DIODE LOW REACTIVE LEVEL LASER THERAPY AND STELLATE GANGLION BLOCK COMPARED IN THE TREATMENT OF FACIAL PALSY

F. Murakami, O. Kenmotsu, Y. Kavano, C. Matsumura, S. Kaseno and M. Imai

Pain Clinic, Hokkaido University Hospital, Sapporo, Japan

In 52 patients who presented with peripheral facial paralysis, (idiopathic facial palsy or Bell’s palsy), 26 received stellate ganglion block (SGB) therapy, 11 received infrared (830 nm) diode laser low reactive level laser therapy (LLLT), and 15 received a combination of both of the above. The data were analysed to compare the effectiveness of the three regimens. Those patients who received only LLLT or the combination of LLLT with SGB showed a similar overall recovery from the paralysis compared to those treated with SGB alone. The group who received LLLT only also demonstrated a slightly better initial improvement in paralysis scores. No serious side effects were reported in the LLLT group. Taking the above data into consideration, the authors recommend diode laser therapy as a suitable single or adjunctive therapy for facial paralysis which is relatively easy and painless to apply, requires less technical skill, compared with SGB, and has no side-effects.

KEY WORDS: LLLT, Diode laser therapy, Idiopathic facial palsy, Bell’s palsy, Stellate ganglion block

Introduction

Low reactive-level laser therapy (LLLT) was first reported by Mester in 1968 in the treatment of intractable torpid ulcers, since when the photobiological activation effects of LLLT have expanded into many fields, including the use of LLLT in the pain clinic. 1. 2 In the Department of Anesthesiology at Hokkaido University School of Medicine, LLLT has been applied in a number of areas where it has been found to offer therapeutic advantages, including pain attenuation; anti-inflammation and oedema control; and activation of local and systemic circulatory systems by increasing blood flow in the irradiated areas. 3-5 Stellate ganglion block (SGB) has been successfully indicated as a therapeutic method for facial palsy, but the administration of SGB requires a very high level of technical skill with a high level of risk for possible complications. If a skilled anaesthesiologist is not available, SGB is a high-risk procedure. LLLT has been reported as improving local circulatory response. Using this effect, the authors felt that LLLT applied to the face and neck would have a good influence on the functional recovery of affected nerves in facial palsy, but there have not been any comparative studies on the effectiveness of LLLT. The present study compares the effectiveness of LLLT and stellate ganglion block in the treatment of facial palsy.

Patients and Methods

The subjects of this study consisted of 52 patients diagnosed as having facial palsy who presented at the authors’ department as outpatients from April 1990 to March 1992. They were treated either with SGB, LLLT or a combination of the two: 26 patients were given SGB, 11 LLLT alone and 15 were treated with a combination of SGB and LLLT. Vitamin B-complex tablets and ATP were given as oral medication to help improve the peripheral circulation, and steroids were not administered. SGB was administered by well-experienced anaesthesiologists, using an injection of 1% lidocaine, 5 ml.

For the LLLT, a diode laser system was used, the Model 2001 GaAlAs system (Mochida, Tokyo, Japan), giving an output power of 60 mW at 830 nm in continuous wave, applied in the contact technique. LLLT was indicated over the area of paralysis, from the corners of the mouth to the neck, following the anatomical pathway of the affected nerves, for 10 s per point on points from 1–2 cm apart, with a total treatment time of from 5–10 min, including 2–3 min LLLT irradiation in the proximity of the stellate ganglion on the affected side.
The treatment effect was assessed using a 3-grade evaluation scale devised by the Facial Nerve Research Group of Japan (Figure 1), which was used to assess the degree of facial palsy at the time of initial consultation at the authors’ department. In order to preserve some degree of continuity, subsequent gradings and observation of the patient’s progress were carried out by the same clinician who did the original assessment.

Although more than one evaluation was made per week per patient, the following four evaluations of improvement (expressed as the mean ± SD) in the degree of paralysis were used for graphical assessment: on the 7th, 14th, 30th and after the 30th post-therapy day. An improvement of over 32 points on the evaluation scale, equal to approximately 80%, was regarded as an effective cure.

Results

Table 1 shows the trial statistics of the patients in each of the three groups. There was no statistically significant difference in the mean patient age, the number of days from onset of paralysis to initial consultation, however the paralysis score at the time of the initial consultation seemed slightly higher for the SGB group compared with the other two groups.

<table>
<thead>
<tr>
<th>Number of patients</th>
<th>11</th>
<th>15</th>
<th>26</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male/female ratio</td>
<td>6/5</td>
<td>10/5</td>
<td>13/13</td>
</tr>
<tr>
<td>Age*</td>
<td>45.3 ± 4.1</td>
<td>43.5 ± 4.1</td>
<td>41.8 ± 4.7</td>
</tr>
<tr>
<td>Paralysis score at initial treatment*</td>
<td>12.0 ± 1.5</td>
<td>15.5 ± 1.2</td>
<td>12.4 ± 0.8</td>
</tr>
<tr>
<td>Interval between paralysis onset and initial treatment*</td>
<td>3.5 ± 1.2</td>
<td>3.5 ± 0.8</td>
<td>3.8 ± 0.7</td>
</tr>
</tbody>
</table>

*Mean ± SEM.

Table 2 and Figures 2, 3 and 4 show the evaluation of the paralysis score for each of the three groups expressed as the mean ± the standard error over the time course in days. The SGB group demonstrated a gradual improvement, with a relatively sharper improvement in the SGB + LLLT group. In the LLLT group, although the final score was similar to the SGB + LLLT group, there was a sharper initial improvement at 7 and 14 days. In the LLLT groups, an 80% effectiveness, 32 points on the paralysis score, was reached earlier than the SGB group, although the difference was not statistically significant. The LLLT groups exceeded the 32 point benchmark in less than 6 weeks on average, whereas it took the SGB group 10 weeks. There were no adverse side-effects reported in any patient from the LLLT and LLLT + SGB groups: numbness of the upper extremities (2) and hoarseness (2) were observed in the SGB group.

Figures 2–4 show the improvement in paralysis score plotted against time for each patient, group by group (Figure 2—SGB group; Figure 3—LLLT + SGB; Figure 4—LLLT alone), shown against outpatient days. This shows the tendency for a much more stable pattern of improvement over time in the LLLT groups compared with a more random distribution of improvement over time in the SGB group. The same pattern is seen in Table 2 is also demonstrated, namely the shorter time taken to reach and exceed the 80% effectiveness point, which was the criterion in the present study for a cure.
Discussion

Facial palsy particularly affects the musculature and other tissue blocks innervated by the 7th cranial (facial) nerve and is one of the most common of the presenting ailments seen in the anaesthetic department outpatient clinic. Facial palsy usually occurs unilaterally, and is recognized as being due to a degree of demyelination of the myelin sheath surrounding the fibres of the facial nerve. However, the actual mechanical cause of this condition is not really clear, although a number of factors have been suggested including cold, viral effects, autoim-
munological influences and physical compression of the nerve tissue by blood vessels, scar tissue and so on. Although some reports have appeared on the epidemiology, natural progression and natural healing of facial paralysis,7,8 there is a lack of information on its established treatment. Accordingly, it is difficult to make generalized statements about the treatment results of the present study. Stellate ganglion block (SGB) is recognized currently as being one of the main therapies of choice in the anaesthesiology pain clinic for the treatment of peripheral facial palsy.9 although very recently laser therapy has offered an alternative treatment
method.\textsuperscript{3} In internal medicine and ENT, steroid-based medication has been successfully applied.\textsuperscript{10} Other effective drugs such as vitamin pills, steroids and medication to improve the peripheral blood flow have been reported with varying degrees of success in restoring nerve function to the paralysed area. Steroids are easy to apply, including oral administration, and steroid-based preparations have been reported to improve the affected nerve function.\textsuperscript{10, 11} On the other hand, contradictory reports have also appeared where no significant improvement was reported.\textsuperscript{11} An important consideration in the long-term application of steroids is the range of possible adverse side-effects, such as local skin damage, possible impairment of liver function and steroid-mediated diabetes. Accordingly we do not currently use steroids in our pain clinic.

We have recently reported that SGB was effective in particular for serious facial palsy where the paralysis score is poor at the time of occurrence.\textsuperscript{10} SGB has the disadvantage of requiring an extended outpatient visit, or even hospitalization, which can be a potential problem for the busy patient. SGB is believed to increase the cranial blood flow, thus indicating promotion of recovery of function and repair in nerves damaged by ischaemia and oedema. To lessen the occurrence of serious side-effects, SGB must be administered by a skilled, experienced anaesthesiologist, otherwise hoarseness, haemorrhage and spasm are possible sequelae. SGB is therefore not a suitable treatment for patients with any existing damage to their necks, or for young children who cannot cooperate well in the treatment.

LLLT on the other hand can be applied by suitably trained paramedical or medical staff even when a clinician is not present, and requires much less in the way of preparation: no sterilized syringe is needed, for example. LLLT has been reported as successfully increasing both local and systemic blood flow. Thus if SGB is associated with an improvement in cerebral blood flow,\textsuperscript{5, 6} and if the same effect can be achieved by the noninvasive and side-effect-free application of laser therapy, the latter should be used. Additional reports associate LLLT with the healing of damaged peripheral nerves and the improvement of neural transmission rates.\textsuperscript{12, 13} Thus there is the possible double action of LLLT on the direct repair or remyelination of the affected nerve, in addition to improved blood flow where ischaemia is a contributory factor. LLLT can be applied along the anatomical lines of the affected nerves, and also onto areas of pain or numbness. However, reports have appeared on the successful and effective application of low reactive level laser or polarized light directly over the stellate ganglion for a number of symptoms,\textsuperscript{14, 15} and so in the present study we added irradiation of the region around the stellate ganglion with the diode laser to the anatomical and pain point methodology.

The facial nerve not only controls the muscles of facial expression, but is also concerned with the sensation of taste, controls the lachrymal, nasal and palatine glands, and can affect hearing by control of the stapedius muscle. A simple paralysis score may not possibly be the best evaluation method for the total effect of LLLT on facial palsy. Our results indicate that LLLT enhances the improvement of facial palsy, as does SGB. Furthermore, in the present study the overall impression was that the LLLT groups improved faster than the SGB group.

When the number of outpatient days is examined, patients tended to stop attending the clinic earlier in the SGB group, but this was not correlated with a higher paralysis score. One patient for example
left before the score had reached 30, less than the benchmark set for effectiveness in the study. There is probably an element of discomfort or even complications and fear associated with SGB, not seen with LLLT, which may well explain why many patients in the LLLT group continued to attend even after reaching the 32 point mark on the paralysis score. Although not part of ‘clinical’ therapy, the psychological advantages and disadvantages of the treatment modality must also be taken into account in assessing the overall effectiveness of the modality.

One patient reported a slight tingling sensation after LLLT, but other than that, no serious side-effect was reported in either of the groups in which LLLT was applied. LLLT, which is a new, nonconventional and painless therapeutic modality, can therefore be easily applied in those patients for whom SGB seems to be a high-risk procedure, such as in children, in patients with existing neck disease, in haemophiliacs or in geriatric patients. LLLT will also avoid the side-effects seen from some medication therapies, such as steroids, while at the same time not causing any of the potentially harmful side-effects associated with SGB.

Conclusions

Infrared diode LLLT alone, LLLT + SGB and SGB alone were indicated in 52 patients who presented with facial paralysis. The LLLT-treated patients demonstrated faster initial recovery and slightly better final paralysis scores than the SGB group, although the differences were not statistically significant. The authors recognize that this is a simple unblinded comparison study, and present the data as preliminary clinical findings in a comparatively small patient population. However, even in the absence of controlled double-blind studies in the application of LLLT for facial palsy, the authors suggest that LLLT provides a safe, easily-applied, pain- and side-effect-free treatment modality for this difficult condition, especially in situations where a skilled and experienced anaesthesiologist is not available to conduct SGB, or contraindications to SGB are present in the patient.

References


