

## **Effect of BL-21 (Wei-Yu) acupoint stimulation on gastric motility following preanesthetic treatment in dogs**

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In acupuncture practice of animals, preanesthetics sometimes are needed. The purpose of this study was to select the ideal chemical restraint at acupuncture for gastric motility. Nine healthy mixed breed dogs weighed 10-21 kg and aged 1-3 years old were used in this study. Two EMG surface electrodes were placed between the seromuscular and the mucosal layer of pylorus. Twenty minutes after feeding normal gastric motility was recorded for 60 minutes using physiograph (Narco-Biosystem). Then preanesthetic treated-gastric motility was observed for 30 minutes. Preanesthetics used were xylazine, diazepam, and acepromazine. Acupuncture needles were inserted to BL-21 (Wei-Yu) acupoint, and then changes of gastric motility were recorded for 60 minutes. The gastric motility following xylazine administration (1 mg/kg, IV) was markedly decreased. BL-21 (Wei-Yu) acupoints stimulation did not alter xylazine-induced depression of gastric motility. The diazepam (1 mg/kg IV) treated-gastric motility was increased mildly 20 minutes after drug administration. BL-21 (Wei-Yu) acupoint stimulation after diazepam administration enhanced gastric motility significantly. The gastric motility following acepromazine (0.3 mg/kg, IM) administration was not changed compared with normal gastric motility. Application of traditional acupuncture at BL-21 (Wei-Yu) significantly increased the gastric motility. Based on these results, acepromazine and diazepam could be acceptable chemical restraints for acupuncture therapy of gastric motility, but xylazine couldn't be.

**key words:** gastric motility, dog, acupuncture, preanesthetics

### **Introduction**

Stimulation of acupoints has various physiologic effects on

the gastrointestinal system, including gut motility and secretions [13, 18, 15, 16]. Acupuncture may be used effectively in cases of inadequate response to conventional western therapy [8, 30, 5, 23, 14].

There are difficulties in applying acupuncture to fractious, uncooperative, or aggressive animals. In such cases acupuncturist needs chemical restraints which aid in an animal restraint by modifying behavior, reducing stress and eliminating or minimizing pain.

But a number of chemical restraints influence on gastric emptying-most commonly delay results [21, 29, 9]. They may also impede the effects of acupuncture for gastric motility.

There are few reports about chemical restraint for acupuncture. The purpose of this study was to select the ideal chemical restraint that produces adequate restraint without alteration to gastric function and acupuncture effectiveness.

### **Materials and Methods**

#### **Experimental Animals**

Nine healthy mixed breed dogs weighed 10-21 kg and aged 1-3 years old were used in this study. Dogs were housed in stainless-steel cage and fed at 9 a.m. each day.

#### **Electrodes implantation**

Dogs were premedicated with acepromazine (Sedaject®, Bayer Korea co., Korea, 0.3 mg/kg, IM) and atropine sulfate (Hwangsan atropine®, Je Il co., Korea, 0.05 mg/kg, SC). Ampicillin (Penbrex®, Sam Yang co., Korea 20 mg/kg, IM) and enrofloxacin (Baytril®, Bayer Korea co., 5 mg/kg, IV) were administered. Anesthesia was induced in dogs with thiopental sodium (Thionyl®, Dai Han co., Korea, 15 mg/kg, IV). Dogs were intubated, and anesthesia was maintained at a surgical plane with isoflurane (Aerane®, Il Sung co., Korea). Electrolyte solution (10 mg/kg/h) was administered intravenously during the procedure. The dog was positioned in dorsal recumbency for midline celiotomy. Two electromyography (EMG) surface electrodes

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of 9 mm pure tin disc with central hole (SEA-924, The Electrode Store, USA) were placed between the seromuscular and the mucosal layer of pylorus. Two tips were 5 mm apart. Wires from each electrode were led out through subcutaneous tunnel at the right flank.

### Electrogastrograms (EGMGs) recording

Gastric electrical activities were recorded on the eighth day after implantation of electrodes. Twenty minutes after feeding normal gastric motility was recorded for 60 minutes with a physiograph (Narco Biosystem, USA). Then preanesthetic treated-gastric motility was observed for 30 minutes.

### Preanesthetics

Preanesthetics used were diazepam (Diazepam®, Myong In co., Korea), acepromazine (Sedaject®, Bayer Korea co., Korea) and xylazine (Rompun®, Bayer Korea co., Korea).

### Acupuncture

Acupuncture was applied to BL-21 (Wei-Yu). The

acupuncture needles were maintained for 20 minutes after manual stimulation. Then changes of gastric motility were recorded for further 60 minutes. BL-21 (Wei-Yu) is located at the tip of the transverse process of the first lumbar vertebra, in the groove between the longissimus lumborum and iliocostalis lumborum muscles.

### Statistical Analysis

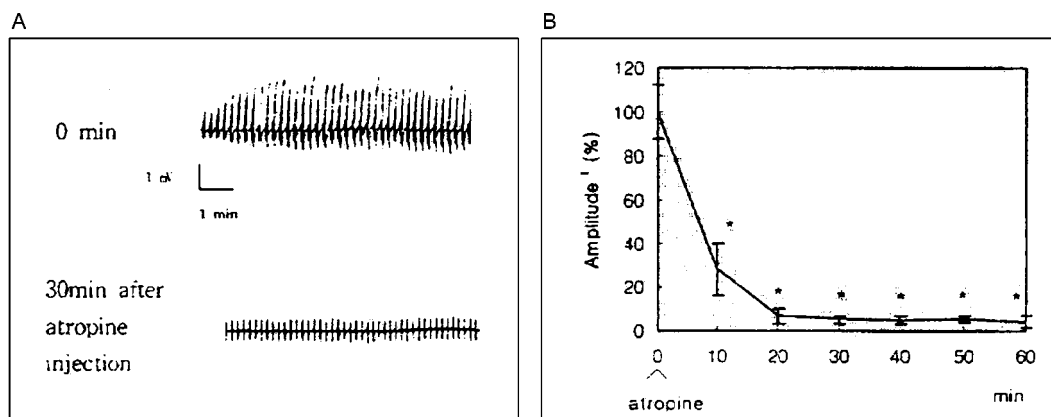
Students *t*-test was used to compare the change of amplitude of slow wave.

## Results

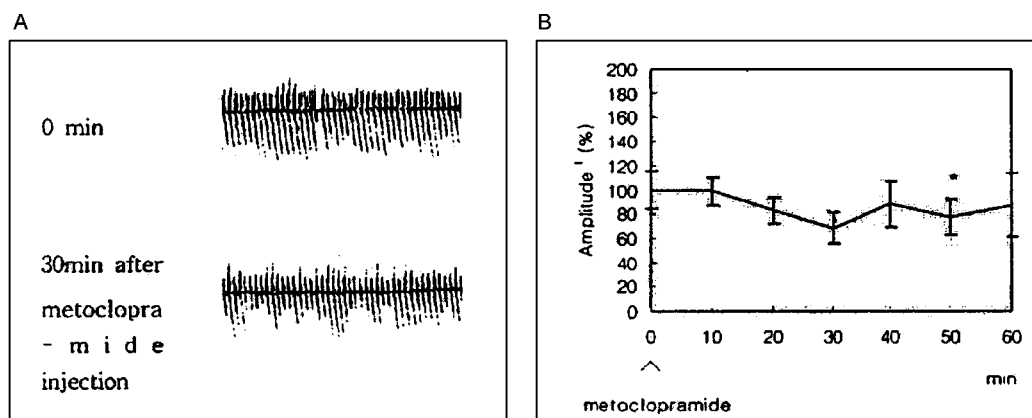
### Basic gastric motility

A normal electrogastrograph pattern was suppressed by atropine sulfate injection. Gastric motility following administration of atropine sulfate exhibited basic electrical rhythm (BER) without action potentials (AP). It was mostly ceased around 20 minutes and lasted for approximately 90 minutes (Fig. 1).

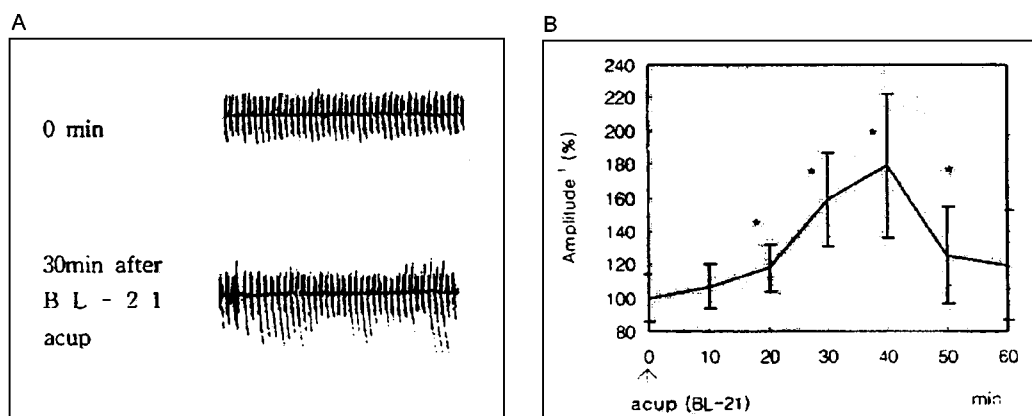
Metoclopramide treatment showed depressive effect on



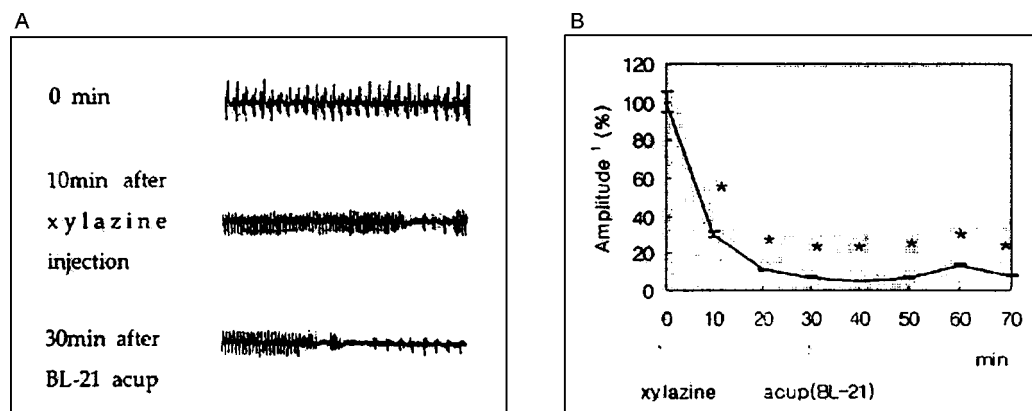
**Fig. 1.** Gastric motility following administration of atropine sulfate (0.05 mg/kg, IM) in dogs (A and B). \*Significantly different from the amplitude of 0 minute ( $p < 0.05$ ). The amplitude is expressed as percentage compared with the amplitude of 0 minute.



**Fig. 2.** Gastric motility following administration of metoclopramide (1 mg/kg, IM) in dogs (A and B). \*Significantly different from the amplitude of 0 minute ( $p < 0.05$ ). The amplitude is expressed as percentage compared with the amplitude of 0 minute.



**Fig. 3.** Gastric motility following traditional acupuncture at BL-21 (Wei-Yu) in dogs (A and B). \*Significantly different from the amplitude of 0 minute ( $p < 0.05$ ). The amplitude is expressed as percentage compared with the amplitude of 0 minute.



**Fig. 4.** Response to BL-21 (Wei-Yu) acupoint stimulation on xylazine treated-gastric motility in dogs (A and B). \*Significantly different from the amplitude of 0 minute ( $p < 0.05$ ). The amplitude is expressed as percentage compared with the amplitude of 0 minute.

slow-wave amplitude (action potential) in EGMG after 30 and 50 minutes of treatment. But, there was no alteration to the slow-wave frequency (Fig. 2).

#### Gastric motility following traditional acupuncture at BL-21 (Wei-Yu) acupoint

The gastric motility was accelerated by acupuncture at BL-21 (Wei-Yu) acupoints from 20 to 50 minutes and mostly after 40 minutes (Fig. 3).

#### Effect of BL-21 (Wei-Yu) acupoint stimulation on gastric motility following preanesthetic treatment

The amplitude of gastric motility following xylazine administration (1 mg/kg, IV) was decreased markedly. The frequency (12 cycle/min) following xylazine was increased compared with gastric motility of 0 minute (4.5 cycle/min). But the acupuncture treatment at BL-21 (Wei-Yu) acupoint 30 minutes after xylazine administration did not alter previously depressed gastric motility (Fig. 4).

The diazepam (1 mg/kg, IV) treated-gastric motility was increased significantly 20 minutes after administration ( $p <$

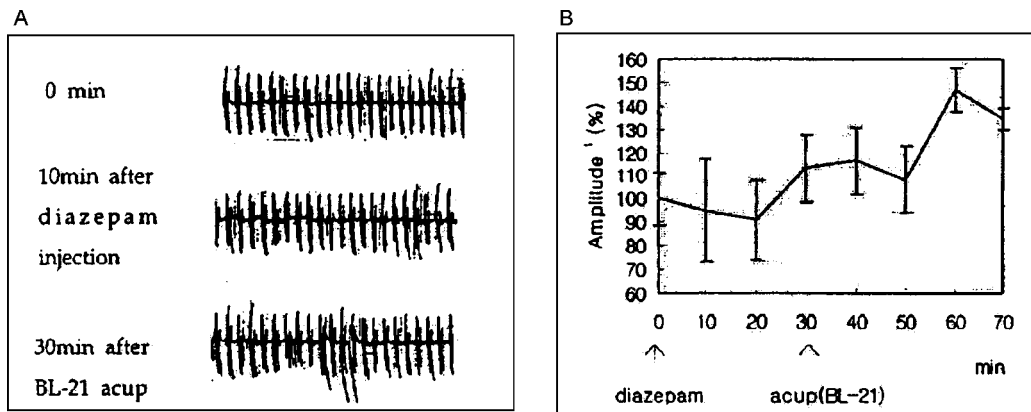
0.05). BL-21 (Wei-Yu) acupoint stimulation applied 30 minutes after diazepam administration significantly enhanced gastric motility ( $p < 0.05$ ) (Fig. 5).

The gastric motility following acepromazine (0.3 mg/kg, IM) administration was not changed compared with the gastric motility of 0 minute. Application of traditional acupuncture at BL-21 (Wei-Yu) increased significantly ( $p < 0.05$ ) the gastric motility (Fig. 6).

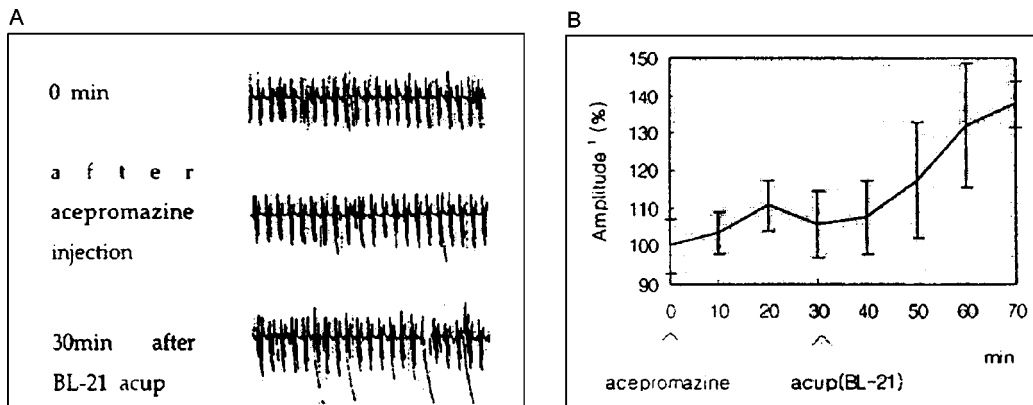
#### Discussion

The electrogastronomyograms (EGMG) show the two wave forms of electric activity in the stomach as basic electrical rhythm (BER) and burst of action potentials (AP). Action potentials are superimposed on the cycles of BER and always appeared just after the triphasic complex. When peristaltic contractions occur in the stomach, AP then accompanies BER. The greater the amplitude and duration of AP burst, the greater the strength and duration of the resulting contractions [15, 4].

The EGMG revealed only BER without AP when gastric



**Fig. 5.** Response to BL-21 (Wei-Yu) acupoint stimulation on diazepam treated-gastric motility in dogs (A and B). \*Significantly different from the amplitude of 0 minute ( $p < 0.05$ ). The amplitude is expressed as percentage compared with the amplitude of 0 minute.



**Fig. 6.** Response to BL-21 (Wei-Yu) acupoint stimulation on acepromazine treated-gastric motility in dogs (A and B). \*Significantly different from the amplitude of 0 minute ( $p < 0.05$ ). The amplitude is expressed as percentage compared with the amplitude of 0 minute.

contractile activity was completely abolished by atropine.

Of the variables used to characterize gastric electrical and contractile activities in this study, only slow-wave (action potential) dysrhythmia was significantly different after metoclopramide treatment. Metoclopramide has been used extensively for treatment of proximal gastrointestinal tract dysfunction [3]. Studies in human beings have established that metoclopramide significantly accelerated gastric emptying in patients with clinical disorders associated with gastric stasis [22]. But in dogs, delayed gastric emptying and increased slow-wave propagation velocity in the nonfed and fed states have been documented after surgical treatment and recovery from gastric dilation-volvulus [12]. Jean *et al.* reported that metoclopramide did not alter gastric electrical or contractile activities in control dogs or dogs with GDV after surgical treatment and recovery. Results of this study suggest that gastric electrical and contractile activities in conscious dogs were resistant to metoclopramide treatment. During the postprandial state, metoclopramide had no significant effect on gastric contraction [11].

The gastric motility was mostly enhanced by stimulation of BL-21 (Wei-Yu) acupoint. BL-21 (Wei-Yu) acupoint has been known to have effects on gastric distention, gastric torsion, gastritis, gastric ulcers, vomiting, abdominal pain and so on [24]. Nam *et al.* (1994) reported that electrical stimulation on BL-21 (Wei-Yu) greatly accelerated the ruminal contractile movement in cattle and had good effects on ruminal atony and tympany. But Kudo *et al.* (1991) reported that electrical stimulation on BL-21 (Wei-Yu) depressed gastric contraction in dogs. The results of Kudo were not accorded with the results of this study. It is considered that further study would be necessary.

Chemical restraints might be used to acupuncture for more fractious or uncooperative patients. But many restraints show the gastric emptying delay [19, 28, 21, 10, 31, 17].

The gastric motility following intravenous xylazine injection was markedly depressed. Xylazine significantly prolonged gastric emptying time in dogs and ponies [7, 25]. Xylazine is unacceptable chemical restraint for acupuncture therapy because it impeded the effect of BL-

21 (Wei-Yu) acupoint stimulation.

It was reported that acepromazine had a sufficiently long duration of action without any apparent effect (retard or acceleration) on the passage of barium sulfate through the stomach and duodenum of dogs [31]. It is considered that acepromazine is acceptable restraint for acupuncture therapy because acepromazine did not alter normal gastric motility and the effects of acupuncture action.

The influences of diazepam on gastric motility were controversial. Steyn *et al.* (1997) advocated that solid phase gastric emptying was significantly delayed when diazepam was used as an appetite stimulant in normal cats. But many studies showed that diazepam had no significant influence on gastrointestinal transit in cat, man and so on [6, 2, 26, 2, 29]. This study demonstrated that diazepam had little effect on gastric motility. Application of traditional acupuncture at BL-21 (Wei-Yu) after diazepam administration significantly enhanced the gastric motility. Diazepam may be acceptable chemical restraints for acupuncture therapy.

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