pre- and post-operative audiograms were available in thirteen of nineteen patients who underwent surgical decompression. Six of these patients experienced hearing losses as shown in Table IV. The average loss of Speech Reception Threshold was 21 decibels and the average loss of discrimination was 28 per cent.

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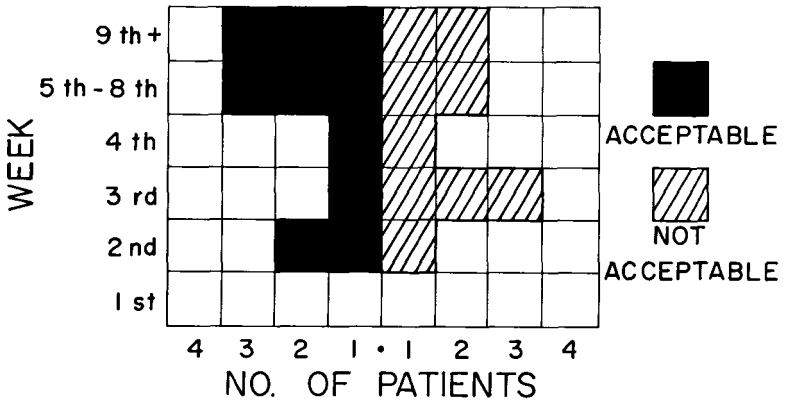


FIG. 14.

TABLE IV.

	Hearing Loss (S.R.T.)	Discrim. Loss (%)
	20	45
	15	20
	20	40
	25	20
	30	40
	15	6
Average	21 dB.	28%

Electromyographic studies: Severe denervation as evidenced by 3+ to 4+ fibrillations were present in seventeen of twenty-three patients in this series who had E.M.G. studies done. Six (36 per cent) of these patients had an unacceptable outcome. Of the remaining patients in whom there were no or only 1+ fibrillations on electromyography, approximately 17 per cent had an unacceptable result. It is therefore seen that although the presence of marked fibrillations on E.M.G. appear to considerably worsen the prognosis, it did not always predict a hopeless outlook.

Discussion

This study was subject to many of the pitfalls which belie retrospective studies, the chief being inadequate accumulation of data, inconsistency of evaluation and inconsistency of treatment. However, in our experience, it would appear that surgical decompression of the facial nerve for Bell's palsy during the second week of the disease and onwards does not appear to improve the outcome of the disease. This is in agreement with the findings of Michelse *et al.* (50). If surgical decompression is to be of benefit in the treatment of Bell's palsy, it is reasonable to assume that it should

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be carried out early in the course of the disease before irreversible damage to the facial nerve has occurred. In view of the fact that electrical testing at best, is 48 to 72 hours late in reflecting these changes in the nerve, it would appear that they are of insufficient value in predicting denervation. In other words, by the time current tests indicate the need for surgery it is probably already too late to achieve the desired goal.

As mentioned previously, chorda tympani function has been utilized by various workers to anticipate the need for early surgical intervention. In our series we have not found loss of chorda tympani function to be necessarily associated with a poor outcome.

In light of the considerable differences of opinion regarding the efficacy of the various modes of treatment in Bell's palsy, it is evident that more adequately controlled prospective studies are needed as well as more accurate and scientific documentation of results and evaluation of data.

Summary

Nineteen patients undergoing surgical decompression for idiopathic Bell's palsy at the University of Michigan Medical Center between 1960 and 1970 have been compared with a similar group of eleven patients in whom no treatment was given. Surgical decompression did not appear to improve the outcome of the disease and in fact, the results were slightly worse in the patients who underwent surgery, as compared with the control group. There appeared to be definite relationship between age and the outcome of the disease, being considerably better in patients in the first three decades of life. All of the unacceptable results appeared in patients in the fourth decade and onwards. The prognosis also appeared to be slightly better in males.

Loss of taste did not appear to significantly affect the outcome, but patients in whom greater superficial petrosal nerve function was lost did appear to have a statistically significant decrease in the prospect of recovery, although the outlook was not necessarily hopeless.

All patients in this series were decompressed from the second week onwards and there appeared to be no relationship between the time of decompression to the final result. Pre- and post-operative audiograms were available in thirteen of nineteen patients who underwent surgical decompression. Approximately 50 per cent (six) manifested hearing losses of significant degree.

The necessity for earlier surgical decompression is stressed as there appears to be no advantage to this modality of treatment after the first week of the paralysis.

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