

Anesthesia by electro acupuncture in neurosurgery

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Abstract

Given the fact that in neuroanesthesia the choice of anesthetic substances must take into account the effect they have over the cerebral substance, we felt that using as few drugs as possible eliminates their shortcomings, improving the intraoperative conditions as well as the outcome of the surgical intervention. For this purpose, we have used anesthesia through electroacupunctural stimulation associated to hypnosis, drug relaxation under controlled breathing on a group of 12 patients, from which 10 patients had undergone brain surgery and 2 patients had undergone surgery for herniated disc. The outcomes showed the better effect of this method than that of the classical, the patients showing excellent intraoperative hemodynamic stability, relaxed brain, without the need to use depleted substances, rapid awakening with a much better postoperative analgesia.

Keywords: electroacupuncture, electrostimulation by acupuncture, neuroanaesthesia.

Introduction

Acupuncture is probably the oldest therapeutic method used worldwide nowadays. The beginning of this therapy is very old, since before our era in China. Surgical anesthesia technique was used for the first time ever in China in 1958 for a dental extraction.

Only after 10 years of experimentation on a large number of cases in various fields of surgery appear the first communications.

In 1969 Professor N. Gheorghiu published the first gynecological operations performed under acupunctural anesthesia. Since 1970, appear many communications on acupuncture anesthesia in a number of countries and the method and its results are discussed in a series of congresses of anesthesia.

The browse of the literature has shown that up until the present there is absolutely no consensus on the effectiveness of acupuncture in the current practice of anesthesia. The encountered views ranged from the rejection of the method to accepting it only as a placebo or hypnosuggestive and efficient method up until proving its real efficiency.

Surgical anesthesia by acupuncture technique is present in the speciality literature under the most various aspects starting with very optimistic reports submitted by the Chinese authors, promoters of the method and some European and American authors and ending with the relative observations made by other authors who failed to reproduce the technique and to create good satisfactory conditions for the deployment of the operatory action.

After many years of research and debates, it is considered today that the

analgesic effect of acupuncture is a certainty.

In Romania, this method was used by Prof. Dr. N. Gheorghiu, who published in 1969 the employment of this technique in gynecological interventions. Starting with the 1980, electroacupunctural anesthesia is applied in our country by Prof. Dr. G. Litarczek, Fundeni Hospital, then in other hospitals.

However, there is no single theory yet to explain the complex mechanism of action of acupuncture.

Studies by Melzack (22) have shown that acupuncture points correlate with trigger points used in classical medicine to inject some substance (anesthetics).

Other studies have demonstrated the existence of some special electrical properties at the level of the acupunctural points, the electric stream passing much easier at this level (3.19).

By stimulating the acupunctural points, in the body appear many neurological and neuro-umoral changes. Researches showed that the stimulation of certain acupuncture points edit nerve transmission in painful areas of the spinal cord and thalamus. There are several theories which confirm the different mechanisms of action.

1. The gate theory explains the effect of acupuncture as:

- the painful excitation is transmitted in the gelatinous substance of the spinal cord, led through the thin nerve fibers. Thicker nerve fibers have inhibitory effect on pain by closing the gate at the spinal level, in the gelatinous substance. Melzack suggests that acupuncture stimulates the thick myelinated nerve fibers, thus closing the gate.

This theory can not explain the complex mechanism of action of acupuncture but it

is certain that acupuncture works in part by blocking the gate

2. Another theory, demonstrated by studies, shows the increase of the level of endorphins in several parts of central nervous system after acupuncture stimulation (25, 12, 1).

This is confirmed by research showing that the effect of acupuncture can be blocked by injecting opioid antagonist substances. Recent studies show that opioid antagonists do not interfere with acupuncture analgesia, considering that betaendorphin release is caused by stress and not by acupuncture.

Other studies have shown otherwise, so not even the endorphins theory explains enough the mechanism of action of this technique (21.5).

3. On the other hand, it is known that the monoaminergic system has an action of pain modulation. Research has shown that the monoaminergic system's antagonistic substances decrease the analgesic effect of electroacupuncture (7).

North and collaborators have shown that the stimulation of adrenoceptors α_2 increases the driving speed of the neurons in the posterior horn, causing hiperpolarization and decreasing excitability, with analgesic effect (23). Also has been found that synthesis and release of serotonin and norepinephrine in the CNS is stimulated by electroacupuncture.

Other studies have shown the role of adrenergic descending pathways in modulating nociception. Spinal administration of norepinephrine or electrical stimulation of the central noradrenergic cells induce strong antinociception. Locus ceruleus in the brainstem is the largest cell group composed of catecolaminergic neurons. By

empowering them antinociception decreases after intrathecal injection of alpha2 antagonists, but not of alpha1 antagonists. In conclusion, analgesia is mediated by alpha2 adrenergic receptors (14).

Anon and collaborators have shown the antishock effect of acupuncture, demonstrating on experiments with dogs, that after a massive bleeding using acupuncture anesthesia, the animals had a significantly higher survival rate (2).

Therefore, it appears that the analgesic effect of acupuncture in various conditions may be mediated by different mechanisms. It is also possible that stimulation of various points to lead to different mechanisms of action.

There are two methods used to achieve electroacupunctural anesthesia:

1. - vigil surgical acupunctural analgesia technique;
2. - hypoanalgesic technique by electroacupuncture hyperstimulation.

In the vigil technique, the patient is awake and manual or electrical underlined stimulation is used.

The technique of hypnoanalgesia by electroacupuncture hyperstimulation is using hypnotics (propofol, midazolam) and muscle relaxants, orotracheal intubation and mechanical ventilation.

For analgesia in major surgical interventions electric supraliminal stimulation is exclusively used.

Material and method

This work is based on general anesthesia performed by technical hypnoanalgesic electroacupuncture on 12 patients who underwent neurosurgical intervention. Of these, 10 patients with the brain surgery (9 patients with brain tumor, 1 patient epilepsy surgery) and 2 patients with

lumbar disc hernia. For electrical stimulation was used the Chinese device DZ 22 and Romanian device ECO 001.

Before surgery, patients were explained the technique used and required written consent to perform anesthesia.

The technique used was:

- trained patients were sedated in the morning and in the evening with: one tablet Diazepam 10mg or Midazolam 7mg and 0.3 to 0.4 mg / kg Clonidine;
- the patient was brought in the operating room where have been mounted least three peripheral venous lines, and possibly a central one, with saline infusion;
- monitoring was started ECG, BP (blood pressure), P(pulse), SpO₂,
- were fitted the needles of acupuncture in points L6 and LI4 bilaterally with an electronic detector of acupuncture points;
- then the electrical stimulation device (Figure 1) was set to 5Hz frequency on the left oscillator and 100-120 Hz on the right one;
- the needles were connected to the device, two for each hand at each of the two channels;
- injectomats were prepared with propofol and / or Midazolam, related to the venous line;

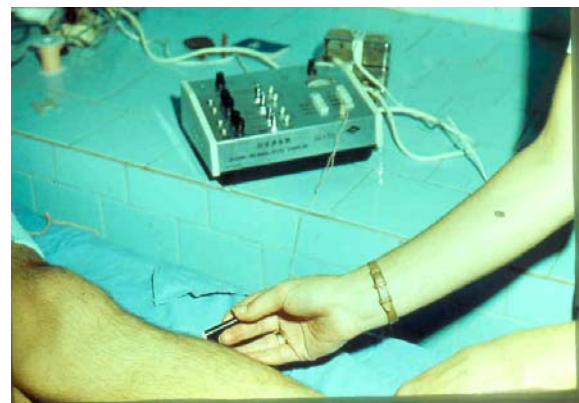


Figure 1 The electrical stimulation device

- the induction was started with curare of protection, then 2mg/kg propofol, succinylcholine 1 mg/kg;
- orotraheal intubation was performed , the patient was connected to the O2 + air flow 1 / 1;
- electrical stimulation has been started, producing alternative unloadings of two frequencies: 5-10 Hz and 90-130 Hz;
- propofol infusion was started with 1-3 mg / kg / hr and / or midazolam 0.05 to 0.1 mg / kg / hr;
- curare administration continued in bolus;
- current voltage was gradually increased incentive to limit supported by the patient, about 40V;
- have implanted two more pins at the ends of the incision, which is stimulated by 100-120 Hz;
- stimulation lasted 30 minutes before the start of surgery and continued until its completion;
- in the end of the intervention were stopped hypnotic drugs and electric stimulation;
- the curare has been antagonized.

Results

The method of electroacupunctural anesthesia under hypnosis and relaxation has proven effective in all cases studied. In one of the cases, in the middle of surgery we found increased BP and P, when in fact stimulation device failed, then the patient was administered opiate to continue the surgery. We found difficulties in monitoring BIS, artifacted by surgical maneuvers in the brain. Analyzing hemodynamic parameters in all patients we found a trend of increasing BP and P within acceptable limits (5-10% of initial value), which was maintained throughout surgery (Figure 2, Figure 3).

- no patient has required extra analgesic;

- excellent hemodynamic stability, warm periphery;
- awakening was quick, no chills, vomiting or respiratory depression danger.
- no patient required analgesic medication in postoperative, enjoying prolonged post acupunctural analgesia.
- resumption of spontaneous micturition was swift.

Discussions

In the case of neurosurgical interventions, painful periods are only related to the skin incision and suture of the teguments, meninges and periosteum, and also these patients do not require relaxation only for intubation and mechanical ventilation.

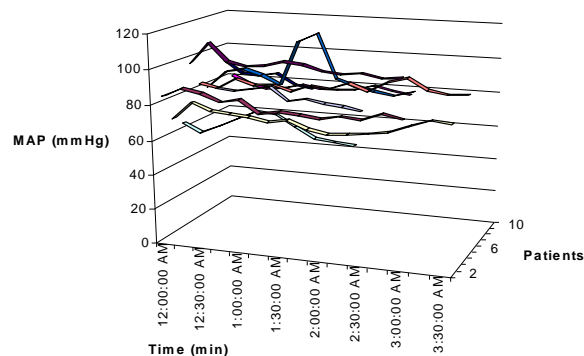


Figure 2 Variation of blood pressure (BP)

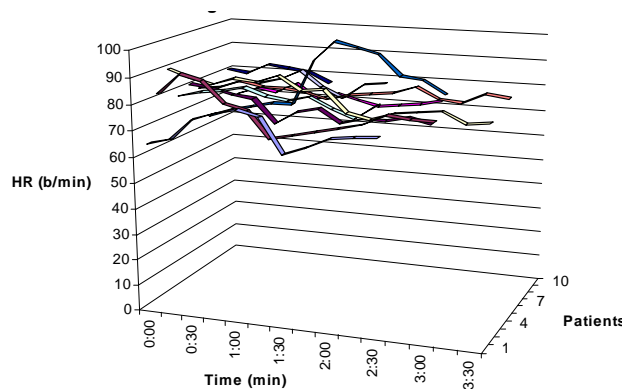


Figure 3 Variation of heart rate

Given the fact that in neurosurgical pathology we are dealing with patients who have low cerebral compliance, a particular importance is the maintenance of the cerebral circulation autoregulation, and its reactivity to PaCO₂. Avoiding the use of nitrous oxide, halogenated substances, as well as the opioids, it is a great advantage to not emphasize the increase of intracranial pressure during the operation. The usage of propofol and/or midazolam have ensured a cerebral protection.

I emphasize the fact that in the presented casuistry no patient required intraoperative depletive treatment, in all cases the brain was relaxed, without edema, facilitating surgical maneuvers and avoiding risk making cerebral ischemia secondary to these maneuvers.

We observed hemodynamic sensitivity of these patients to major volemic loses. Hypovolemia could be avoided by careful monitoring and adequate volemic filling pending the loses.

A great advantage is also the probability to awaken the patient during the surgical intervention maintaining analgesia taking into account the fact that in neurosurgery the so-called "awake craniotomy" technique is becoming increasingly used in the surgical approach of motor and speech areas, in the epilepsy surgery and Parkinson disease.

Rapid postoperative awakening is a great advantage in neurosurgery for the neurological evaluation, it can be made immediately, and could act quickly if there is clinical examination and then by fast CT appearance of postoperative hematoma.

Also, the absence of postoperative pain and chills does not expose the patient to increased risks of cerebral edema due to ICP by hypoxia, hypercapnia, high

respiratory pressure. The literature data shows that hyperstimulation made by electroacupuncture realises analgesia and blockade of thermoregulatory reaction by direct interference with the central nervous mechanisms involved in making a reaction to nociception and cold (Litarczek).

The occurrence of postoperative vomiting also increases the risk of increased ICP. It is described in the specialty literature that the L6 point stimulation significantly reduces postoperative nausea and vomiting, a stronger effect, compared with prophylactic anti-emetic medication (8,9).

Numerous studies (27,15) showed the effect of stimulating the immune system both cellular and humoral, which is a big advantage compared with traditional general anesthesia.

Hemodynamic stability both at the microcirculation and macrocirculation level is another important advantage of this anesthetic technique.

After a few hours postoperative we have found an analgesic effect without having to be given special medication for pain, this being found by other studies also (4).

The only disadvantage of this technique would be the prolongation of the induction time until the beginning of surgery with about 30 minutes, needed to install analgesia after starting stimulation.

Some authors consider that the application of this method in neurosurgery is very useful, because of avoiding the use of drugs that interfere with the self-regulation of cerebral circulation and its reactivity to PaCO₂ and to avoid cerebral vasodilatation with increased intracranial pressure.

Conclusions

Excellent hemodynamic stability obtained using this technique helps to avoid the occurrence secondary cerebral ischemia lesions.

Lack of favorable effects of increased intracranial pressure by eliminating the use of substances (volatile anesthetics, gas, opioids) and possible intraoperative awakening to maintain analgesia is a real advantage in neurosurgery.

Fast awakening, without chills, nausea, vomiting, allow early neurological assessment and avoid the occurrence of cerebral edema immediately after surgery, anesthesia costs of eliminating the use of several drugs are other advantages.

The only disadvantage would be the prolongation of anesthetic induction time needed about 30 minutes required for analgesia.

In conclusion, acupunctural hypoanalgesia is an anesthetic technique that is suitable for wide use in neurosurgical interventions.

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