Acupuncture Anesthesia: A Review

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A review of acupuncture anesthesia's use in China reveals that it has a relatively short history, certain obvious advantages and disadvantages, and that it requires specific methods and techniques. Although acupuncture anesthesia is not the anesthesia of choice for all people, it has been used in a diversity of operations from neurosurgery, thyroidectomy, laryngectomy, and both pulmonary and cardiac thoracic surgery. In the over 400,000 operations performed in the People's Republic of China between the years 1966 and 1972 the anesthesia was approximately 90% successful in respect to the fact that acupuncture was the major form of anesthesia used during these operations.

Phantom Horse winging its path through the sky
Showering light upon the East
Thought masked from the West by cultural clouds of doubt
Yes, Westerners, cut away your cultural shrouds
Investigate the New Changes, Don't Ignore Them!

History

When I visited China in the spring of 1972, many Western newspapers heralded acupuncture anesthesia as an Eastern form of hypnotism or fakery. Even today, many Western doctors ignore the readily available Chinese research to label acupuncture as a form of hypnotism (1). As one of the first American physicians fortunate enough to visit the People's Republic of China, I investigated first-hand the Eastern art and science of acupuncture anesthesia.

For reasons of semantics, acupuncture anesthesia should be called acupuncture analgesia or hypogesia; for the patient feels all sensations except pain at the site of surgery. Although the roots of acupuncture stretch back through the centuries for over 3,000 years, acupuncture anesthesia did not emerge until 1958. At that time Shanghai medical workers applying acupuncture to prevent and relieve post-operative pain during dressing changes or after tonsillectomies, asked themselves, "If needling can stop pain, can it also produce anesthesia for operations?" (2, 3). In 1958, medical workers in Sian City (Shensi province) first used acupuncture anesthesia for a surgical procedure, the incision and drainage of a breast (4). Medical workers in Shanghai and other places successfully experimented in the use of acupuncture for anesthesia in such operations as thyroidectomies, herniorraphies, and tonsillectomies; their success opened the door to a more extensive use of acupuncture (5). For medical cadre began to use acupuncture as an anesthesia for major operations; according to the Chinese Medical Journal, "from 1959, Chinese medical workers began to use acupuncture anesthesia in operations on the neck and limbs, in the chest and abdominal cavities, in pneumonectomies, and the removal of cerebral tumors" (6).

However, as with many medical breakthroughs, the road to its acceptance crossed many a rocky and barren pathway. Some experts felts that it could only be used for minor surgery and that it should be only used by a few experimental research workers (7). Other experts bragged that acupuncture anesthesia was "not scientific, without any practical value and a retrogression in the history of anesthesia" (5). Consequently, less than ten thousand operations were performed between 1958 and the Cultural Revolution in 1966. Since the Cultural Revolution, the broad masses of medical workers have changed the general research line to follow Chairman Mao's principles, "Chinese medicine and pharmacology are a great treasure house; efforts should be made to explore them and raise them to a higher level . . . We cannot take the beaten path traversed by other countries in the development of technology and trail behind them at a snail's pace" (5). From 1966 to 1972, I learned that over 400,000 acupuncture anesthesia type operations were performed in the People's Republic of China; they were approximately 90% effective. By effective or successful, I mean that acupuncture anesthesia did not have to be replaced by any other major form of anesthesia such as general or spinal anesthesia; in other words, acupuncture provided the major analgesia. Acupuncture anesthesia serves as the anesthesia of choice in many of the surgical operations in modern China. These operations consist of a diversity of major procedures from neurosurgery to cervical, thoracic, abdominal, and pelvic surgery.

According to the Peking Acupuncture Anesthesia Coordinating Group, "Acupuncture anesthesia is suitable for surgical operations of the head, neck, eyes, nose, throat and mouth, including the teeth, tongue, oral cavity and its associated structures, the chest, abdomen, the four limbs, the bones and joints as well as operations in obstetrics, gynecology, and pediatrics" (8). Acupuncture anesthesia is used extensively in China for people of all ages from very young babies to people over eighty (3).

Acupuncture anesthesia also plays an extensive role in animal surgery. The Peking Municipal Veterinary Hospital and the Army Horse Disease Prevention and Treatment Center of the Peking Units of the People's Liberation Army have used acupuncture anesthesia from 1970 to 1972 to operate on the chest, neck, limbs, and other parts of the body of 360 animals including horses, mules, donkeys, cattle, and pigs. They have achieved a 94% success rate (9).

Advantages and Disadvantages

However, as with other medical techniques, acupuncture anesthesia has its advantages as well as its disadvantages. To begin with the advantages, acupuncture anesthesia is safe; for one out of every 1,000 persons undergoing conventional anesthesia will die as a result of its complications. In using acupuncture anesthesia, there are no dangerous side effects from drug allergies or even the drug toxicities sometimes seen in patients with liver or kidney diseases; there are no drug inhibitions of respiratory or cardiac functions. In fact, the patients may eat immediately after surgery, thus eliminating or reducing the amount of intravenous fluids (10). With acupuncture anesthesia, the surgeon has fewer post-operative complications and the patient enjoys a faster recovery. I saw one patient sit up, walk, and talk after a subtotal thyroidectomy (the partial removal of a thyroid gland), and saw another patient eat and drink both during and after a pulmonary resection.

In addition to its general use, acupuncture anesthesia is also much safer in operating on seriously ill or debilitated elderly patients, especially in patients too ill to undergo the risks and complications of a general anesthesia agent. Two specific examples from the booklet, Acupuncture Anesthesia, can easily illustrate this point:

> In a spacious and brightly lit operating room, medical workers of the Peking Worker-Peasant-Soldier Hospital and the Peking Tuberculosis Research Institute were performing a thoracoplasty on Hy Shy-hsuan, a patient suffering from pyothorax.

There were no complicated anesthetization apparatus, nor any odor of anesthetics. The medical personnel simply applied two needles on Hy's ears and twisted them lightly for some twenty minutes. The operation then commenced, with the patient fully conscious.

The patient's pyothorax was the result of infection after an operation five years earlier. Pus and blood oozed out through a fistula in his chest all the year round. An operation was required to clear out the pus and obliterate the cavity. However, Hu Shu-hsuan was weak, his heart and lungs functioned poorly and he obviously could not stand the effects of anesthetic drugs. On several previous occasions, general anesthesia had caused cardiac failure which endangered his life. Later, spinal anesthesia and local anesthesia were applied instead. But these also failed to ease the pain and the operations proved unsatisfactory. Having undergone 24 unsuccessful minor and major operations in all, he had become weaker and weaker.

In this latest operation with acupuncture anesthesia, skin consisting almost entirely of scar tissue had to be removed; in addition, six ribs had to be resected, bone that had grown following each earlier operation had to be removed and the pus and infected part in the cavity cleared out. The difficulties involved and the effect of the operation on the patient were far greater than before. But throughout the two-and-a-half-hour operation, the patient was calm and in good spirits, and his blood pressure and pulse remained steady. The sound of his ribs being cut did not upset him. At the beginning, he only felt a scratch on his body but no pain at all when the surgeon was excising his scar-covered skin. While cutting his ribs with precise, light strokes, the surgeon gently told him: "Just tell us if you feel uncomfortable." "I am all right," replied Hyu. "There's no pain at all. Go ahead."

The medical workers cleared out the pus thoroughly, removed the fistula and closed the cavity. The operation was highly successful. As soon as the surgeon finished dressing the wound, the smiling Hu Shu-hsuan sat up on the operating table and, facing a portrait of Chairman Mao, cheered: "Long live Chairman Mao! A long, long life to Chairman Mao!"

After each previous operation, he had been in a daze for days from the effect of the anesthetics. His pulse was rapid and breathing was difficult; he had no appetite and slept badly. Several times he almost choked to death because of the phlegm that had accumulated in his throat after the operation. The surgeon had to cut open the trachea and give him oxygen to save his life. Previously, recuperation was slow and it was three weeks after each operation before he could get out of bed and walk. This time, however, anesthetization by acupuncture made things different. After the operation, he was calm as usual, his breathing was normal and there was little phlegm. He could eat on the day of operation, and three days later he could get out of bed and walk about.

Tsao Hung-tan, a patient with severe multiple fractures, was wheeled into the operating room of Chaoyang Hospital in Peking. A reduction of the femoral fracture was anesthetization by acupuncture.

A member of the Tsaitun Commune in Miyun County on Peking's outskirts, the patient had in an accident sustained fractures of his right upper arm, right thigh and leg, several right ribs and lumbar vertebrae, as well as the pelvis. On arrival at the hospital, he was pale and his limbs cold; his systolic pressure had dropped to 50 mm, while his diastolic pressure was indeterminable. He was in a state of severe shock. He came to after emergency treatment, but reduction of the fractures presented a complicated problem.

The comminuted fracture in the patient's right thigh called for an incision in order to perform the reduction. But the injury was very serious, and there had been considerable loss of blood. Moreover, he had just come out of shock and was very weak. Four ribs were fractured, and the pain affected his breathing, making it difficult to cough up phlegm. General anesthesia by drugs could easily cause pulmonary complications and unforeseen danger. The surgeons decided to do the operation with acupuncture anesthesia.

After slowly and carefully inserting two needles into two points on the patient's left ear, the anesthetist inserted two other needles into the right ear, and one on each on the hip and the abdomen, and connected them with wires to a small electrical apparatus for anesthetization. When the current was turned on, the patient became numb, heavy and distended in the region where needles were, as in the case where needles are manipulated by hand. The operation began 20 minutes later.

Throughout the operation which lasted more than an hour the patient remained calm, and his blood pressure and pulse were normal. Only when the fractured bones were reduced did he feel somewhat uncomfortable because of muscle traction. But this feeling soon disappeared after the frequency of the electric needles was increased and the surgeon told him to breathe deeply and relax his muscles.

Back in the ward after the operation, Tsao Hung-tan could eat and drink without difficulty. While recuperating, he showed no signs

of agitation common to patients after operations performed with anesthesia by drugs, thus preventing possible bad effects on other fractured parts (11).

These two examples clearly illustrate the added value of acupuncture anesthesia in the debilitated patient.

Since the patient is completely conscious during the surgery, acupuncture anesthesia can offer the maximum cooperation between the patient and the surgeon. I witnessed this close cooperation during the correction of strabismus, a squinting defect, at the Worker, Peasant, and Soldier's hospital in Peking. The patient purposely moved his eyes at the surgeon's request to insure that the eye muscles were cut to the correct length. Thus, the surgeon can evaluate his results during the operation, to prevent poor results or an unnecessary repeat operation. I also saw a thyroidectomy in which the surgeon freely talked with his patient to determine the patient's vocal status, thus avoiding any accidental damage to the recurrent laryngeal nerve which innervates the vocal cords. During orthopedic procedures such as plastic surgery on the muscles and tendons of the fingers, the patient can move his fingers in cooperation with the surgeon's request so that the surgeon can easily find the injured muscles and tendons (5). During neurosurgery near the facial nerve such as in the removal of an acoustic neuroma (a tumor of the eighth cranial nerve), the patient's cooperation with the surgeon can help to prevent facial paralysis. Acupuncture anesthesia can, therefore, offer the maximum cooperation between the patient and his surgeon.

Since acupuncture anesthesia is simple, easy, economical, and practical, requiring neither expensive drugs nor complicated equipment, it is ideally suitable for medical workers in the distant rural areas and mountainous regions. In fact, I learned in China that the mobile medical teams frequently perform sterile surgical operations in the patient's own house. This would not be possible without acupuncture anesthesia. A look at the health center at the Lochia Commune in the Kiangsi Province exemplifies the role acupuncture anesthesia plays in rural medicine:

> The health center of the Lochia Commune in Kiangsi Province's Nanchange County has very simple equipment. Most of its staff are "barefoot doctors" (medical trainees from among the peasants who do medical and health work in addition to their regular job in production) selected from various production brigades. They mastered anesthetization by acupuncture after a short period of training.
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> At the end of last year, the doctors there used acupuncture anesthesia to perform a gastrectomy on 55-year old poor peasant Wan Ting-li who had a gastric ulcer. A few needles were inserted into the patient's ear while he lay quietly on the operating table. A young surgeon, Wan Tao-keng, opened the abdomen and after examining it carefully, found an adhesion of the ulcerous part to the posterior abdominal wall. Together with his assistants, the surgeon carefully separated it, performed the subtotal gastrectomy without incident and then joined up the stomach and intestine. During the operation which lasted two hours and 45 minutes, the patient was calm, with normal breathing and pulse. He felt somewhat uncomfortable only when separation of the duodenal bulb caused visceral traction. At that point, the surgeon told him to do deep breathing, which immediately made him feel better. After the operation, he put on his clothes, got off the operating table and walked back to the ward.
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> Nine days later, he left the hospital. After three months of recuperation, he had regained his health and was able to take part in transplanting rice seedlings, harvesting and other work.
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> Safe, effective, simple and economical, acupuncture anesthesia has created extremely favorable conditions for operations in the countryside.
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> The Lochia Commune health care center is now able to use acupuncture anesthesia by needling the body, ears and nose to perform more than 20 kinds of minor and medium operations, and the rate of success is over 90 per cent (5).

Thus, acupuncture plays a vital role in bringing health care to 80% of the Chinese people who live in the rural areas.

Clinically, acupuncture appears to play a regulating effect in maintaining normal human physiology (8, 12, 13). For example, needling the point Tsusanli (#178, ST-36) can

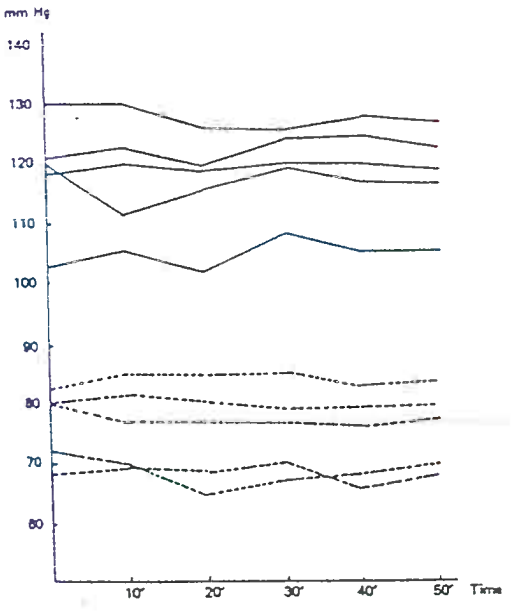


Fig. 1. Blood pressure change in needle analgesia.

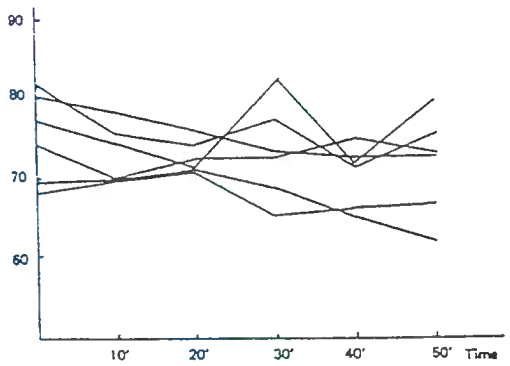


Fig. 2. Pulse frequency changes in needle analgesia.

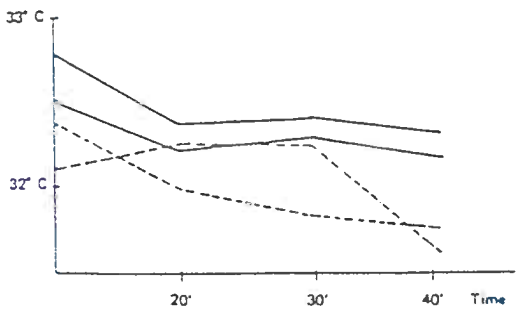


Fig. 3. Temperature changes of two different points in needle analgesia.

either correct diarrhea or empty constipated bowels. Needling can either decrease or increase the heart rate; needling can be used in the treatment of hypertension as well as hypotension (12, 14). In patients with appendicitis, the gamma and beta globulin increased significantly after needling Tsusanli (12); also the white blood cell count, the percentage of neutrophiles, and the phagocytic index of the white blood cells increased (12, 13). These changes may serve as some basis in understanding the physiological regulating roles played by acupuncture anesthesia.

In respect to the role of acupuncture in a patient with normal vital signs, Dr. Michio Tany from the Tany Clinic in Tokyo, personally investigated and carried out over 500 research experiments and clinical operations to reach these conclusions:

1. Normally, the blood pressure does not change during acupuncture analgesia (Fig. 1).
2. The pulse rate does not change but at times may tend toward slight bradycardia (Fig. 2).
3. There is little evidence of change in the skin temperature at the anesthetized area when compared with other areas of the skin (Fig. 3).
4. There is no apparent change in the electrical resistance at the anesthetized area (15).

In contrast with conventional anesthesia, either general or spinal, there may be marked changes in the blood pressure, pulse and temperature. Dr. Tany used acupuncture anesthesia in six types of surgery: Thyroidectomy, appendectomy, Caesarean sections, small areas of surgery, and castration procedures; he found that acupuncture anesthesia produced a successful form of analgesia in approximately 80% of his patients (15).

Operations using acupuncture anesthesia on patients in shock suggests that needling has some therapeutic effects on shock. The Worker, Peasant, and Soldier's Hospital in Peking operated on five patients in shock; during the operations, the blood pressure remained constant (Table 1) (12). The anes-

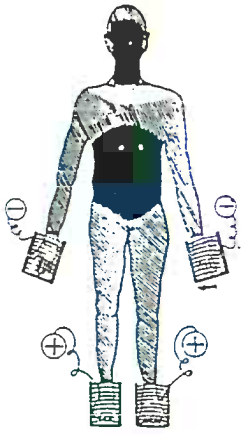


Fig. 4. Analgesia appearance caused by static electricity stimulation on hand and foot.

thesiology department of the Anhwei Medical College, Hofei, used acupuncture anesthesia in 50 cases of shock; they had a success rate of over 86% (16).

As with all forms of medical therapy, acupuncture anesthesia has its disadvantages. The problem of incomplete analgesia exists: I learned from the staff of the Worker, Peasant, and Soldier's Hospital in Peking that acupuncture anesthesia works better above the diaphragm than below the diaphragm. The patient may feel some discomfort when the surgeon handles certain internal abdominal organs. I witnessed a hemigastrectomy (removal of part of the stomach) during which the patient grimaced in pain during the handling of his mesentery; this pain was relieved by xylocaine.

Twelve U.S. physicians and scientists selected by the National Academy of Sciences to study acupuncture as an anesthetic in surgery reported that, "... despite careful screening to eliminate unsuitable (mentally disturbed, nervous, low pain threshold, unwilling) patients, about 30% of surgical procedures using acupuncture analgesia result in moderate to severe pain and marked changes in vital signs, requiring use of either local, intravenous, or general anesthesia" (17). The National Academy of Sciences' group also mentioned that "present Chinese standards for research in acupuncture would satisfy the most rigorous demands in this country" (17).

During thoracic surgery, the skin is sometimes infiltrated with xylocaine prior to the first incision. In describing the efficacy of acupuncture anesthesia in chest surgery, Hsin Yu-Ling at the Peking Tuberculosis Research Institute states his conclusions after the evaluation of 664 operations with a 90% success rate:

> At present, acupuncture anesthesia is not able to create a state of complete painlessness. Some patients still feel slight pain at certain stages of the operation, so, according to the patient's condition, a small amount of local anesthetic is used in sensitive areas during difficult operations. This supplements the acupuncture anesthesia and encourages more people willing to use it (15).

There is also less muscle relaxation with acupuncture anesthesia than with the more convenient forms of anesthesia. Since acupuncture anesthesia requires an induction time of 15 to 20 minutes, it should probably not be used for any emergency surgery which cannot tolerate the luxury of a 20 minute wait. Because acupuncture produces regional analgesia, Dr. Chou, the chairman of the revolutionary committee at the Peking Worker, Peasant, and Soldier's Hospital, informed me that they did not use acupuncture anesthesia with cancer surgery due to the dangers of metastasis; however, cases of the use of acupuncture anesthesia in certain types of cancer surgery, such as brain surgery, have been recorded in the Chinese literature.

Some Western authorities feel that cardiac arrythmias should be a contraindication for the use of acupuncture anesthesia. This aspect was not discussed during my trip to China, nor have I found a discussion of this point in the available Chinese literature. It is my personal opinion that if patients with pacemakers or with many types of cardiac arrythmia were to desire acupuncture anesthesia; the manual twirling of the needles, not the low voltage electrical stimulation, would be indicated until more control studies are made available.

Table 1. Blood pressure and pulse rate of patients with different complications operated under acupuncture anesthesia.

Operation	Age	Complications	Before Operation		During Operation	
			Blood Pressure	Pulse	Blood Pressure	Pulse
Internal fixation of fracture of neck of femur	74	Hypertension, cerebro-vascular ischemia, irregularity of heart rate	190/110	88	160/100 —180/110	80
Operation on incarcerated hernia	74	Hypertension, cerebro-vascular arteriosclerosis, hemiplegia	190/110	100	140/80 —178/100	100
Ureterocystostomy	33	Uremia N. P. N. 40 mg % P. S. P. 0% (2hr)	150/100	96	140/100 —150/100	84—88
Ectopic pregnancy	32	Shock 70/40 40/f	80/60		100/80 —90/70	
Rupture of uterus	32	Shock 80/70	110/80	152	110/100 —130/110	124 —132

Dr. Choi informed me that the surgeons who use acupuncture anesthesia should be quite adept and quick with their craftsmanship; since the patient remains conscious during the surgery, they do not want to prolong his stay under anesthesia. The patient must choose and desire acupuncture anesthesia for his surgery; contrary to the implications of some Western experts on acupuncture (19), the Chinese medical community does not force acupuncture anesthesia on anyone. Although the other types of anesthesia exist in China, acupuncture anesthesia was the principal form of anesthesia at the Peking Worker, Peasant, and Soldier's Hospital.

In contrast, during his visit to China in 1973, Dr. Michael Debakey observed that, "The number of patients who volunteer for surgery under acupuncture ranges from a low of seven per cent in one hospital... to 30 per cent in another" (2). The American Medical Association's delegation to the People's Republic of China estimated that only 15 per cent of all the major surgery in China was performed by means of acupuncture anesthesia (21).

Methods and Technique

Prior to surgery, both the surgeon and the anesthetist discuss the details of the surgical and acupuncture procedures with the patient. The anesthetist shows the patient the specific points to be used and describes the subjective sensations to be felt by the patient; the anesthetist may perform a trial run of the necessary points prior to surgery; the trial run tests the patient's level of pain tolerance and his response to needling so as to gauge the force needed for needle manipulation or electrical stimulation (4). Hysterical patients, blessed with a neurotic disposition, are not considered satisfactory candidates for acupuncture anesthesia; for the patients should be emotional stable in order to tolerate the psychological trauma of being conscious during major surgery.

Continuous practice over the last fifteen years has led to an increasing number of methods of anesthetization by means of acupuncture, from manual rotation of the needles to their electrical stimulation, from pressing a point with the fingers to injecting distilled water into the point (3). Finger pressure anesthesia, the manual massage of

acupuncture points, serves as an especially good method in dental work with children (3). Through practice, the number of points required for acupuncture has been effectively reduced; for example, in pulmonary resection, the number of points has been reduced from forty to one (4). Regardless of the type of acupuncture, manual rotation, electrical stimulation, or the injection of a particular solution at the acupuncture site, the Peking Acupuncture Anesthesia Coordinating Group found no significant difference in efficacy between the different types (12).

With acupuncture anesthesia, the preanesthetic drugs are similar, in most cases to drugs which are used in Western anesthesia, for example, scopolamine (22), demerol (10, 22, 23), phenobarbitol (23), and amytal with atropine (4). The induction time for acupuncture anesthesia usually lasts from 15 to 20 minutes. The Peking Acupuncture Coordinating Group found that an induction time less than 15 minutes could decrease the efficacy of the anesthesia and that an induction time greater than 30 minutes would not intensify the efficacy (12). In studying the cortical electric potential evoked by stimulation of tooth pulp in rabbits, they found that they could increase the analgesic effect of the acupuncture by using an induction time of 20 minutes (12). Even after induction, the needle stimulation or rotation has to continue throughout the operation.

In spite of the almost exorcistic sensationalism attached to acupuncture in some quarters, the technique used for acupuncture anesthesia is quite simple, regardless whether it is manual rotation or electrical stimulation. With manual rotation, the anesthetist holds the needle with his or her thumb, index and middle fingers. This way, the thumb controls the rotating movements of the needle while the index and middle fingers guide the lift and thrust of the needle. The lift and thrust of the needle may vary from 0.5 cm to 1 cm; the degree of rotation varies from 180 to 360 degrees. The frequency of the manual twirling varies between 104 to 160 movements per minute (6). In Peking, I witnessed the use of electrical devices which rotated the needle.

Certain factors such as the force of rotation influence the anesthesia. The pressure and frequency used in rotating the needles varies from patient to patient and also with the particular surgical procedure or manipulation in question. An increased force is used on patients with a good tolerance to needling or during very traumatic surgical procedures; a decreased force is used on patients with a poor tolerance to needling or on patients during minimally traumatic surgical procedures (8). For example, the force required for rotating the needle to produce anesthesia for incisions of the skin or muscles may be relatively strong; in contrast, while operating on internal organs, the force required may be relatively weak. For instance, in sewing up the scalp after brain surgery, the frequency of the twirling has to be increased to diminish the pain; however, a milder stimulus is quite satisfactory during the actual surgery (24).

The technique of electrical acupuncture decreases the number of personnel needed for anesthesia. With this technique, the needles are stimulated electrically. The frequency used for anesthesia usually varies from 200 to 300 cycles per minute (6). The frequency does affect the results of the anesthesia; in experiments on cats, lower frequencies such as sixty cycles per minute produced better results than higher frequencies such as 1980 cycles per minute (Fig. 5). Nevertheless, the force of stimulation or voltage must be sufficient; clinically, 3 to 5 volts are usually used in electrical anesthesia. However, the intensity may vary from 0.5 volts to 13 volts (12). The desired intensity of stimulation in animal experiments has varied from 4 to 18 volts; the cortical electrical effects of the anesthesia could not be inhibited with a decrease in voltage; but increasing the voltage did not increase the depression of cortical functions.

In using electrical acupuncture anesthesia, Dr. Michio Tany of Japan found these results:

1. When the sensory nerve center is blocked in some way, for example in the case of cerebral hemorrhage, it is difficult to arrive at an analgesic effect using acupunc-

ture stimulation, and even when possible, the effect is usually weak.

2. The analgesic area resulting from acupuncture stimulation will immediately diminish or change radically under the influence of low electrical voltage at high frequencies, for example, 0.5 V, 10 cycle sine wave.
3. Changes in static electricity or strong repelling magnetic forces at certain points of the body produce an analgesic effect similar to that produced by acupuncture (needle) stimulation. If this static or magnetic change is extinguished, the analgetic effect immediately diminishes (15).

Thus, Dr. Tany found that he could produce analgesia without needles through the use of either static electricity or a magnetic field at the acupuncure points (Fig. 4).

The selection of the proper or appropriate acupuncture point has evolved through a process based on practical investigations, not on dogmatic rules. The Shanghai Acupuncture Anesthesia Coordinating Group describes how the points selected evolved from many loci to a few loci:

> Our understanding of Teh-Ch'i* improved as a result of the following research. Initially, we selected many loci for acupuncture anesthesia. The maximum number for one operation might exceed 80 loci. Hence, manipulation was very clumsy, adding to the discomfort of the patient.
>
> We wondered if it was possible to select a few highly effective loci from these many loci. Therefore, we used an instrument to measure the degree of pain present both before and after the insertion of needles in ourselves and in normal subjects to compare differences in the analgesic effect of the various loci.
>
> In experiments on over 660 people, we analyzed 29 ordinarily used loci for acupuncture-induced analgesic action. Altogether we conducted over 40,000 experiments and proved that acupuncture loci could really produce analgesic action and that different loci were capable of producing differential analgesia action.
>
> Generally speaking, needle insertion accompanied by strong feeling of Teh-Ch'i produced a more evident, analgesic effect than those accompanied by weak feelings of Teh-Ch'i. As a result of these findings, we were able to choose loci which produced more effective analgesic action. Furthermore, although the selected loci were fewer in number, the effectiveness of the acupuncture anesthesia was not diminished. Therefore, we now always use the loci which have strong feelings of Teh-Ch'i, and thus the total number of loci required for operative anesthesia often amounts to 3 or 4 or even 1 to 2 sites.
>
> This method of loci selection for acupuncture anesthesia is simplified, facilitating its general application. The feeling of Teh-Ch'i after needle insertion into the loci can be considered crucial to the success of acupuncture anesthesia. With this insight, we have begun to understand the real nature of acupuncture anesthesia (2).

Through practice, the Chinese anesthetists learned that the concept, "the more needles, the better the anesthesia" was incorrect.

The Chinese medical workers learned to decrease the points, limiting them to the more efficient points. In pneumonectomy or lung surgery, the number of points was gradually reduced from 40 to only one needle point (12, 25). In 106 cases of thoracic operations performed under acupuncture anesthesia with one needle, the Peking acupuncture Anesthesia Group found that needling at one site was more effective in preventing respiratory difficulty and mediastinal flutter with an open chest while needling at another site was more effective in stopping pain (12).

The Peking Acupuncture Anesthesia Coordinating Group also compared the efficacy of over 20 combinations of acupuncture points in 300 appendectomies; they found that three of these points were the most effective. Applying these three points to more than 100 randomly selected cases of appendectomy, they obtained good results even though the needling as well as the surgery were performed by different sets of physicians (12).

The examples cited in the previous paragraph point to the relative specificity of the acupuncture points. The Peking Acupuncture Anesthesia Coordinating Group also demonstrated this relative specificity in their experimental investigations. They found that needling at acupuncture points Hoku (#84,

*) Teh-Ch'i: Subjective sensations of soreness, swelling, heaviness, and numbness.

Table 2. Reacting points in the auricula when different locations of the body were irritated.

Irradiating Area	Midpoint Between Elbow Crease and Wrist Crease	Midpoint of the Popliteal Crease and the Heel	Middle of the Forehead
Location of reacting pt.	Between the wrist and elbow area in the auricula	Between ankle and knee area in the antihelix	The forehead area in the anti-tragus
Number of persons investigated	16 persons 21 times	26 persons 41 times	5 persons 5 times
Times of reacting pt. formed	16 persons 21 times	26 persons 41 times	5 persons 5 times

LI-4) and Neikuan (#68, P-6) could inhibit the cortical electrical potential evoked by stimulating the thyroid region. However, needling at the points Tsusanli (#178, ST-36) and Fenglung (#182, ST-40) on the hindleg did not give a similar inhibitory effect (12).

Through practice, the Chinese medical workers have also learned that one type of operation may be performed with different combinations of points, and that one combination of points may be suitable for many different kinds of operations. Perhaps these facts may be difficult for many Western physicians to understand and accept. Dr. Michael Debakey, who visited China in 1973, has expressed some concern over the "illogical selection of points:"

> "I am concerned too, that the acupuncture procedure varies widely and illogically from one hospital to another. Moreover, the acupuncture points selected seem to bear no relation whatever to the human nervous system—and as yet no research anywhere has shown an alternate to the nervous system for the transmission of pain in the human body" (20).

The selection of some points can be explained by conventional neurophysiological theory such as the principle of selecting points which are near the target area or innervated by the same nerve which innervates the target area (26). However, contemporary neurophysiology and neuroanatomy cannot explain the fact that needling the ear produces anesthesia for abdominal and thoracic surgery as well as facial surgery or the fact that needling Kuangming (#224, GB-32), a point on the lower leg, produces acupuncture anesthesia for eye operations (13). The Peking Acupuncture Anesthesia Coordinating Group irradiated the leg, forearm, and forehead of healthy adults with photoradiant heat to cause scorching pain; they investigated the reacting points on corresponding areas of the ear and the neighboring ear region before and after the irritation. In 67 healthy adults, they found some reacting points on the ear which consistently corresponded to the irradiated areas (Table 2) (12. 13). At this time, the only useful theory for interpreting the phenomenon is the traditional meridian or "Jing-lo" theory. In this theory of meridians, there are twelve pathways of connection between different parts of the body's surface and between the body's surface and the internal organs.

Acupuncture Anesthesia Use in China

A review of some of the uses of acupuncture anesthesia in China should add some insight in understanding the relevance of acupuncture in anesthesia. The remainder of this paper will review the uses of acupuncture anesthesia in neurosurgery, thyroidectomy, laryngectomy, pulmonary and cardiac surgery, splenectomy, pediatric surgery, surgery during shock, and dental extractions.

The department of anesthesiology at the Hsuan Wu Hospital in Peking applied acu-

puncture anesthesia to 482 craniotomies (surgical openings into the skull) between December 1965 and August 1972 (27). In comparing 70 randomly selected acupuncture cases with 70 cases of conventional drug anesthesia, they found that the acupuncture anesthesia patients had the least interference with respiratory and circulatory functions. They also found that an immediate assessment of the operative results was possible and that postoperative nursing was easier with the patients who had received acupuncture anesthesia.

In order to clarify the influencing factors involved in acupuncture anesthesia during neurosurgery, the Hsuan Wu department of anesthesiology statistically analyzed the clinical data in 474 of the 482 cases. It was found that:

1. Anesthesia is usually successful in patients, 20-60 years, who are readily cooperative and mentally stable; who tolerate and respond to needling satisfactorily, having the feeling of soreness, swelling, heaviness, and numbness and who tend to remain calm with the cerebral cortex in a depressed state after induction of analgesia.
2. Success of anesthesia depends largely upon correct selection of acupuncture points and proper stimulation.
3. Steady, sure, light, and quick operative manipulation enhances the efficacy of anesthesia.
4. The site of incision and type of operation also affect the result of anesthesia; generally it is most effective in frontal operations and least effective in spinal cord operations (27).

The disadvantages were the problems of incomplete analgesia of the skin, reactions to traction of the dura mater and diaphragma sellae, and control of the syndrome of low intracranial pressure. The Hsuan Wu Hospital did not research the problems of acupuncture anesthesia in neurosurgery on children and on patients who were in a coma, uncooperative, or who suffered from severe cerebral trauma.

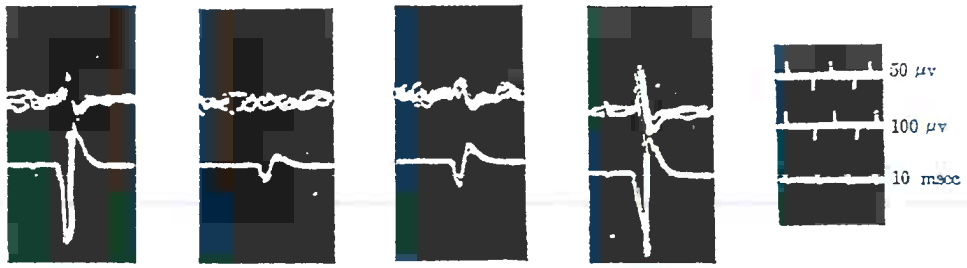
The Hua Shan Hospital of the Shanghai First Medical College evaluated 619 neurosurgical cases (120 spinal cord operations and 499 craniotomies) to evaluate the efficacy of the Chuanliao point group (#141, SI-18) (22). The overall success rate of surgical anesthesia in this series was 96.3% with excellent and good results in 65.6%, whereas the ear and body points were excellent in 60.7%. This points to the fact that the Chuanliao group seems to be the better set of points for craniotomy with frontal scalp incisions. Since the Chuanliao point is located in the region innervated by the maxillary branch of the trigeminal nerve and since the supraorbital branch of the trigeminal nerve innervates the frontal scalp, the better results may be due to Chuanliao's closer relation to the front region than to the parietal, occipital, and temporal regions which are innervated by the cervical nerves. The greater efficacy of acupuncture points located closer to the operative site, compared to those located farther away, illustrates the relative specificity of acupuncture points.

The Shanghai First People's Hospital reviewed the results of 700 thyroidectomies performed under acupuncture anesthesia between 1959 and 1972 (23). Anesthesia was performed in 93 cases by manual rotation and in 607 cases by electrical stimulation. In evaluating 12 sets of acupuncture points, they found them all satisfactory; however, the Futu set (#98, LI-18) in the region of the dermatome over the thyroid gland was distinctly better than any of the other sets, such as those located far from the dermatomes. They now believe that direct stimulation of those nerves innervating the surgical area will bring forth good results. They also found that the stimulation effect worked better with deep tissues than with superficial tissues. The Shanghai surgeons found that the disadvantages were incomplete analgesia of the skin and pain associated with traction on the thyroid gland or with ligation of the thyroid arteries.

The Eye, Ear, Nose, and Throat Hospital of Shanghai's First Medical College evaluated 74 cases of laryngectomy performed under acupuncture anesthesia; the success rate was 91.9%, with excellent results in 83.8% (28). In

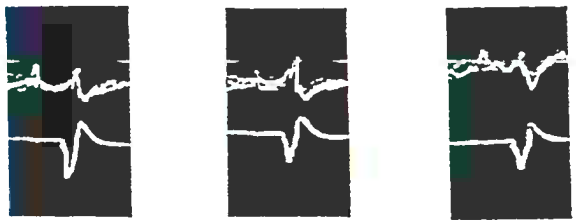
Fig. 5. Comparison of inhibitory effect produced by low and high frequency electro-acupuncture stimulation. The inhibitory effect is demonstrated by depression of cortical potential and EMG of submaxillar muscle evoked by bipolar stimulation of implanted electrodes in tooth pulp of 4/4. The animal is awake and in semifixed state. The first line shows the cortical potential. The second line shows the EMG. Each represents average of five successive responses.

Low frequency electro-acupuncture stimulation (60 cpm):



Control before needling | Immediately after stopping needling | 3 min later | 20 min later

High frequency (1980 cpm):



Control before needling | Immediately after stopping needling | 4 min later

most cases, analgesia was induced by acupuncture at the following points on both ears: The Shenmen point through the Sympathetic point, the Lung point, the Adrenal gland point through to the Pharyngolaryngeal point, the Neck point through to the Ping-chuan point, and also by needling on the upper extremity, unilaterally, at points Hoku and Chihkou (#106, TH-6). Induction with electric current with a frequency of 120 to 200 vibrations per minute lasted 20 to 30 minutes. They maintained the stimulation at the level where the patient felt soreness, distention, heaviness, and numbness.

Laryngectomy under acupuncture anesthesia had the following advantages:

1. Less operative bleeding.
2. Easier checking of the suturing of the pharyngolyngeal mucous membrane.
3. Marked decrease of tracheal secretions during and after the operation.
4. Only mild systemic reactions (fever and headaches).
5. Rapid recovery.

In a few patients, however, there were still such problems as incomplete analgesia, respiratory difficulty during traction, and an irritating cough.

The Shanghai First Tuberculosis Hospital used acupuncture anesthesia to perform 611 pulmonary resections, mainly lobectomies for

tuberculosis with cavities (4). The success rate was 96.2%; there were 486 males and 125 females, generally between the ages of 21 and 50 years. The anesthetists originally needled the patient at many points; they have now decreased the points to one, either the Pinao point (#94, LI-14) or a point in the thoracic area of the head.

This original work by the Shanghai First Tuberculosis Hospital was reported in the Chinese Medical Journal:

> After the chest was opened, the patient was asked to take deep and slow abdominal breathing so as to control or alleviate mediastinal flutter and paradoxical breathing. Irritating cough reflexes were suppressed by deep open mouth breathing or, if necessary, by peribronchial infiltration of procaine. In the presence of pain, local procaine infiltration or intravenous injection of a suitable dose of dolatin (demerol) was resorted to, in addition to stronger needle manipulation. In cases with poor pulmonary function or profuse bronchial secretions, an endotracheal tube or a double lumen intrabronchial tube was inserted to prevent obstruction of the respiratory tract and assisted respiration was performed.
>
> Examination during operation showed that the patient's pain threshold was somewhat elevated, while the temperature, touch and pressure sensations and two-point sensibility were fully preserved. In 17 patients, upon completion of induction, the palmar temperature and rectal temperature were found to have gone up from 30.5 to 34.8 C. and from 37.4 to 37.8 C. respectively. In 90 patients, both the blood pressure and pulse rate were increased during acupuncture anesthesia induction and at the beginning of operation, the increase being especially marked at certain operative steps after the chest had been opened. Following closure of the chest, they dropped a little, but were still higher than the preoperative levels.
>
> Generally, the respiration rate of these patients remained unchanged during induction (not more than 30 per minute), increased during skin incision and became still more rapid (averaging 32 per minute), after the chest had been opened. After closure of the chest, respiration was slowed down, but still quicker than in the preoperative period. EEG's obtained from 25 patients and EGG's from 9 patients showed nothing abnormal. Comparison of 5 patients receiving general anesthesia as controls revealed that, in the former, the white cell count was higher following acupuncture, and the percentage of neutrophils was elevated while that of lymphcytes are lowered. In the latter cases, on the other hand, no change was observed after general anesthesia, though subsequently a rise in WBC was noted (4).

In these patients, preoperatively, the anesthetic procedure was explained to the patient and trial needling was done to test the patient's level of pain tolerance and response to needling in order to gauge the force needed for needle manipulation or electrical stimulation. Amytal and atropine were prescribed to allay stress and to reduce respiratory secretions.

Between 1965 and 1972, the thoracic surgery section of the Peking Acupuncture Anesthesia Coordinating Group performed 818 cases of introthoracic operations (570 males, 248 females, varying in age from 9 to 72 years) including pulmonary resection, decortication, extirpation of medistinal tumor, division and suture of patent ductus arteriosus, valvulotomy of the mitral valve, and radical operations for carcinoma of the esophagus and cardia of the stomach (29). They simplified the technique of inducing anesthesia by reducing the number of points from 40 to only 1; they have increased the rate of excellent results from 70% to 88.5% (29).

Even with one needle, the successful results were not decreased. The particular point selected depended on the type of operation; the best results were obtained with these respective points: Shousanli (#90, LI-10), Waikuan (#105, TH-5), Sanyanglo (#108, TH-8), and Yifeng (#117, TH-17).

The Peking Acupuncture Anesthesia Coordinating Group found acupuncture to be successful in patients who had a feeling of combined soreness, swelling, heaviness, and numbness during the needling, who were mentally stable, whose basal pain threshold was high, and whose ability to discriminate two points, by the two point sensibility compass test, was lowered after needling. They recommended that every surgical procedure be quick, sure, and precise, and that every effort be made to reduce the patient's pain. Among the 818 cases, there were 18 failures due to incomplete analgesia, too much trau-

matic stimulation, excessive secretions, violent mediastinal flutter, and accidents in surgical manipulations.

During the surgery, there were no significant changes in pH, the blood acidity, or $P.CO_2$, the carbon dioxide pressure; in cardiac operations, controlled respiration with sufficient oxygen was instituted. Endotracheal or endobronchial intubation was used in a few cases of "wet lung" with satisfactory results in all except one. The anesthetist solved the problem of an open pneumothorax (air in the pleural cavity) in this manner:

> Open pneumothorax is a critical problem in thoracic surgery. To solve this, the breathing therapy of traditional Chinese medicine was applied. Before operation, the patient was required to practice deep abdominal breathing. By this means, the glottis was relaxed, airway resistance above the carina trachea was reduced, and paradoxical respiration was prevented; smooth and slow diaphragmatic respiration increased the tidal volume (the normal air exchange) and decreased the magnitude of mediastinal movement (29).

The Thoracic Section of the Acupuncture Anesthesia Group of the Second Teaching Hospital of Hunan Medical College used acupuncture anesthesia on 144 cases of cardiac surgery which included 90 cases of mitral stenosis and 54 cases of constrictive pericarditis (10). In each of the two groups, excellent and good results were 94.4%; there were three cases that failed.* Their original work was reported in the Chinese Medical Journal:

> Before operation, the patient was instructed to practice deep, slow abdominal breathing, and digitalis was prescribed; 25-50 mg. of dolantin were given 5 minutes preoperatively. Needling with pulsating electric current was done at Hoku (#84, LI-4) and Neikuan (#68, P-6) at the operative site. Induction took 15-20 minutes. Before skin incision and opening of the thoracic cavity, 20 ml and 15 ml of 0.25-0.5% procaine respectively, were used for local skin infiltration and intercostal nerve block.
>
> The main advantage of acupuncture anesthesia in cardiac surgery are: Less interference with the patient's physiological condition; active cooperation between the surgeon and the patient; feasibility of food intake immediately after operation, thus eliminating the necessity of venous infusion or reducing the amount needed; obviation of pain due to intubation and inhibitory action upon the respiratory and cardiac functions which the use of drugs gives rise to (10).

From 1970 up to the beginning of 1972, surgeons at the Chanshan County People's Hospital in Chekiang Province performed splenectomies on 305 cases of late schistosomiasis with a success rate of 95% (30). Unilateral ear points were used in 130 cases and unilateral ear points as well as nose points were used in 175 cases. The ear points were the Sympathetic point, the Shenmen point, the Lung point, and the Spleen point; the nose points were the Ear point, the Lung point, the Spleen point, and the Stomach point. Generally, acupuncture anesthesia was induced by needling the nose at the Lung point through to the Spleen point in addition to needling at the Stomach point or the Ear point, or by needling at the Ear point through to the Spleen point. Through practice, they found that the best results were obtained with the needling at combinations of ear and nose points. Needling the ear has a stronger inhibitory effect on transaction sensation and needling the nose provides comparatively satisfactory analgesia and muscle relaxation. As to be expected, the effect of the anesthesia, from needling the ear and the nose, was closely related to the patient's mental stability, the acupuncture points selected, and the degree of stimulation.

Let us quote from their protocol:

> Needling was done by electrical current with a frequency of 150-200 cycles per minute and an intensity of 4-7 milliamperes. The induction period lasted 30 to 40 minutes. The mean before operation consisted of a small amount of liquid food. Generally, no enema or gastric decompression tube was required. One hour priot to operation, 0.1-0.2 gm of sodium luminal intramuscularly or 0.2-0.6 gm of meprobamate orally was prescribed. During operation, if necessary, dolantin 50 mg and prom-

*) Of the three cases which failed, in one a small blood clot was found in the left auricle during operation, necessitating bilateral thoractomy, endotracheal intubation with ether anesthesia was necessary. Endotracheal ether anesthesia was given to the other 2 cases because of disturbance of respiration and anoxia after thoracotomy (10).

ethazine hydrochloride 25 mg by slow intravenous dripping were administered. In over half the cases, 0.5% procaine, 10-30 ml was injected into the muscular layer after the skin incision (30).

From 1966 to 1972, the department of surgery at the Peking Children's Hospital operated upon 1,308 children between the ages of one day to 14 years; the acupuncture anesthesia consisted of either manual rotation of the needles or electrical stimulation (31). Entirely satisfactory results were found in 80.8%; this compares with a success rate of 88.0% in 859 operations under regional and local anesthesia in 1965. Because of the difficulties involved in operating on an excited child, 69.6% of the 1,308 cases received either intramuscular injections of sodium pentothal or inhalation of a few drops of methoxyfluorane or trichloroethylene prior to the needling; similar anesthetics were also used in 63.6% of the 859 cases prior to their receiving local anesthesia.

The surgeons felt that acupuncture had certain obvious advantages in pediatric surgery; it eliminates the danger of overdosage from the anesthetic and provides a simple, inexpensive technique that can be used almost everywhere. They felt that if the procedure could be developed to induce a higher degree of analgesia as well as sleep; it would be a welcome advance in pediatric surgery.

The anesthesiology department at the Anhwei Medical College in Hofei, employed acupuncture anesthesia for surgery in 50 cases* of shock with a success rate of 86%. All cases except one had an increase in blood pressure (10-30 mm Hg in most cases; 50-70 in a few) following 10-15 minutes of induction needling.** Needling at the Adrenal point on the ear raised the blood pressure, thus providing surgery with a wider margin of safety and eliminating the possibility of damage to the body from long-standing medication. Needling on the nose yielded sufficient muscle relaxation for lower abdominal operations; this combined with certain stimulation points on the body produced adequate analgesia for skin incisions.

Using acupuncture analgesia, the Anhwei anesthesiologists found that they could decrease the amount of blood needed to restore the blood pressure and relieve the shock. They believe that the effect of acupuncture on hemorrhagic shock is due to "its action in strengthening the resistance of the body and raising the tone of the interior organs, such as the endocrine glands and the respiratory and circulatory systems."

They also found acupuncture anesthesia to be helpful in the control of breathing. In the Anhwei Medical College's series of operations, no cases of shallow respiration or dyspnea occurred; these respiratory difficulties are most often seen with general anesthesia. Also as might be expected, the recuperation period was usually shortened.

The Department of Physiology at Anhwei Medical College in Hofei performed controlled clinical experiments on cats to observe the action of needling on the function of the cardiovascular system in cats under induced hemorrhagic shock (29). Their experiments showed that acupuncture had no marked effect on a normal cat's blood pressure. However, after bleeding the cats, a comparison with controls showed that acupuncture delayed the time interval for the blood pressure to drop to shock levels, greatly increased the amount of blood loss needed to precipitate shock, and lowered the mortality rate from the shock. These phyiologists believe that acupuncture plays a role in the prevention and treatment of shock (16).

*) Among these, 28 had hemorrhagic shock, 12 had toxic shock and 10 had traumatic or other critical illnesses. Six patients were admitted in shock as emergency cases but were not given anti-shock treatment upon admission, mainly transfusion of blood and infusions, but failed to show improvement in either blood pressure (below 80 mm Hg systolic; or pulse rate (over 120 beats per minute). The remaining 6 patients suffered from cancerous cachexia, severe anemia or hypoproteinemia.

**) The acupuncture points used in this series were as follows: On the ears, 27 cases; on the body and the ears, 7 cases; on the nose, 6 cases; on the nose and the ears, 4 cases; on the ears with novocain block of the fringe area around the ears, 1 case; and on the nose and the body (subcutaneously), 4 cases (32).

In addition to anesthesia for general surgery, acupuncture has been used throughout China in the field of dentistry. The Sian Fourth Hospital E.N.T. Department has applied acupuncture extensively in dental extractions using electrical acupuncture from 1959 to 1960, finger-pressure acupuncture from 1961 to 1962, acupuncture induced by injecting the earlobe with saline from 1970 to 1972, and nose acupuncture from 1972 onward. Their combined success rate in the treatment of 1,845 patients was 64.9% or 1,198 cases (33).

In a different series of 1250 patients, they injected 0.3-1.0 cc of saline into certain earlobe points, waited 10-15 minutes for the patient to feel a sensation of warmth, and then extracted the teeth. In this series, 65.6% felt no pain and 31.5% felt a little pain; there was a failure rate of 2.9%. In neither of their series of extractions were they able to extract the teeth and achieve a result in which all of the patients felt no pain; however, their best results were with the patients who felt a sensation of warmth or swelling.

Some Western physicians or experts do not feel that acupuncture anesthesia will play a significant role in Western medicine. Dr. Gerald J. Greenberger feels:

> Patients in Western countries will not be able to tolerate as much discomfort as patients in the People's Republic of China, who after all may not be given much choice in the matter. Acupuncture for surgery is widely used in China today, because it is much cheaper, requiring no expensive anesthetic machines and drugs. Postoperatively, the patient will not have to be kept so long in an expensive hospital, but can go home to be cared for by his family or local health personnel (16).

My feeling of the relevance of acupuncture anesthesia for the West will be discussed in a following paper, "The Politics of Acupuncture."

Conclusion

In an attempt to review acupuncture anesthesia in its proper perspective, one must not only investigate its history but also the political climate which would permit such an "undesirable weed" to flower. Acupuncture anesthesia must be visualized with its advantages and disadvantages; it should neither be looked upon as the sensational anesthesia for all kinds of operations nor should it be looked upon as a primitive form of voodoo to be ignored. One must realize that acupuncture anesthesia is not the anesthesia for all patients and also that certain factors can increase or decrease its efficacy. Any student of acupuncture anesthesia should approach it with a scientific, non-prejudiced investigation of the Chinese experience of over 400,000 operations between 1966 and 1972. Although acupuncture anesthesia should be reviewed with a critical eye, no true scientist should pollute the objectiveness of his research with political prejudices against the People's Republic of China. In the final analysis, many things are known about acupuncture anesthesia, but not everything. Certainly, a wide field for further study lies over the horizon.

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