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Therapeutic Effect of Bee-Venom and Dexamethasone in Dogs with Facial Nerve Paralysis

Hyung-kyou Jun, Hyun-uk Oh, Ji-won Han, Hyun-hwa Lee, SeongMok Jeong, Seok Hwa Choi*, Cristopher Mun-ho Kim** and Duck-hwan Kim[1]

College of Veterinary Medicine, Chungnam National University, Daejeon 305-764, Korea
**College of Veterinary Medicine, Chungbuk National University, Cheongju 361-763, Korea, **Anapunsesang Clinic, Seoul, Korea*

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Abstract: Although canine facial nerve paralysis (FNP) occurs similarly in humans, there is no properly recognized therapy using Western medicine for idiopathic causes. To elucidate therapeutic measures by acupuncture (AP) on canine FNP, we examined the therapeutic effect of injection-AP on the artificially induced canine FNP. Twelve dogs on artificially induced canine FNP were divided into a control group (4 dogs), an experimental dexamethasone-treated group (dexamethasone group, 4 dogs) and an experimental bee venom-treated group (apitoxin group, 4 dogs). Saline (1 ml) was intramuscularly injected into the head muscle after the induction of FNP in the control group. On the other hand, injection-AP with dexamethasone was performed on such acupoints as LI04, LI20, ST02, ST07, TH17, SI18, GB03 and GB34, twice per week after induction of FNP in the dexamethasone group. In addition, injection-AP with 100 μg of apitoxin was performed on the same acupoints as the dexamethasone group twice per week after the induction of FNP in the apitoxin group, respectively. The changes of the clinical symptoms of FNP with each treatment during the experimental period were recorded by using clinical scores, respectively. The changes of serum creatine kinase (CK) activities along with each treatment were determined using an autoanalyzer. The significant differences of clinical scores were detected on day 14 ($p<0.05$) in the apitoxin and dexamethasone groups, compared with those in the control group, respectively. However, significant difference was not detected between the apitoxin and dexamethasone groups. Significant differences of serum CK activities were detected on day 7 ($p<0.05$) and day 14 ($p<0.05$) in the dexamethasone and apitoxin groups, compared with those in the control group, respectively. However, significant difference was not detected between the dexamethasone and apitoxin groups. In conclusion, injection-APs with apitoxin and dexamethasone were all effective for treatment of canine FNP and the therapeutic effect by injection-AP with apitoxin was similar to that of injection-AP with dexamethasone.

Key words: Injection-acupuncture, apitoxin, canine, facial nerve paralysis

Introduction

Facial nerve paralysis (FNP) is a disease which is characterized by paralysis of the facial muscle associated with the disturbance of the unilateral or bilateral facial nerve. FNP occurs not only in humans, but also in animals such as dogs (4,18). As for the cause of FNP, Tveitnes *et al.* (17) reported that 75(65%) of a total 115 children were diagnosed as Lyme borreliosis and nearly all of these were associated with lymphocytic meningitis. However, Kern *et al.* (4) described that the causes of facial nerve dysfunction in dogs and cats were also surgical and nonsurgical trauma, neoplasia, and otitis media/interna and also facial neuropathy were judged to be idiopathic in 74.7% of dogs and 25% of cats. The clinical signs such as the inability to close the eyelids and to move the lips, or to move the ears are frequently observed in canine FNP (2). As for the treatment of canine FNP, there is no proper therapy in the case of idiopathic causes, however, symptomatic therapy including treatment of keratoconjuntivitis can be also applied in the case of known causes (2,3).

The therapeutic effects of acupuncture (AP) were broadly investigated in various human and animal diseases (7,9,10,16). As for research on animal FNP, there were only a few case reports in canine FNP (2,3,4,19,20). As for treatment of FNP, again very few case reports about the treatment of FNP by AP were described in canine and equine FNP in veterinary literature (3,14).

On the other hand, it was known that bee-venom (apitoxin) therapy was effective for treatment of various human and animal diseases including laminitis, arthritis, and pain control etc (1,5,10,12). However, the therapeutic effect of apitoxin therapy on canine FNP has not been investigated.

To elucidate therapeutic measures by AP on canine FNP, we examined the therapeutic effect of injection-AP on artificially induced canine FNP.

[1]Corresponding author.
E-mail : dhkim@cnu.ac.kr

Materials and methods

Experimental animals

A total of 12 clinically healthy mongrel dogs (2 to 3 years old, 2.0 to 5.6 kg BW) were used in the present study. The experimental dogs were fed with commercial dog food (Sun-Jung Co., Korea) 2 weeks before the start of the experiment. The present study was performed according to the rules of the Ethics Committee for Experimental Animals, Chungnam National University.

Division of experimental group and the treatment of each group

The experimental animals were divided into 3 groups as a control group (4 dogs), an experimental dexamethasone-treated group (dexamethasone group, 4 dogs) and an experimental bee venom-treated group (apitoxin group, 4 dogs), respectively.

Saline (1 ml) was intramuscularly injected into the head muscle after the induction of FNP in control group. On the other hand, injection-AP with 1 ml of dexamethasone (Daewon Pharmacological Co., Korea: 1 mg/ml) was made into the acupoints such as He Gu (between the first and second metacarpal bones, LI04), Ying Xiang (lateral to the nasal ala, LI20), Si Bai (on the infraorbital foramen, ST02), Xia Guan (in a depression ventral to the zygomatic arch and rostral to the condyloid process of the mandible, ST07), Yi Feng (in a depression caudal to the mandible and ventral to the ear base, TH17), Quan Liao (ventral to the zygomatic arch and rostral to the masseter muscle, SI18), Shang Guan (in the depression caudal to the masseter muscle and dorsal to the zygomatic arch, GB03) and Yang Ling Quan (cranial and ventral to the head of fibula at the interosseous space, GB34), twice per week after the induction of FNP in the dexamethasone group. In addition, injection-AP with 100 μg of apitoxin (Guju and Apimez Pharmacological Co., Korea: 1 mg/bottle) was performed on the same acupoints as the dexamethasone group twice per week after the induction of FNP in the apitoxin group, respectively (Fig 1).

Induction of FNP

Induction of FNP was performed by clamping the facial nerve using 3 hemostatic forceps (straight) for 20 minutes under zoletil (Virbac, France) anesthesia (Fig 2).

Assesment in FNP

The change of clinical symptoms (symmetry of lips and sialosis) of FNP with each treatment during experimental period was made using clinical scores (normal: 0, mild: 1, moderate: 2 and severe: 3), respectively (Table 1).

Determination of serum creatine kinase (CK) activities

The changes of serum CK activities along with each treatment were determined using an autoanalyzer (VETTEST, IDEXX, USA).

Statistical analysis

Statistical significances of the obtained results were analyzed by ANOVA of SPSS 12.0K for windows ($p < 0.05$).

Results

The change of clinical symptoms

The FNP symptoms (symmetry of lips and sialosis) showed

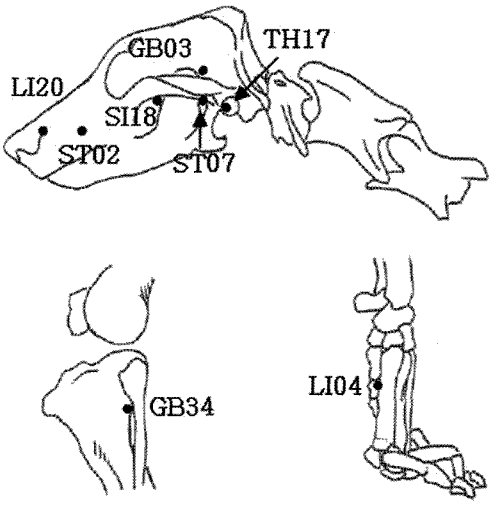

Fig 1. The acupoints used in this study.

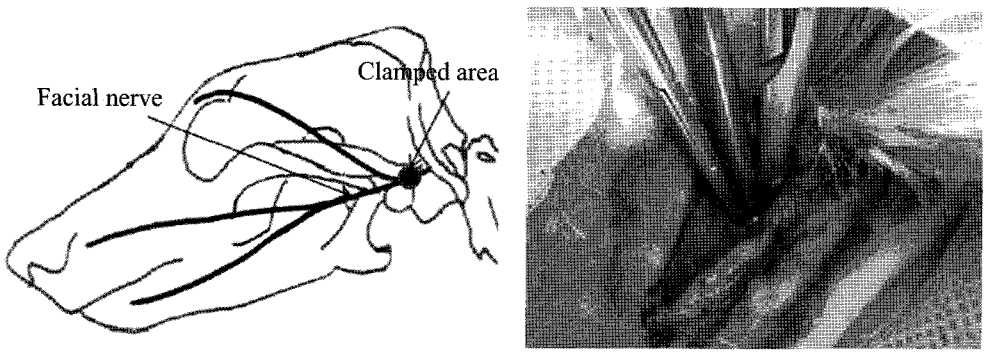

Fig 2. Surgical procedure for facial nerve paralysis in a dog (facial nerve was clamped by 3 hemostatic forceps for 20 minutes).

Table 1. The clinical sign evaluation criteria

Clinical sign	Score	Definition
lips	0	Normal
	1	Mild, end of the lips are turned over and slight drooped
	2	Moderate, lips are drooped to the jawbone
	3	Severe, lips are drooped over the jawbone
Sialosis	0	Normal
	1	Mild, some saliva at end of the lips
	2	Moderate, drooping at times
	3	Severe, always drooping

no improvement at all by day 14 in the control group; however, the FNP symptoms greatly improved by day 14 in the dexamethasone and apitoxin groups, respectively (Fig 3). The significant differences of the clinical scores were detected on day 14 ($p < 0.05$) in the dexamethasone and apitoxin groups, compared with those in the control group, respectively. However, significant differences were not detected between the dexamethasone and apitoxin groups (Table 2).

The change of serum CK activities

Serum CK activities were increased until Day 7 and then slightly decreased until day 14 in the control group. On the contrary, they showed a slightly decreasing pattern till Day 14 in the dexamethasone group and they showed a slight increasing tendency in the apitoxin group. Significant differences were detected on day 7 ($p<0.05$) and day 14 ($p<0.05$) in the dexamethasone and apitoxin groups, compared with

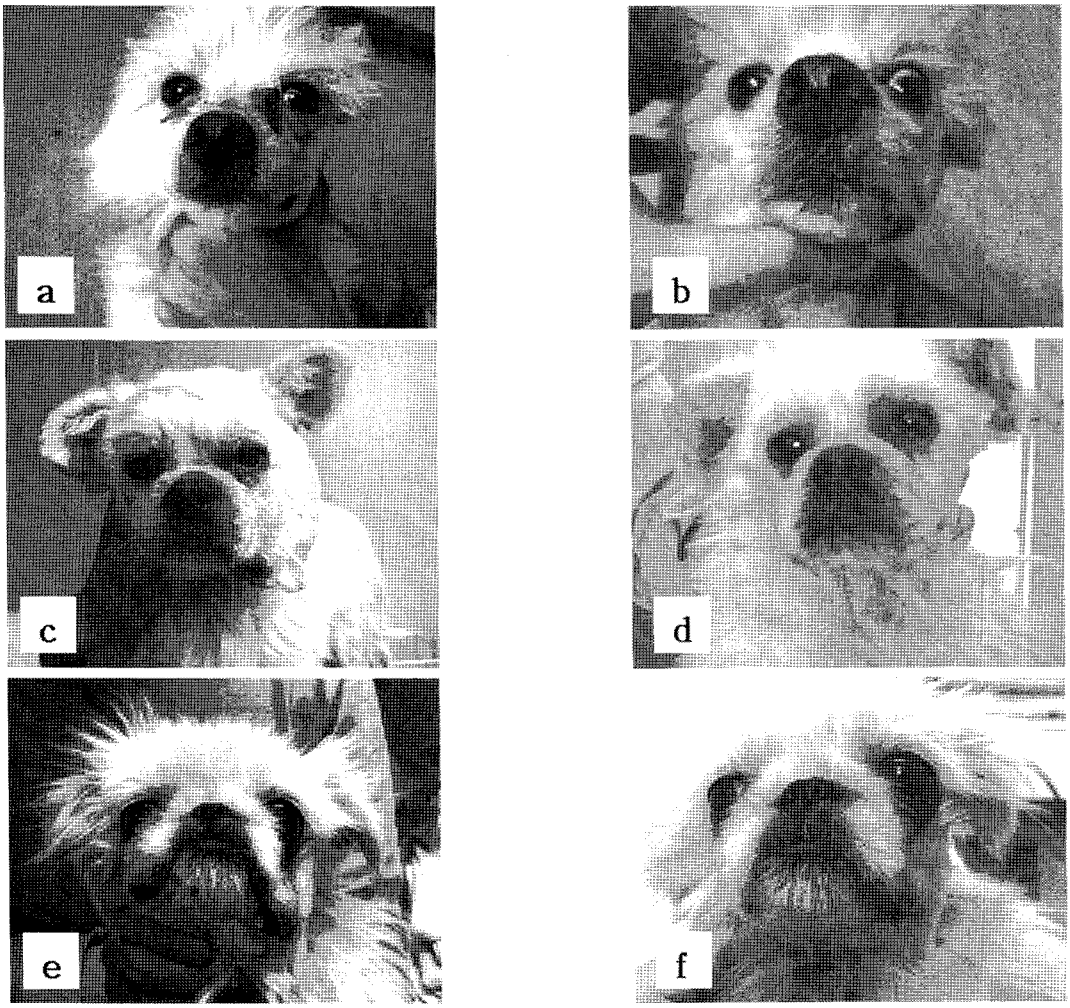

Fig 3. The changes of FNP symptoms in experimental groups (a: day 0 in control group, b: day 14 in control group, c: day 0 in dexamethasone group, d: day 14 in dexamethasone group, e: day 0 in apitoxin group, f: day 14 in apitoxin group).

Table 2. The change of clinical symptoms in experimental groups

	Days after induction of FNP			
Groups	pre	0	7	14
Control	0.0±0.00	3.5±1.00	3.8±0.96	3.75±0.96
Dexamethasone	0.0±0.00	4.3±2.06	2.0±1.63	0.5±0.58*
Apitoxin	0.0±0.00	3.5±1.29	1.75±1.50	0.5±0.58*

(Results are shown as the mean ± S.D.*; significant difference between control and experimental treated groups, $p < 0.05$)

Table 3. The change of serum CK activities in experimental groups

	Days after induction of FNP			
Group	Pre	0	7	14
Control	125.0±25.86	161.3±38.38	835.8±180.04	638.3±89.82
Dexamethasone	102.0±29.70	103.5±11.62	81.5±9.04*	70.5±27.83*
Apitoxin	129.8±31.38	124.8±45.98	143.0±114.49*	241.3±170.91*

(Results are shown as the mean ± S.D. *; significant difference between control and experimental treated groups, $p < 0.05$)

cance was not detected among the dexamethasone and apitoxin groups (Table 3).

Discussion

Most canine FNP can occur by idiopathic cause, however, it is known that FNP is caused by the deficiency of qi and blood in Traditional Oriental Medicine (5). Symptomatic therapy can be commonly applied for treatment of FNP, however, no treatment exists for canine idiopathic FNP in Western medicine (13).

On the other hand, was known that 6 to 10 needle-AP and electro-AP treatment using the acupoints such as ST02, ST03, ST06, SI18, GB20 and GB20A, separated by not longer than 7 days usually produced significant improvement in human FNP patients (13). The including GB14, BL01, ST02, LI20, ST04, ST06 and ST08 as local points, and ST36, SP06, GB20, LI04, TH05, TH17 and GB34 as distal points were used for treatment of human patients with FNP (11). In addition, the acupoints such as ST04, SI18, ST02, ST03, ST06, ST07, LI20, GV26, GB20, LI04, ST36 and ST44 were used for treatment of horse patients with idiopathic FNP (14). The acupoints including LI20, ST02, ST07, SI18, TH17 and GB03 as local points, and GB34 and LI04 as distal points were used for treatment of canine patients with idiopathic FNP (3). Furthermore, Jeong *et al.* (3) reported that complete symmetry of the face was achieved after 4 weeks treatment (every other day for one week and once a week for 3 weeks) with needle-AP. In the present study the authors also used similar acupoints as those by Jeong *et al.* (3), however, the improvement of the clinical symptoms of canine FNP could be achieved by injection-AP with dexamethasone and apitoxin within 2 weeks. There are many reports that injection-AP is more effective than that of needle-AP in therapeutic effects for treatment of humans and animal diseases (8,22). In addition, therapeutic effects of apitoxin were investigated in human pain control, inflammatory diseases such as human and animal arthritis, pain-releasing, anti-cancer effects, laminitis etc (1,5,12,15). It is thought that favorable therapeutic responses from injection-AP with dexamethasone and injection-AP with apitoxin in the present study are caused by the anti-pain and anti-inflammatory action of dexamethasone and apitoxin.

Because serum CK activities can be demonstrated in the central nervous system, cardiac muscle and skeletal muscle, serum CK activities can be used for differential diagnosis of several diseases including the CNS system, cardiac and skeletal muscular diseases (6,21).

Decreasing patterns of serum CK activities from injection-AP with dexamethasone and apitoxin contrary to those of the control group were observed in the present study. It was thought that the change of serum CK activities reflected the improvement of clinical symptoms. In addition, it was an interesting fact that difference of the therapeutic effect on canine FNP between injection-AP with dexamethasone and injection-AP with apitoxin was not found in the present study. Accordingly, it was thought that injection-AP with apitoxin could be an alternative method for treatment of canine FNP. The therapeutic effect of injection-AP with apitoxin and dexamehasone was investigated on artificially induced canine FNP in the present study, however, various research studies using naturally occurred patients with canine FNP should be performed in the near future.

In conclusion, injection-APs with dexamethasone and apitoxin were all effective for treatment of canine FNP and the therapeutic effect of injection-AP with apitoxin was similar to that of injection-AP with dexamethasone.

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개 안면신경마비에 대한 봉독과 덱사메타손의 치료효과

전형규 · 오현욱 · 한지원 · 이현화 · 정성목 · 최석화* · 김문호** · 김덕환[1]

충남대학교 수의과대학, *충북대학교 수의과대학, **안아픈세상 병원

요 약 : 사람에서와 같이 개에서도 안면신경마비가 발생되지만, 특발성 원인에 의한 안면신경마비에 대한 유용한 서양의학적 치료 방법이 없는 실정이다. 따라서 개 안면신경마비에 대한 약침의 치료 효과를 알아보기 위하여 인공 유발된 개 안면신경마비에 대하여 약침의 효과를 실험하였다. 안면신경마비가 인공적으로 유발된 12두의 개는 대조군(4두), 덱사메타손 투여군(4두) 및 봉독 투여군(4두)로 나누어 공시하였다. 안면신경마비 유발 후 대조군은 식염수 1 ml을 머리 근육에 일주일에 두 번 근육주사 하였다. 반면에 덱사메타손 투여군과 봉독 투여군은 합곡, 영향, 사백, 하관, 예풍, 권료, 상관 및 양릉천 혈위에 각각 덱사메타손과 봉독을 일주일에 두 번 약침하였다. 실험 기간 동안 안면신경마비에 대한 임상증상과 혈중 creatine kinase(CK) 활성의 변화를 각각 검토하였다. 임상증상은 치료 14일에 봉독 투여군과 덱사메타손 투여군이 대조군에 비하여 유의성 있는 저치를 보였으나 봉독 투여군과 덱사메타손 투여군 간에는 유의성이 인정되지 않았다. 혈중 CK 활성의 변화는 치료 7일 및 14일에 봉독 투여군과 덱사메타손 투여군이 대조군에 비하여 유의성 있는 저치를 보였으나, 봉독 투여군과 덱사메타손 투여군 간에는 유의성이 인정되지 않았다. 따라서, 개 안면신경마비의 치료에 봉독과 덱사메타손 약침이 효과적이었으며, 그 효과는 유사한 것으로 판단되었다.

주요어 : 약침, 봉독, 개, 안면신경마비