

Acupuncture analgesia and its application in cranio-maxillofacial surgical procedures

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SUMMARY. Background: The present study investigated the use of acupuncture analgesia in maxillofacial surgery. Patients and methods: Acupuncture analgesia was applied in 120 patients. In 20 of these, surgery was carried out under general anaesthesia in combination with acupuncture analgesia. In 100 patients, acupuncture analgesia was applied in addition to traditional postoperative analgesia. In case of troublesome postoperative pain, it was necessary to carry out additional sessions (1–4) of acupuncture stimulation. Results: When acupuncture analgesia was used, the pulse rate and blood pressure during surgery generally remained stable. In the present study serum cortisol was also measured and showed only minor elevation. Discussion: The present study demonstrated favourable results when the first variant of the brake method of acupoint stimulation was used for 40–50 min with additional manual twirling of the needles. This involved inserting needles into the acupoints and, using slow, rolling manual movements increasing the amplitude step-by-step provoking simultaneous especially strong patient sensations. Conclusion: Acupuncture analgesia can be a useful adjunct to conventional anaesthesia in maxillofacial surgery. © 2004 European Association for Cranio-Maxillofacial Surgery

Keywords: Analgesia; Acupuncture; Surgery; Postoperative pain

INTRODUCTION

General anaesthesia for surgical procedures has been widely practiced for many years. Unfortunately, not every patient can be safely operated upon in this way because of the side effects of conventional anaesthesia (Kataria et al., 1988; Anderson, 1992).

This paper reports the outcome of acupuncture analgesia in cranio-maxillofacial surgery. Acupuncture analgesia is a technique directed towards the relief of pain and regulation of the physiological function of the human body by needling. It aims to abolish pain during surgery by stimulating certain specific points. The authors studied acupuncture analgesia in 120 patients. 20 patients of these received acupuncture analgesia in combination with conventional anaesthesia. In the other 100 patients the technique was applied in addition to standard analgesics to alleviate postoperative pain.

Significant advances in the field of the anaesthetic research and active developments by the pharmaceutical industry have facilitated the performance of all surgical procedures. Relief of pain during surgery is provided by the administration of anaesthetic drugs. However, there is always the risk of adverse physiological side effects. The use of local anaesthesia in out-patient surgery also has the side effect that postoperative recovery may be slow and troublesome.

Postoperative pain relief is one of the most complex problems associated with surgery. Severe postoperative pain can destabilize pulse and blood

pressure, depress respiration, and limit the patient's activities. In addition, pain can produce adverse effects in the alimentary tract and urethra (Chapochnikov and Nikolaev, 1978; Ignatov et al., 1990; Puk, 1994).

All these led to an increased interest in acupuncture analgesia for cranio-maxillofacial surgery, especially if combined with sedation or general anaesthesia. According to Luvsan (1990), the earliest acupuncture analgesia techniques were attributed to Hua To (200 AD).

According to the literature, acupuncture analgesia has been employed in approximately 600 thousand operations with 90% of these procedures being successful and anaesthesia reported as being adequate (Zhang et al., 1981; Qin, 1996; Kitade and Ohyabu, 2000; Zhang et al., 2000; Yang et al., 2001).

The practice of acupuncture analgesia has been widely reviewed in the medical literature. However, few of the published papers contain statistical data or illustrations. The majority are purely descriptive perceptions of practicalities. Reports on effectiveness of the use of acupuncture in anaesthesia for surgery are controversial.

The aim of the present research was to rationalize the use of acupuncture analgesia in maxillofacial surgery by studying its influence on the level of pain at the operative site when specific acupuncture points were used. The most effective combinations of the acupuncture points were also studied.

PATIENTS AND METHODS

A randomized, controlled study involving 120 patients undergoing operative procedures at the Centre for Maxillofacial and Plastic Surgery of the Belarussian State Medical University in Minsk, aimed to assess the use of acupuncture analgesia. Only men aged 35–40 years were studied who were healthy apart from the stomatological condition under treatment. 20 patients of these received acupuncture analgesia *in combination* with traditional conventional anaesthesia during surgery as the latter was considered to be essential for the anticipated surgery. These patients comprised group I.

In group II, acupuncture analgesia was used in 100 patients during and after conventional anaesthesia to alleviate *postoperative pain* following eight types of maxillofacial surgery (Table 1).

Chemical anaesthesia alone was applied to 30 patients who were considered as the control group.

According to the time of operation all operations were divided into: (a) Duration of 45–60 min on average such as, surgical treatment for skull base fractures, osteosynthesis of mandibular fractures, surgical treatment for osteoradionecrosis (resection), (b) duration of 1.5–2.0 h on average such as, osteoplastic reconstruction of mandibular and maxillary defects, bimaxillary osteotomy, traumatic injuries of the facial nerve and its repair by end-to end anastomosis, surgical treatment for parotid tumours, temporalis muscle transposition for facial reanimation.

The cardiovascular state of all patients was studied (pulse, blood pressure, electrocardiography (ECG)). The serum cortisol level of both groups of patients was determined by the following method: cold blood was centrifuged and the supernatant serum was stored in disposable plastic test tubes held in liquid nitrogen at a temperature of -196°C . The hormone level was determined in nmol/l by means of cortisol marked with iodine 125 and placed in a gamma counter within 1 min for each test. The arithmetic mean of all blood cortisol levels found in the control group was considered as the normal base line (100%).

Table 1 – Diagnosis and operations carried out when acupuncture analgesia was applied with conventional general anaesthesia

| Diagnosis and surgical procedures | Number of patients | |
|--|--------------------|----------|
| | Group I | Group II |
| Surgical treatment for skull base fractures | 3 | 14 |
| Osteosynthesis of mandibular fractures | 3 | 16 |
| Osteoplastic reconstruction of mandibular and maxillary defects | 3 | 13 |
| Surgical treatment for osteoradionecrosis (resection) | 2 | 10 |
| Bimaxillary osteotomy | 2 | 14 |
| Repair of traumatic injuries of facial nerve by end-to end anastomosis | 2 | 7 |
| Surgical treatment for parotid tumours | 3 | 16 |
| Temporalis muscle transposition for facial reanimation | 2 | 10 |
| Total | 20 | 100 |

The research was carried out sequentially: stage 1—before surgery; stage 2—after the incision; stage 3—during the surgical intervention; stage 4—immediately after surgery. The effectiveness and adequacy of analgesia was determined by the calculated serum cortisol level, the dose of drugs administered during surgery and the subjective response of the patients.

The acupuncture meridians and points of application were chosen individually before each surgical procedure according to the Channel theory of human acupuncture described by *Nagayama (1973)* and *Niboyet (1973)*.

Channels of the human body related to the maxillofacial region and those passing directly through the operation site were determined for needle manipulation (Figs. 1–3) by *Chen Jing (1990)*. These were:

- *Yang Channels*: LI—the Large Intestine Channel of Hand-Yangming; SI—the Small Intestine Channel of Hand-Taiyang; St—the Stomach Channel of Foot-Yangming; GB—the Gall Bladder Channel of Foot-Shaoyang; TH—the Triple Heater Channel of Hand-Shaoyang; BI—the Urinary Bladder channel of Foot-Taiyang. The Channels passing directly through the operation site were considered as the most important.
- *Yin Channels*, recommended to be used by *Luvsan (1990)*: LU—the Lung Channel of Hand-Taiyin; SP—the Spleen-Pancreas Channel of Foot-Taiyin; Ht—the Heart Channel of Hand-Shaoyin; K—the Kidney Channel of Foot-Shaoyin; HC—the Pericardium Channel of Hand-Jueyin.

The following acupuncture points were selected for stimulation:

- *On Yang Channels*: Li4 (Hegu), Li10 (Shousanli), Li11 (Quchi), SI3 (Houxi), SI14 (Jian waishu), SI15 (Jian zhogshu), St2 (Sibai), St10 (Shuitu), St26 (Wailing), St36 (Zusanli), BI11 (Dazhu), BI62 (Shenmai), TH20 (Jiaosun), GB1 (Tongziliao), GB20 (Fengchi), GB21 (Jianjing), GB22 (Yuanye), GB26 (Daimai), GB38 (Yangfu).
- *On Yin Channels*: LU7 (Lieque), SP6 (Sanyinjiao), Ht1 (Iiguan), Ht5 (Tongli), Ht7 (Shenmen), K6 (Zhaohai), K15 (Zhongzhu), HC6 (Neiguan).

The following acupuncture points were also stimulated:

- points of Eight Extra Channels: GV4 (Mingmen), GV12 (Shenzhu), GV14 (Dazhui), CV22 (Tiantu), CV23 (Lianquan);
- related acupuncture points on the hand and the foot (*Puk, 1994*).

The first variant of the brake method was used to stimulate the acupuncture points: needles were inserted into the acupoints and using slow, rolling manual movements increasing the amplitude step by step at the same time provoking especially strong patient sensations (gravity, breaking, growing numb,

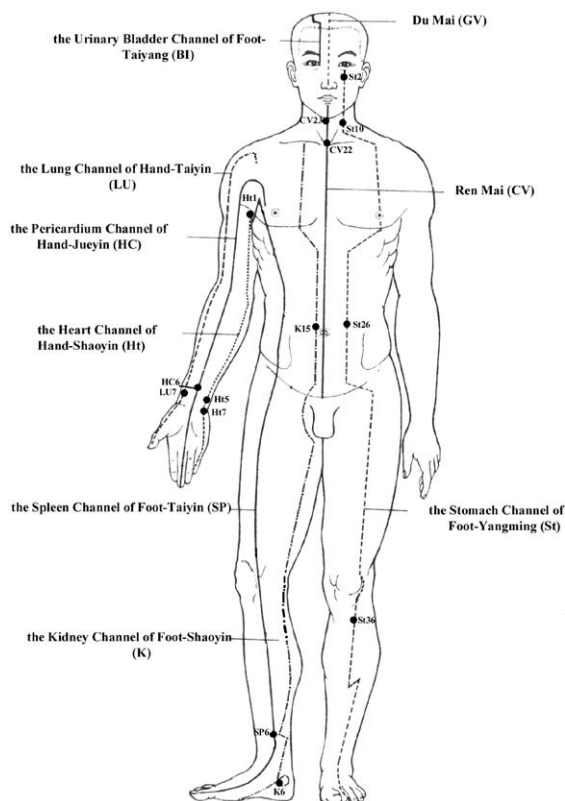


Fig. 1 – Distribution of channels and related acupuncture points (anterior view).

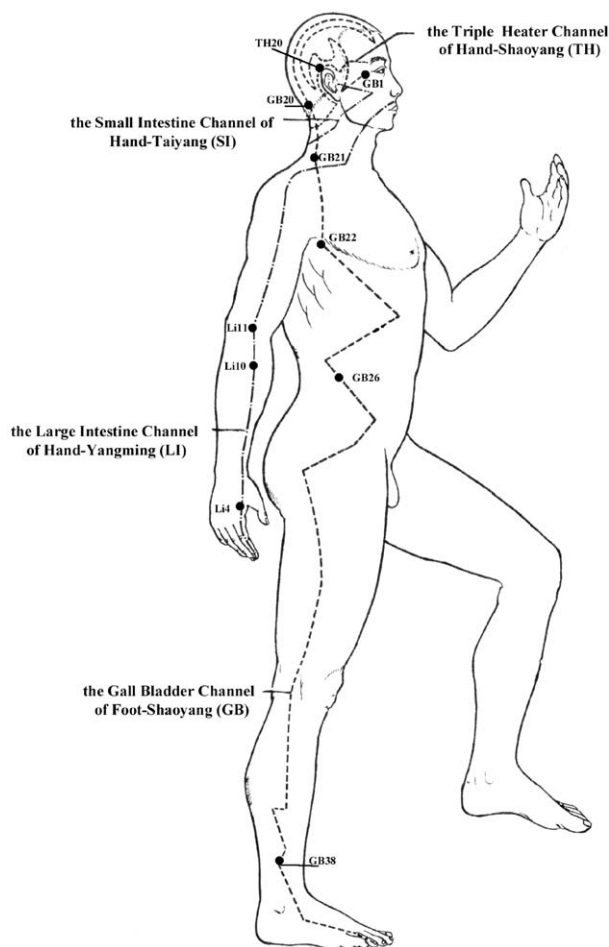


Fig. 3 – Distribution of channels and related acupuncture points (lateral).

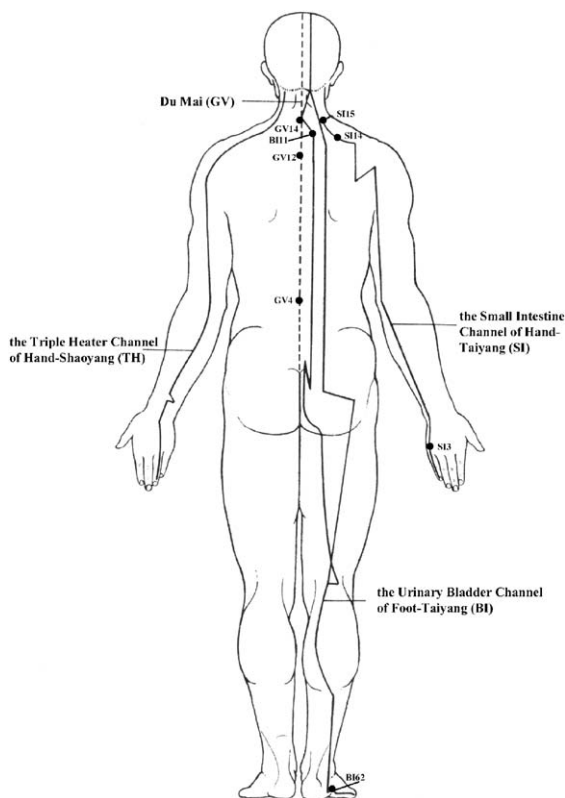


Fig. 2 – Distribution of channels and related acupuncture points (posterior view).

etc.). As a result, all necessary sensations were evoked. The acupuncture points were also stimulated with additional twirling of the needles during a long acupuncture session throughout the surgical procedure, or soon after the operation with the aim of relieving postoperative pain.

Thirty minutes before surgery 0.5ml of 0.1% Atropine Sulphate and Diazepam 7.5mg were given intramuscularly as premedication. For the patients in group I, acupuncture stimulation was performed 10–15 min before the induction of conventional general anaesthesia using neuroleptanalgesia and endotracheal intubation. A total of 200–300mg of 1% barbiturate solution was used for preliminary anaesthesia. Muscle relaxants of short- and long-term action were also used. When nasal intubation had been carried out, 0.5% halothane was given (with oxygen) and within 1.5–3 min, the percentage was increased to 3–4%. A total of 0.5–2% of inhaled volume of halothane was used to maintain anaesthesia.

RESULTS

The pulse fluctuation did not exceed 10–20% and the arterial pressure changed only between 0.3% and 5%

of the initial reading throughout the acupuncture analgesia stimulation and surgical procedure at the patients in group I. Cardiovascular monitoring confirmed normal electrocardiography.

Patients of group II were given the first acupuncture session 2–3 h postoperatively, when they had regained consciousness. In contrast to the acupuncture analgesia administered during surgery, it was now possible to stimulate acupuncture points located near the operation site.

The main difficulty was checking the patient's physiological state during acupuncture. Measurements of pulse and arterial pressure showed small differences but returned to normal after the pain was relieved in 94% of the cases. The postoperative pain was completely alleviated in 62% of patients and partially in the other 38%. In one case postoperative pain relief persisted for 6–10 h after the acupuncture point stimulation was discontinued suggesting that acupuncture analgesia treatment can have prolonged effects. In this series, the postoperative pain was alleviated for so many that additional analgesic drugs were required only in 10% of the cases. Towards the end of the fifth session of acupuncture treatment, postoperative pain was relieved completely in all the patients.

Acupuncture analgesia was only partly effective in 4 patients, while in only 3 patients a fifth session of acupuncture treatment was necessary. However, it should be emphasized that depression of vital functions of these patients was marked, and that from the outset they were ill disposed to the acupuncture analgesia.

DISCUSSION

The most painful stages of a surgical operation for a patient are skin and periosteal incisions, as well as procedures carried out near neurovascular bundles. These were accompanied by short-term hypotension and bradycardia. However, when the acupuncture points were stimulated by needles during the surgical interventions, the pulse rate and blood pressure quickly became stable.

The serum cortisol level in group I was a little higher during the first (preoperative) and second (following incision) stages of the research than in the control group (Fig. 4). However, this was not statistically significant ($p > 0.05$). Stabilization of the hormone level recurred during the third and fourth stages with no difference between that of the control group. This can be explained by the fact that: immediately before the operation patients were informed about the acupuncture analgesia. In the first few minutes after stimulation began, it was usual for patients to show a mild stress reaction with increasing blood pressure, faster respiration and heart rate. These quickly returned to normal or near normal levels, and should remain so during the operation.

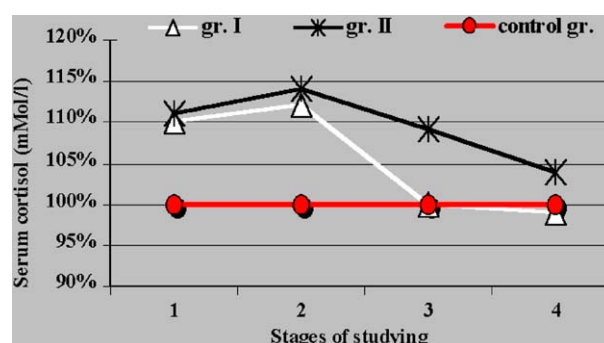


Fig. 4 – Changes in serum cortisol levels of the patients during surgery. Key: Group I: Acupuncture analgesia during conventional general anaesthesia (20 patients). Group II: Acupuncture analgesia during and after general anaesthesia (100 patients). Control: Conventional general anaesthesia (30 patients) Stage 1—preoperatively. 2—after incision. 3— intraoperatively. 4—immediately postoperatively.

Several authors have previously (*Chapochnikov and Nikolaev, 1978; Chudakova et al., 1999*) shown that the best effects of combined anaesthesia treatment were reached when the following acupoint combinations were selected for stimulation: Yang Channel – LI—the Large Intestine Channel of Hand-Yangming: Li4 (Hegu), Li10 (Shousanli), also acupoints related to the operation site (Su-jok technique initially described by *Puk (1994)*) combined with the points of Yin Channels: the Heart Channel of Hand-Shaoyin: Ht7 (Shenmen), the Pericardium Channel: HC6 (Neiguan).

The results of consecutive studies have led the authors to conclude that in the postoperative period, especially during the first 24 h when the pain was most intense, it was necessary to apply first variant of the brake method of acupuncture points stimulation for 40–50 min with additional manual twirling of the needles for the first 10–15 min, at an interval of 3–5 min. If the postoperative pain recurred or increased during the first postoperative day it was necessary to carry out between 1 and 4 sessions of acupuncture stimulation.

The major advantages of acupuncture analgesia are: safety of application for high-risk patients, excellent postoperative pain relief, low complication rate following surgery. At the same time, the technique is simple, cheap and effective for surgery, especially if combined with sedation or general anaesthesia. It could be the only method of surgical analgesia available in time of war, natural disasters and other emergency situations.

Extensive clinical practice has shown that acupuncture analgesia is completely safe and that with the best results there was no pain at any stage during the operation.

As acupuncture functions by regulating the physiological state of the human body, doctors are able to take immediate measures to avoid the physiological disturbance caused by severe pain by adjusting the technique according to the subjective physical signs of the patient. Blood pressure, pulse and respiration

rates during the operation remain stable in most cases. Postoperatively the patient's physiological state generally remains stable as manifest by early mobilization and satisfactory wound healing. All these are conducive to an early recovery.

CONCLUSIONS

The results suggest that further development of anaesthetic techniques combined with acupuncture analgesia would be expedient and could be applied to every-day surgical practice.

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