

Electroacupuncture regional analgesia in cattle

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소에서의 電針傳達麻酔

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초 목 : 소에서는 전신마취보다 전달마취로써 대부분의 수술을 수행한다. 본 연구는 9두의 소에서 요방 1혈(제 1요추 횡돌기의 전단), 요방 2혈(제 2요추 횡돌기 후단) 그리고 요방 4혈(제 4요추의 횡돌기 후단)에 침을 삽입하고 2.0~9.5volt와 주파수 30Hz로 통전하여 각종 수술을 실시하였다.

마취 도입에는 10~25분이 소요되었고, 9두중 7두(78%)에서 전침전달마취만으로, 2두(22%)는 추가 침윤마취로 수술을 원만하게 완료할 수 있었다.

이상의 결과 소에 대한 전침전달마취는 복강수술을 위해서 특히 poor risk 상태에서는 활용될 수 있을 것으로 생각된다.

Key words : Electroacupuncture, regional anesthesia, acupoints, electrostimulation.

Introduction

Acupuncture anesthesia is a form of analgesic methods

making it possible to operate patients under full consciousness by stimulation through the needle inserted into acupoints. The true concept of acupuncture anesthesia is analgesia and not anesthesia. However, the term of a-

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cupuncture anesthesia is clinically used because surgical procedure under acupuncture analgesia can be performed.

There are some methods in producing acupuncture analgesia; manual stimulation of the needles inserted into acupoints, electrostimulation with electrostimulator connected to the needles, and injection of medicaments into acupoints.

The advantages of acupuncture anesthesia are its easiness, safety, minimal effects on physiological function, inexpensiveness, and others. Disadvantages are long period of onset, incomplete analgesic action, muscular tension, and pain due to traction of viscera.

There are systemic and regional anesthesia in electroacupuncture anesthesia. For general electroacupuncture analgesia groups of Chang feng-San yang lo acupoints(China), Tien ping-Bai hui(Japan) and San yang lo~Xi men-San yin chiao~Fu yang(Korea) were reported to be effective¹. For regional electroacupuncture anesthesia some reports on the combinations of acupoints which are related with operating sites were introduced².

A number of cases in need of abdominal operations such as rumenotomy, correction of abdominal displacement have been encountered in bovine clinic. Standing position is usually more desirable than recumbency for these operations. Abdominal surgery under standing posture is generally performed with premedication and infiltration or paravertebral anesthesia³.

Brunner⁴ described the acupuncture analgesia techniques for operation on large domestic animals. Acupuncture analgesia was used for cesarean section in a cow, 5 for repair of abnormal abdominal vent in a bullock and for abdominal surgery in bovines⁶.

In this paper the effectiveness of electroacupuncture regional anesthesia for bovine abdominal surgery was examined.

Materials and Methods

Experimental animals : Animals used in this experiment were 9 healthy, 2 to 3 years old, 200 to 400kg Korean native cattle (3 males, 6 females). Four heads for laparotomy, 3 for rumenotomy and 2 for omentopexy were performed with

electroacupuncture regional anesthesia(Table 1).

Table 1. Abdominal operations of Korean native cattle under electroacupuncture anesthesia

Animal No.	Age(Y)	B.W.(kg)	Sex	Abdominal operation
1	2	200	♀	Laparotomy
2	3	400	♂	"
3	3	300	♂	Rumenotomy
4	2	200	♀	"
5	3	300	♀	Omentopexy
6	3	300	♀	"
7	3	200	♂	Laparotomy
8	3	300	♀	Rumenotomy
9	2	200	♀	Laparotomy

Combination of acupoints : Three acupoints were selected; The anterior end part of transverse process of 1st lumbar(Yao pang 1), the posterior end part of transverse process of 2nd lumbar(Yao pang 2), and 4th lumbar(Yao pang 4) as shown in Fig 1.

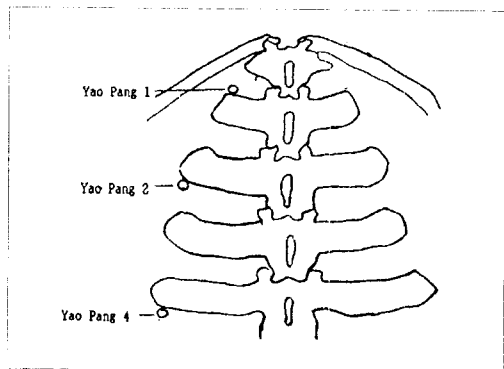


Fig 1. Acupuncture points for electroacupuncture regional analgesia in cattle.

Round needles were inserted antero-ventrally into these three acupoints. Yao pang 1 and 4 acupoints were connected to channel A of stimulator(TEC pulse stimulation AM 3000, TENKA Co. Japan), and Yao pang 2 and 4 were connected to channel B of stimulator. Both channels of Yao pang 4 were connected to cathodes.

Electroacupuncture analgesia : After premedication with 2% xylazine(0.5ml/100kg B.W.) IM, the acupoints were stimulated with the currents of 1.0~5.0 voltages and the frequencies of 30Hz. The currents were gradually increased to 4.0~9.5 volts according to the animal status until adequate analgesia was achieved.

Attainment of regional anesthesia : Disappearance of pain against pricking on the incision line and skin wrinkle shown on the flank region was judged as good analgesia. When the skin of flank was inflated, the currents were slightly reduced.

Restraint : Electroacupuncture anesthesia was performed at standing position.

Abdominal operations : Under electroacupuncture anesthesia operations such as laparotomy, rumenotomy, and omentopexy were conducted.

Results

The results of regional electroacupuncture anesthesia for 9 Korean native cattle were summarized in Table 2.

Table 2. Results of electroacupuncture anesthesia in Korean native cattle

Animal No.	Electrical currencty		Induction time(min)	Results
	Frequency(Hz)	Voltage(V)		
1	30	4.0~9.5	22	good
2	30	4.0~7.0	14	good
3	30	4.0~8.0	10	good
4	30	2.0~4.0	25	poor
5	30	5.0~9.5	10	fair
6	30	2.5~6.0	10	good
7	30	1.0~2.0	15	good
8	30	1.0~5.5	10	good
9	30	2.0~4.0	15	poor

Good : operation could be efficiently completed under electroacupuncture analgesia(EAA) alone.

Fair : operation could be efficiently performed under EAA, but some struggles during operation were observed.

Poor : operation could not be accomplished under EAA without additional infiltration anesthesia.

The frequency was kept uniformly 30Hz but the current

was controlled according to the depth of anesthesia ranged from 1.0 to 9.5 volts.

A latency of 10 to 25 minutes was required to induce regional anesthesia.

The effects of electroacupuncture anesthesia were good in 6 heads of 9 (68%), fair in 1(11%) and poor in 2(22%).

In poor 2 cases, it was impossible to complete abdominal surgery under the electroacupuncture regional anesthesia, without additional infiltration anesthesia.

Pain responses were recovered to normal within 5 minutes after the needles were withdrawn.

Discussion

Thirteenth thoracic, 1st and 2nd lumbar nerves are distributed in the flank of cattle. The flank region is desensitized by infiltration of local anesthetic around these nerve trunks. In this study, three acupoints which are close to these nerves were selected for electroacupuncture regional analgesia : Yao pang 1(anterior end part of transverse process of 1st lumbar vertebra), Yao pang 2(posterior end part of transverse process of 2nd lumbar vertebra) and Yao pang 4(posterior end part of transverse process of 4th lumbar vertebra). It was considered that the exact insertion of the needles to acupoint in electroacupuncture was less critical than in manual acupuncture because electrostimulation could be spread wildly around the acupoints.

Current conditions such as frequency, voltage and polarity of electrode is important in electroacupuncture anesthesia.

The frequency and voltages for electroacupuncture anesthesia in cattle were 20~30Hz and 5.3~5.6 volts by Suh and Han⁷, 10~30 Hz and 7~9 volts by Kazawa *et al*⁸, and 30Hz and 2.0~9.5 volts by Harata *et al*⁹. In this experiment, current flow was 30Hz and 2.0~9.5 volts.

The best result was obtained when anode was connected to peripheral region and cathode was connected to cranial region in acupuncture anesthesia of rabbit¹⁰.

In this study, the anode was connected to the anterior end of transverse process of 1st lumbar vertebra, and to posterior end of transverse process of 2nd lumbar vertebra, and the cathode to the posterior end of transverse process of 4th

lumbar vertebra. The anesthetic effect under this arrangement was relatively good. However, further study for changing the polarity of electrode must be performed in the future.

Electrostimulation to Tien ping - Bai hui acupoints caused the patient to be recumbency. But the stimulation to Yao pang acupoints in this study could maintain standing position during the anesthesia.

Skin folds were appeared at the induction period of electroacupuncture anesthesia. The pain response to the incision line of the flank region was disappeared following skin wrinkles². A latency of 10 to 25 minutes to induce anesthesia was required in this study.

Harata *et al*⁹ reported that it took long time to produce the effects of anesthesia. Harata *et al*⁹ performed the correction of abomasal displacement and rumenotomy under electro-acupuncture anesthesia with the combination of Tien ping-Bai hui and Yao pang 1-Yao pang 3 acupoints.

White *et al*¹¹ reported that they got a sufficient anesthetic stage to operate abdominal wall in standing position through electro-stimulation of Yao pang 1, Shen men, and Bai hui acupoints in two dairy cows.

Abdominal surgery by electrostimulation to Yao pang 1 and 2 acupoints in the horse was possible with 30-50Hz and tolerable currents.

In this experiment rumenotomy and correction of abomasal displacement could be done satisfactorily with electroacupuncture on the combination of Yao pang 1, 2 and 4 acupoints. However, a number of electroacupuncture techniques such as frequency, voltage and polarity of current would be clearly resolved.

Conclusion

Electroacupuncture regional anesthesia to the anterior end part of transverse process of 1st lumbar vertebra(Yao pang 1), the posterior end part of transverse process of 2nd lumbar vertebra(Yao pang 2) and the posterior end part of transverse process of 4th lumbar vertebra(Yao pang 4) with

the currents of 30Hz and 2.0 to 9.5 voltage was performed for the operation of the flank region in Korean native cattle.

Regional anesthesia was successfully induced for abdominal operations in 7 of 9 cattle under the electroacupuncture on 3 acupoints ; Yao pang1, 2 and 4.

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