Facial Nerve Conduction after Sclerotherapy in Children with Facial Lymphatic Malformations: Report of Two Cases

Pei-Jung Lin,1 Yuh-Cherng Guo,2,4 Jan-You Lin3,4 and Yu-Tang Chang3,4

1Department of Neurology, E-Da Hospital and I-Shou University, Kaohsiung, Taiwan
2Department of Neurology, Kaohsiung Medical University Hospital, Kaohsiung, Taiwan
3Department of Surgery, Kaohsiung Medical University Hospital, Kaohsiung, Taiwan
4Faculty of Medical School, College of Medicine, Kaohsiung Medical University, Kaohsiung, Taiwan

LIN, P.-J., GUO, Y.-C., LIN, J.-Y. and CHANG, Y.-T. Facial Nerve Conduction after Sclerotherapy in Children with Facial Lymphatic Malformations: Report of Two Cases. Tohoku J. Exp. Med., 2007, 211 (4), 401-406 — Surgical excision is thought to be the standard treatment of choice for lymphatic malformations. However, when the lesions are limited to the face only, surgical scar and facial nerve injury may impair cosmetics and facial expression. Sclerotherapy, an injection of a sclerosing agent directly through the skin into a lesion, is an alternative method. By evaluating facial nerve conduction, we observed the long-term effect of facial lymphatic malformations after intralesional injection of OK-432 and correlated the findings with anatomic outcomes. One 12-year-old boy with a lesion over the right-side preauricular area adjacent to the main trunk of facial nerve and the other 5-year-old boy with a lesion in the left-sided cheek involving the buccinator muscle were enrolled. The follow-up data of more than one year, including clinical appearance, computed tomography (CT) scan and facial nerve evaluation were collected. The facial nerve conduction study was normal in both cases. Blink reflex in both children revealed normal results as well. Complete resolution was noted on outward appearance and CT scan. The neurophysiologic data were compatible with good anatomic and functional outcomes. Our report suggests that the inflammatory reaction of OK-432 did not interfere with adjacent facial nerve conduction. Lymphatic malformation; OK-432; sclerotherapy; facial nerve conduction; children © 2007 Tohoku University Medical Press

Lymphatic malformations are congenital malformations of lymphatic drainage. Although standard treatment has been surgical resection with the preservation of the surrounding vital structure, for facial lymphatic malformations, most surgeons hesitate to surgically intervene for fear of repeat operations and potential later complications such as a big scar, outward asymmetry or cranial nerve injury (Padwa et al. 1995). To decrease surgical morbidity, a non-surgical treat-
ment such as intralesional injection with various sclerosing agents (sclerotherapy) has been employed.

Some authors have even reported that sclerotherapy might have superiority over surgical resection. Although incomplete resolution happens frequently and repeat injections are sometimes necessary in an interval of 3-6 weeks (Ogita et al. 1994), it has the advantages of minimal invasiveness, and a good cosmetic effect. After treatment, most patients can be discharged within two days (Sanlialp et al. 2003). However, such adverse effects of sclerotherapy as injury to adjacent nerves, necrosis of overlying skin and cardiotoxicity related to overdose have been delineated in the textbook Pediatric Surgery (2005).

OK-432 (Picibanil, Chugai Pharmaceutical Co., Tokyo) is a biologic preparation of lyophilized powder containing Streptococcus pyogenes Su strain cells (group A, type 3) treated with benzylpenicillin potassium. Sclerotherapy with OK-432 was first described by Ogita et al. (1987) and has been extensively applied in most medical centers. In the past, the response after sclerotherapy was based on inspection, palpation and imaging studies (Ogita et al. 1987; Tanigawa et al. 1987; Orford et al. 1995; Dubois et al. 1997; Sanlialp et al. 2003; Won et al. 2004; Smithers and Fishman 2005). However, there is no information available about the presence and extent of nerve damage after sclerotherapy. In the present study, we aimed to evaluate the facial nerve conduction after sclerotherapy in children with facial lymphatic malformations and correlate the findings with anatomic results.

METHODS AND MATERIALS

In 2004, five children presenting lymphatic malformations underwent sclerotherapy with OK-432, including back (1), thigh (1), axilla (1), and face (2). Of them, two boys with solitary lesions over the preauricular area were selected for this study. Both macrocystic (> 2 cm) and microcystic (< 2 cm) cysts were present in the two children according to imaging studies. Before sclerotherapy, none of these had had operation, allergy or trauma history. Their parents all signed the informed consent. Case patients were analyzed for their descriptive data and perioperative adverse effects by reviewing their medical charts and radiological examinations. Follow-up data, including outward appearance, computed tomography (CT) and facial nerve conduction study were collected more than one year after treatment.

Procedure of sclerotherapy

The technique of sclerotherapy was performed as previously described (Ogita et al. 1991). The procedures were performed under general anesthesia. 0.1 mg of OK-432 was prepared by dilution with 10 ml physiological saline. Under sonographic and fluoroscopic guidance, the prepared solution was injected as was the same volume of aspirated fluid or infiltrated around the lesions if the aspiration of intralesional fluid was difficult. The volume of solution did not exceed 0.2 mg of OK-432 in one injection. A second injection was given when response of the lesion was judged insufficient 3 to 6 weeks after the initial treatment.

Functional evaluation of facial nerve

We chose facial nerve conduction study and blink reflex to evaluate the two patients. These studies were performed at least one year later after sclerotherapy by the same neurologist who is a specialist of peripheral nerve and muscle disorder. The facial nerve conduction study was performed by stimulating the preauricular facial nerve with recording patches on the nasalis. We performed the blink reflex to double check the facial nerve function. It was elicited by stimulating the first branch of the trigeminal nerve over the supraorbital notch. A rapid unilateral monosynaptic component (R1) and a delayed bilateral polysynaptic component (R2) were recorded. Recorded electrode patches were located at the bilateral orbicularis oculi and temporalis.

RESULTS

Patient 1

The 12-year-old boy had a lesion over the right-side preauricular area. Pretreatment sonography showed mixed macrocystic and microcystic lesions (Fig. 1). The lobulated lesion (3.72 × 1.72 × 2.79 cm) was located behind the parotid gland, just adjacent to the main trunk of facial nerve emerging from the stylomastoid foramen. Under general anesthesia and ultrasound guidance, 8 ml of fluid could be aspirated and was replaced by the same volume of OK-432 at the same site of
Facial Nerve Conduction after Sclerotherapy

aspiration. However, multiple aspirations of the microcystic lesions were attempted and were unsuccessful. Therefore, 3 ml of OK-432 was infiltrated around the microcystic lesions at three different sites. After injections, the swelling and mild fever resolved within 5 days.

At 4 weeks, a second injection was performed after aspiration of 3 ml of fluid. During a follow-up period of 19 months, the result was excellent. Complete resolution was noted on outward appearance and CT scan. The facial nerve conduction study showed normal distal latencies (right and left: 2.1 and 3.0 msec) and normal CMAP amplitudes (1.6 microvolts) for both facial nerves (Fig. 3A). The ipsilateral R1 response of blink reflex was 9.7 and 10.0 msec (right and left), ipsilateral R2 response was 33.2 and 34.8 msec (right and left), and contralateral R2 response was 34.0 and 33.5 msec (by right and left stimulation) (Fig. 3B). These results are all within normal limits.

**Patient 2**

The 5-year-old boy had a lesion in the left-sided cheek, which had been present since 2 months of age and had suddenly enlarged in size recently (Fig. 2). The CT scan showed a multiloculated cystic lesion (5 cm × 2.7 cm × 5 cm) with septal contrast enhancement in the left cheek and infratemporal area involving the buccinator muscle.

---

**Fig. 1.** CT and sonography image from patient 1.
There was a multi-loculated cystic lesion in the right cheek and infratemporal area (left). Both macrocystic (arrow) and microcystic (arrowhead) lymphatic malformations were present (right).

**Fig. 2.** Image from patient 2.
A lymphatic malformation of the left cheek is demonstrated in this child. Before treatment (left), after treatment (right).
muscle. He also received two injections of OK-432. Fourteen ml of OK-432 was injected the first time. Continuing mild fever for 1 week was noted. The softening of the swelling and obvious shrinking were observed after 2 weeks of injections.

A second 4-ml-injection was performed 6 weeks later. During a follow-up period of 16 months, marked shrinkage of the lesion and slight left-sided swelling were noted after 2 weeks of injections.

A second 4-ml-injection was performed 6 weeks later. During a follow-up period of 16 months, marked shrinkage of the lesion and slight left-sided swelling were noted after 2 weeks of injections.

DISCUSSION

Sclerotherapy is an injection of a sclerosing agent directly through the skin into a lesion and is used primarily for slow-flow vascular malformations, particularly for lymphatic malformation and venous malformation (Smithers and Fishman 2005). Since Harrower’s (1933) use of sodium morrhuate, various sclerosing agents, including ethanol, bleomycin, Ethamolin, alcoholic solution of Zein and acetic acid, have been employed for sclerotherapy with satisfactory outcomes (Tanigawa et al. 1987; Orford et al. 1995; Dubois et al. 1997; Puig et al. 2003; Won et al. 2004).

During the last two decades, the emphasis on sclerotherapy with OK-432 is the treatment of choice for lymphatic malformations in most medical centers of Japan and Europe (Ogita et al. 1987, 1994; Luzzatto et al. 2000; Sanlialp et al. 2003). The regimen is an effective treatment for unresectable lesions, incomplete resection and recurrent lymphatic malformations (Ogita et al. 1991, 1994; Mikhail et al. 1995). Some authors considered sclerotherapy with OK-432 to be the initial treatment for lymphatic malformations (Ogita et al. 1994; Luzzatto et al. 2000; Sung et al. 2001).

92%-100% of patients with macrocystic lesions and 41-60% of patients with microcystic lesions
have a favorable response (Ogita et al. 1994; Luzzatto et al. 2000; Sanlialp et al. 2003). Ogita et al. (1987, 1991, 1994) also suggested that the local inflammation caused by OK-432 did not cause any damage to the overlying skin and did not lead to scar formation. However, transient facial nerve palsy after sclerotherapy with OK-432 at the parotid area has previously been reported, and believed that stretching of the nerve by swelling was regarded as the principal cause (Sung et al. 2001).

To prevent the adverse effects caused by extravasation of the sclerosing agent or unintentional vascular injection (Berenguer et al. 1999; Sung et al. 2001; Puig et al. 2003), Ogita et al. (1987) suggested the volume of sclerosing agent injected should be the same as fluid aspirated for macrocystic lesions, while double-needle methods and placement of a pigtail catheter were used to minimize extravasation (Dubois et al. 1997; Puig et al. 2003; Won et al. 2004). Sonography, computed tomography and magnetic resonance image were also reported to guide the procedure (Molitch et al. 1995; Lewin et al. 1999; Luzzatto et al. 2000). However, with the shrinkage of macrocystic lesions after the fluid is aspirated, controlling the depth of injection of the sclerosing agent is difficult. When the cyst cavities are rather small, the sclerosing agent is usually blindly injected into surrounding tissues or draining channels. Extravasation may still be inevitable and result in producing damage to the surrounding nerves and tissue.

The efficacy of sclerotherapy was usually based on anatomic features according to significant reduction of lymphatic malformations on outward appearance and/or radiological examinations (Tangawa et al. 1987; Orford et al. 1995; Dubois et al. 1997; Sung et al. 2001; Sanlialp et al. 2003; Won et al. 2004). However, a procedure-related functional disability, such as focal neuropathy or scarring of the surrounding tissue, might affect outcomes, which may not be obvious on outward appearance or radiological examinations. The authors evaluated long-term influence of sclerotherapy with OK-432 on facial nerve conduction velocity when the lesion was located at the preauricular area peripheral to the stylomastoid foramen. With the trend to minimize invasive therapy, widespread use of OK-432 for facial lymphatic malformations is reassured since the sclerosing agent has been proved to cause little damage to the adjacent nerves in the present study.

A number of drawbacks in this study have been identified. The major drawback is our limited case number. Even if these studies had been abnormal, we cannot definitively implicate OK-432 in a cause-and-effect relationship unless the facial nerve conduction is also evaluated before injection. A randomized comparison of effect on nerve conduction between surgical intervention and sclerotherapy could then be evaluated.

On the basis of the report of the two cases, sclerotherapy with OK-432 is suitable and safe in the treatment of facial lymphatic malformations. The effectiveness of sclerotherapy should be evaluated by gross appearance, radiological judgments and functional outcomes. According to the facial nerve conduction, sclerotherapy with OK-432 did not cause any damage to the adjacent nerves. Functional outcomes were correlated with the anatomic findings during a long-term follow-up.

References


