

Special Article

Anesthesiology in The People's Republic of China

John J. Bonica, M.D.*

THIS REPORT summarizes observations made and impressions gained as a member of the first official American medical mission to the People's Republic of China. The trip was organized by the National Academy of Sciences upon the invitation by the Chinese Medical Association. The 16-member delegation was headed by Dr. John R. Hogness, President of the National Institute of Medicine, and included people with expertise and special interest in internal medicine, pediatrics, family planning, maternity care, neurosciences, psychiatry, dentistry, public health, health care organization, and population.

We began our trip on June 15, 1973, at the China-New Territory (Hong Kong) border, where we boarded a train that took us to Kwang Chow (Canton). During the ensuing three weeks we spent five days in Kwang Chow, seven in Peking, four in Shanghai, and the remainder of the time visiting Hanchow and three cities in Manchuria, Shen-Yang, An-Shan, and Fu-Shun. Our hosts developed a very full schedule, which often ran 16 hours a day and included visits to five medical schools, 18 hospitals, a health spa, three research institutes, three communes, a city workers' village, three factories, a steel mill, and a coal mine. The itinerary also included visits to museums, historical sites, and tourist attractions, and most evenings were taken up by official receptions and by special social events.

The delegation was extended superb hospitality by the Minister of Public Health, officials of the Chinese Medical Association and Chinese Academy of Sciences, officials of the provincial and municipal governments and medical associations, and leading medical

educators and health professionals. We were also received by Vice Premier Li Hsien-nien.

Members of the delegation had the opportunity to confer with physicians and scientists in their fields and to see almost everything requested. I and several other members were invited to give lectures, which were extremely well attended and well discussed. I had the opportunity to enter the operating room area of every hospital visited, saw 32 operations in progress, took dozens of photographs of the patients and the teams, was allowed to monitor many of the patients, and tape-recorded conversations between patients and the anesthesiologists and surgeons.

To appreciate the development and practice of anesthesia in The People's Republic of China, and especially the use of acupuncture anesthesia, it is necessary to comment on medical education and health care in The People's Republic of China in general, and on surgical practice. More detailed accounts are found in reports by previous visitors.¹⁻²³

Medical Education and Health Care

For centuries China had one of the highest death rates and lowest life expectancies in the world. At the time of the Chinese communist victory in 1949, which they call the "War of Liberation," the health care system was almost totally inoperative and there was about one physician for every 28,000 people.⁴⁵

Soon intensive programs of improving food production, housing, and prevention of disease were initiated. Mao Tse Tung set forth five principles of health care: serve the workers, peasants, and soldiers; put prevention first; increase the number of health workers; unite Western and traditional Chinese medicine; and coordinate medical campaigns with mass movements. The Russians helped build new hospitals and rehabilitate old ones and helped

* Professor and Chairman, Department of Anesthesiology and Anesthesia Research Center, University of Washington School of Medicine, Seattle, Washington 98195.

to increase medical school enrollment manyfold, resulting in a far greater number of Western-trained physicians. At the same time the Chinese increased the numbers of nurses, midwives, and "assistant doctors," who were comparable to the Soviet "feldsher," and also developed their own new types of part-time health workers, called "barefoot doctors" and "worker doctors"—peasants or factory workers given three months of formal training followed by on-the-job training to provide basic health care. Chairman Mao emphasized the importance of traditional practitioners by stating, "Chinese medicine and pharmacology are a great treasure house; efforts should be made to explore them and raise them to higher levels."

From the very start, the public health policies of The People's Republic of China have fluctuated with national political, economic, and social policies. During the initial period, first priority was given to the development of heavy industry, and consequently the limited medical resources were used for urban workers at the expense of the people in rural areas, who constitute 80 per cent of China's total population. The original goal—the provision of health services to the majority of people—was not achieved. With the Great Leap Forward in 1958, decentralization was accompanied in the health sphere by movement of medical personnel from the cities to the countryside. However, in the early 1960's, after the disastrous results of the Great Leap and the subsequent withdrawal of Soviet aid, China's economy returned to a high degree of centralization and emphasis on skilled manpower. Thus, the trend once again was toward quality care for a relatively small number of people. Mao Tse Tung and his followers became disillusioned with the growing spirit of professional elitism and exclusiveness among the urban medical corps and felt that the new doctors were overtrained and were of little use in rural areas. Mao Tse Tung's "June 26th Directive" in 1965 ordered "in health and medical work, stress the rural areas" and proposed radical changes in medical education and training, with renewed emphasis on traditional Chinese medicine.

The Great Proletariat Cultural Revolution during the years 1966–1969 effected the radical changes proposed by Chairman Mao, affecting not only health care, but every aspect of

life. During the revolution universities and medical schools were closed and scientific publications were suspended. Medical students were graduated whether they had completed the full curriculum or not and sent to the countryside in mobile medical teams along with their professors, who were sent there for varying periods of "re-education," which included not only medical work but physical labor in the fields. When the medical schools were reopened several years later, they were no longer run exclusively by health professionals but by "revolutionary committees" consisting of representatives of the People's Liberation Army, members of the masses (students), and the faculty and administration. Medical school, formerly six years, was reduced to two years at the beginning of the Cultural Revolution, and is now three to three and a half years.

Anesthesiology

During my stay in The People's Republic of China I met and talked to more than 50 anesthesiologists and nurse-anesthetists and as many surgeons. The following information on the development of the specialty and its current status has been derived from extensive discussions I had with 12 prominent anesthesiologists and surgeons in Peking, Shanghai, and Kwang Chow. All of them speak English fluently. Every physician I met was very gracious, answered most questions, and readily agreed to have our conversation tape-recorded. I am convinced that the almost instantaneous rapport and the friendship we developed reflected not only mutual professional interest, but a basic characteristic of the Chinese. I was impressed not only by the number of anesthesiologists, but by the quality of anesthetic care provided.

DEVELOPMENT OF ANESTHESIOLOGY

Before the War of Liberation most of the anesthetics used in China were administered by surgeons and some nurses, as was the case in the United States and most other Western countries prior to the development of the specialty in the decade 1935–1945. In the early 1950's, a small group of pioneer anesthesiologists, some of whom had been trained in the United States, developed training pro-



FIG. 1. The official photograph of the meeting of the American delegation with Vice Premier Li Hsien-nien at the Great Hall of the People in Peking on June 26th, which was nationally publicized. *First row (bottom), left to right:* Dr. John Ingle, Kuo Hsing-kuo (President of the Chinese Medical Association), the author, Mrs. Hogness, Hsieh Hua (Minister of Public Health), Dr. Hogness, the Vice Premier, Dr. Walsh McDermott, Mrs. McDermott, Chow Fa-yen, Dr. Martin Cherkasky, Huang Chia-szu (President of the Chinese Academy of Medical Sciences); *Second row:* Dr. Myron Wagman, Mr. Leo Orleans, Dr. Philip Lee, Dr. Seymour Kety, Mrs. Ruth Lubic, Chang Hsiao-chien (Director of Medicine, Capital Hospital, Peking), Wu Jui-ping (Peking Children's Hospital), Dr. George Lythcott, Mrs. Stead, Dr. Eugene Stead, Lu Chih-chun (President, Institute of Chinese Traditional Medicine), and Weaver Gim (U.S. State Department). In the third and fourth rows are medical leaders and members of the Chinese Medical Association, including Dr. Wu Wei-jan (Chief of Surgery, Capital Hospital, Peking), Dr. Wu Ying-kai (Director of the Fu Wai Hospital), and Dr. Fu Yi-cheng (Deputy Secretary General of the Chinese Medical Association), and interpreters.

grams similar to those in North America and Europe. During the early phase of development, anesthesia personnel were members of the department of surgery, and since there were no free-standing anesthesia societies, anesthesia belonged to the Section of Surgery of the Chinese Medical Association. Initially, training was for one year, but with the emphasis on specialization which characterized the late 1950's, it was gradually increased to three years, and some programs offered a fourth year devoted to research. In addition to training specialists, most major anesthesia departments offered postgraduate courses lasting 3-12 months for general physicians, surgeons, nurses, and other health workers. Upon completion of their training, they would return to the district, county, or commune hospitals to practice anesthesia on a part-time basis.

By 1965 there were "several" thousand anesthesiologists and an even greater number of part-time anesthetists. As part of the national trend towards specialization, some anesthesiology programs were given departmental status, and national and regional anesthesia societies began to be formed. During the late 1950's and until the Cultural Revolution, many papers were presented at national and regional meetings and symposia. A bibliographic reference recently published by the Fogarty International Center⁸ shows that between January 1960 and June 1966, 221 articles dealing with all aspects of anesthesiology were published.

ANESTHESIOLOGY TODAY

The Cultural Revolution had a major impact on anesthesiology training, like in all other aspects of health care. Although the training

programs continued in most hospitals, they underwent marked changes. For one thing, as part of decentralization the revolutionary committee of each hospital decides the makeup of its anesthetic staff, the duration of anesthesia training and the type of anesthetic care. This has resulted in significant differences among the various anesthesia training programs. In some major hospitals I visited the periods of training are a year or less, while others offer two-year programs. However, the duration of training for any specific individual depends on the progress he or she makes as judged by the revolutionary committee, which decides when the training has been completed. There is no certifying body in anesthesiology or any other medical or surgical specialty. Since the Cultural Revolution there is also greater emphasis on training of surgeons, nurses, and other health workers to administer anesthesia in the smaller hospitals and on the integration of traditional practitioners skilled in acupuncture into departments of anesthesiology to practice and teach the technique to anesthesiologists.

I was told that currently there are between 5,000 and 7,000 anesthesiologists and between 8,000 and 10,000 part-time anesthetists who have had some training providing anesthetic care for 750 million people. As expected, the majority of anesthesiologists are in major cities: about 75-100 in Peking, 40-60 in Shanghai, and 30-50 in Kwang Chow, concentrated in the large hospitals. While the ratio appears small in comparison with figures for the United States, Britain, and other "developed" countries, it is better than the ratios in most developing countries. Moreover, it is important to keep in mind that the incidence of elective surgical interventions is probably much lower in The People's Republic of China, in part because some surgical conditions are treated with acupuncture and herb medicine.

The type and number of anesthetic personnel depend on the hospital category and the type of surgery done. In China there are six categories of hospitals: commune, county, district, municipal, provincial, and medical school hospitals. The commune hospitals have 40-60 beds, 1-2 operating rooms, and a delivery room equipped with very simple and rather crude apparatus. The

medical staff usually includes one or two surgeons who do about 30-60 operations per month, including herniorrhaphies, hysterectomies, appendectomies, and uncomplicated orthopedic procedures. In some of these hospitals gastrectomies are done, but cesarean sections are usually referred to a district or municipal hospital. Anesthesia is administered by the surgeon or another physician or a nurse with part-time training in anesthesia.

The larger hospitals are adequately furnished and equipped and extremely well-staffed. The surgeons are very well-trained, highly skilled, and use the most modern surgical techniques. Most of them operate faster than our American colleagues. Chinese surgery is justly proud of some very impressive achievements, including the successful re-implantation of limbs after periods of as long as 36 hours with restoration of excellent function, and spectacular success in the treatment of patients with extensive burns. In major cities some hospitals tend to specialize in a particular area of surgery, such as cardiovascular, pediatric, plastic, or orthopedic. Correction of cardiac septal defects is done both with extracorporeal circulation and with hypothermia. In the large hospitals I visited most of the anesthesia staff is composed of anesthesiologists and anesthesia residents, with only a minority of nurse anesthetists and traditional acupuncturists. For example, the Fu Wai Hospital in Peking is staffed by six anesthesiologists and two nurse anesthetists, and at the Chun Shan Hospital in Shanghai there are nine anesthesiologists and one nurse anesthetist.

The Cultural Revolution also altered the status of the specialty and of individual anesthesiologists. Virtually every program which had achieved departmental status has reverted to being a section of the department of surgery. Anesthesia is considered important and enjoys the same prestige as other surgical specialties. There is no difference between the salary of anesthesiologists and that of surgeons of similar "workers' grades." The grade an individual is given depends on his ability, experience, performance, and contribution. In contrast to the high value given publications before the Cultural Revolution, this is not an im-

portant criterion for professional advancement. The salary of the average physician ranges between 125 and 250 yuans per month, compared with a salary of 50–60 yuans for a worker (1 yuan = \$0.53). A physician's salary increases with advance in grade, with some "top" physicians, including some departmental chiefs, receiving 300 yuans and some even as much as 350–400 yuans per month.

The anesthesiologists I spoke to seemed to be well-informed about recent advances in the field. Although there have been no Chinese publications since the beginning of the Cultural Revolution, apparently they have continued to obtain medical and scientific journals from other countries, including the United States, even during the 22-year period when no diplomatic relations existed. We visited the library of the National Academy of Sciences, which is housed at Capital Hospital, and were most impressed by the vast number of books and journals. The English section contained complete sets of ANESTHESIOLOGY, *The British Journal of Anaesthesia*, and many other important anesthesia journals and books. There is a similar library in Shanghai, and there are fairly complete libraries in other major cities, which are apparently well-utilized by anesthesiologists. Many of those I met are well acquainted with American anesthesiology literature, manifested great respect for American anesthesiology, and expressed desire for future exchanges.

Anesthesiologists belong to the surgical section of the Chinese Medical Association. There are also regional, provincial, and municipal groups or societies which have scientific meetings. The anesthesiologists of the Peking area meet monthly to discuss important topics in anesthesia. A recent meeting was devoted to complete discussion of ketamine.

ANESTHESIOLOGY PRACTICE

As part of the national policy for self-reliance, virtually all of the medical equipment is manufactured in The People's Republic of China. In most of the larger hospitals the anesthetic equipment is good, and all drugs currently used in the United States are available, including all of the inhalation



FIG. 2. The author observing and monitoring a patient undergoing lobectomy in the Kwang Chow Provincial Hospital.

anesthetics, the muscle relaxants except pancuronium, and all the local anesthetics except bupivacaine. The anesthetic machines have the same basic design as American, British, and German equipment. The newer anesthetic agents, such as methoxyflurane and ketamine, and new equipment are apparently manufactured in The People's Republic of China without regard to Western patent rights. Some foreign equipment does exist. I saw Bleasé and Bird ventilators, a Dräger anesthesia machine, and Italian monitoring equipment to measure intraarterial pressure, ECG, EEG, plethysmography, and blood gases. In the small commune and county hospitals we visited, the anesthesia equipment consisted of simple inhalation machines of the type used in this country before 1940. Each of these hospitals had adequate equipment for regional anesthesia, including spinal and continuous epidural blocks.

Local and regional anesthesia is being used for 60–70 per cent of the surgical



FIG. 3. Photograph taken by the author showing a female patient undergoing partial gastrectomy under acupuncture analgesia in a Peking Hospital.



FIG. 4. Photograph taken by the author showing a patient being given acupressure in preparation for extensive dental extraction in the Shenyang College of Traditional Chinese Medicine.

operations, general anesthesia for 15-20 per cent, and the rest are done with acupuncture anesthesia. Obstetric anesthesia is limited to cesarean sections, most of which are done with epidural block. Patients with normal vaginal delivery are given no drug analgesia, whereas those who have complicated deliveries requiring instrumentation are given systemic analgesics in moderate doses.

General Anesthesia. In major hospitals general anesthesia is usually induced with the thiopental-succinylcholine-tracheal intubation sequence and maintained with a potent inhalation agent. For all abdominal

and thoracic operations or any other procedure requiring muscular relaxation, *d*-tubocurarine and controlled ventilation are usually used. During the 1950's and early 1960's, chloroform and trichloroethylene were used, but with the advent of halothane and methoxyflurane they have been abandoned. Of the potent inhalation anesthetics, diethyl ether is used most frequently, with halothane and methoxyflurane reserved for specific indications. Nitrous oxide is also used infrequently. Intravenous procaine infusion is used as the major general anesthetic in some hospitals.

In small commune or county hospitals

general anesthesia is used in less than 10–15 per cent of the cases, primarily because many patients are operated upon in emergency situations and at times trained personnel are lacking. When general anesthesia is used, it consists of thiopental induction and maintenance with ether in oxygen or ether-air. Tracheal intubation is done infrequently. In middle-sized district and municipal hospitals where most of the anesthetics are administered by nurse anesthetists or assistant doctors who have had some formal training, balanced anesthesia is employed.

Regional Anesthesia. The popularity and widespread use of regional anesthesia in The People's Republic of China have existed since the middle 1950's. Nearly half the articles published during the 1960–66 period dealt with regional anesthesia.⁶ All techniques are used, including epidural, subarachnoid, supraclavicular brachial plexus, axillary, and sciatic femoral blocks. For block of peripheral nerves and subarachnoid block they use procaine and tetracaine combined, whereas for epidural anesthesia they usually employ a combination of 1–1.5 per cent lidocaine and 0.15–0.2 per cent tetracaine.

Data provided me suggest that continuous epidural block is used more often than all of the other techniques combined. Virtually all abdominal operations, including gastrectomies and cholecystectomies, are done with segmental (T5–T12) continuous epidural block, achieved by placement of the catheter tip at about the T8 level, using a Tuohy-type needle and plastic catheter manufactured in The People's Republic of China. In operations on the upper extremity which are predicted to last more than three hours some anesthesiologists use continuous segmental epidural block achieved with a puncture between C7 and T1 and the catheter advanced cephalad. Subarachnoid block is still used, but not as much as previously, for somewhat the same reasons its use has decreased in the United States.

I was most impressed by the great skill and dexterity with which our Chinese colleagues performed these procedures. It was obvious that they had been taught well, learned quickly, and gained extensive experience. The latter undoubtedly reflects the importance attached to regional anesthesia



FIG. 5. A patient receiving therapeutic acupuncture with multiple needles for a neurologic disorder in the Shen-yang Hospital of Traditional Chinese Medicine.

in The People's Republic of China and its popularity, not only among anesthesiologists, but among surgeons and part-time anesthetists.

Acupuncture Anesthesia

In contrast to its use for therapy of disorders, acupuncture anesthesia is a new development, first used in Sian in 1958, apparently prompted by the simple question "if acupuncture relieves pain of medical disorders why not use it to prevent pain of surgery?" The first operations done were tonsillectomies, changing of burn dressings, and other simple procedures. The initial report created a great deal of excitement and interest because this was an exclusive Chinese discovery, unrelated to Western medicine which still had the taint of Western imperialism. Anesthesiologists began to attempt the technique, but it did not become as widely used as expected. In fact, during the early 1960's its use was

abandoned in some (many?) hospitals. During the six years preceding the Cultural Revolution, only one article on its use for surgical anesthesia was published in major medical journals.⁶ From the guarded comments made by several anesthesiologists, I concluded that this disuse was the result of disappointing failures in a significant proportion of patients. During the Cultural Revolution this "negative" trend of not using acupuncture was considered the work of revisionists, and subsequently greater emphasis was given to the widespread use of acupuncture in all hospitals.

The reports of previous American visitors to The People's Republic of China have given the American medical community and public the impression that acupuncture anesthesia is being used widely there for many, if not most, operations,^{1-7,8} but I found this not to be the case. From data given me by anesthesiologists and surgeons in hospitals we visited, I estimate that acupuncture anesthesia is being used in 5 per cent or less of the operations done in three commune hospitals, 10 per cent or less of the cases in four hospitals, and in 10-15 per cent of the operations in the rest. Only the Shen Yang Traditional Medicine Hospital reported that 60-80 per cent of the 300-500 operations a year are done with acupuncture anesthesia. No accurate statistics on the total number of acupuncture anesthetics are available, but according to some newspaper accounts,⁹ it has been used for 400,000 to 600,000 operations since it was introduced 15 years ago. Assuming that most of these anesthetics were done since the onset of the Cultural Revolution in 1966 (when its use was markedly increased), even the higher figure accounts for a little more than 1 per cent of the operations done during this seven-year period.

Among the physicians with whom I spoke, there was unanimity of opinion regarding the indications, advantages, disadvantages, and limitations of acupuncture anesthesia, which were cited with so much sameness that one is tempted to believe these have been made national policy. Advantages claimed include complete safety with no physiologic disturbance to the patient, the technique is simple and requires no elaborate equipment, during the operation the patient can cooperate with the surgeon, as, for example, in thyroid

surgery, and there is no postanesthetic morbidity or residual depression and consequently the patient can ambulate promptly, nor is there nausea and vomiting so that patients can take nutrient by mouth as soon as they return to the ward. However, when I pressed some of these issues, some of the anesthesiologists did admit that in most instances it is better to use chemical anesthesia, especially in intrathoracic operations. In regard to indications, every respondent stated that acupuncture anesthesia is best for thyroidectomy and other neck operations and for superficial operations on the face, nose, and throat, and superficial operations on the trunk and limbs. It is used in 95 per cent of thyroidectomies with a 95 per cent success rate.

SELECTION AND PREPARATION OF PATIENTS

In response to repeated questions about criteria used for selection of patients for acupuncture anesthesia, the answers were vague and varied. Everyone emphasized the importance of properly selecting and preparing the patient for this method, but no specific criteria were given. The decision to use this method is usually made by the surgeon, who tells the patient that he or she is a good candidate for acupuncture. Although the patient is said to have a choice, I gained the impression that by the time the surgeon finishes his discussion it is difficult for a patient to refuse acupuncture. The surgeon emphasizes that: 1) this is a new Chinese invention which resulted from the great teachings of Chairman Mao; 2) it does not harm the body, whereas chemical anesthesia has serious toxic effects. All respondents emphasized the importance of avoiding acupuncture in nervous, apprehensive, or anxious patients because these usually fail to achieve good results. It is also important that the patient be in good physical condition, without serious systemic disease and with no adhesions or other complications in the area of operation. Patients who undergo intrathoracic operation are admitted to the hospital several days prior to surgery to practice abdominal breathing under the instruction and supervision of therapists. The Chinese believe this is essential to prevent

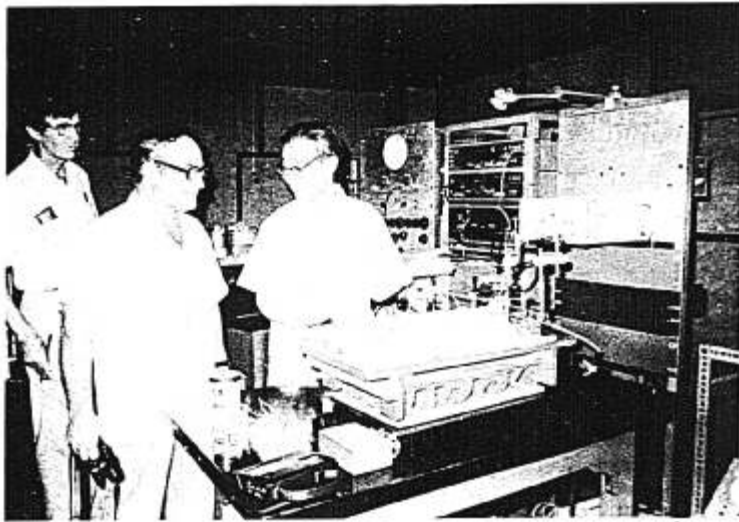


FIG. 6. Professor Chang Tsiang-Tun describing his neurophysiologic preparation used to study acupuncture analgesia to the author and Dr. Philip Lee at the Shanghai Institute of Physiology.

the usual disturbances of surgical pneumothorax. One previous report indicated that a pneumothorax is induced four or five days prior to the operation to permit the patient to become adapted to the collapsed lung.⁷ However, none of the anesthesiologists I spoke to was using this procedure.

The anesthesiologist usually sees the patient the day before the operation and re-emphasizes the advantages of acupuncture analgesia, as well as the disadvantages and side-effects and complications of chemical anesthesia. If the surgeon has not done so, the anesthesiologist explains the sensations elicited by the acupuncture needle as "slight local soreness and a feeling of distention which spreads from the site of needling and eventually the patient develops numbness." The patient is also informed of the sensation he will feel with the surgical incision ("a feeling of coldness across your neck") and other surgical maneuvers, such

as traction on the trachea and neck muscles during thyroidectomy, or feeling of traction or heaviness within the abdomen or chest. Patients who are to undergo thoracotomy are told that they will probably experience shortness of breath, a feeling of heaviness, or inability to breathe—all of which are important signs for the patient to breathe with the diaphragm as previously instructed. Some anesthesiologists use trial acupuncture to elicit the aforementioned sensation of soreness and distention and development of numbness. If the patient does not experience these, he or she is considered not a good candidate for the procedure.

In addition to the psychologic preparation, there is preanesthetic medication, usually consisting of a moderate dose of barbiturate or other sedative the night before and a narcotic (e.g., 75 mg meperidine) one hour before operation. Not infrequently this is supplemented with intravenous injection of a modest dose of narcotic.

TECHNIQUES

Initially, acupuncture anesthesia was achieved with numerous needles (as many as 50-90) inserted into traditional acupuncture points in the four extremities, face, and trunk by four to six acupuncturists. With development of the technique, this was gradually reduced to three to five needles; in some cases only one needle is used. Some still use manual twirling, but most operators use electrical stimulation, usually 125-150 cycles per minute employing 6-9 volts which deliver 3-9 milliamperes. In a demonstration I requested of one colleague, the insertion of the needle through the skin of my forearm was painless, but the location of the acupuncture point and the needle twirling were uncomfortable. The anesthesiologist locates the acupuncture point by a feeling of "heaviness and vibration." Induction of analgesia usually consumes 15-20 minutes, but at times it takes longer. After the feeling of local soreness and distention, the patient develops a subjective numbness, but no demonstrable area of analgesia to pin prick or other sensory stimulation. The acupuncture is done either by an acupuncturist with an anesthesiologist in attendance in the event of failure, or by anesthesiologists who have had 2-4 months of training in the technique. In traditional hospitals and some Western-type hospitals, surgical analgesia is also achieved by acupressure, which entails exerting marked pressure over certain acupuncture points instead of inserting needles. An intravenous narcotic is often given at the beginning of the operation. In addition, surgeons often inject 1-2 per cent procaine into the thoracotomy incision and hilum of the lung and into the parietal peritoneum just prior to laparotomy.

PERSONAL OBSERVATIONS

I personally observed 15 patients undergoing operations with acupuncture analgesia alone, including four patients undergoing thyroidectomy; three, lobectomy; one, mediastinal tumor; two, partial gastrectomies; one, hysterectomy; one, renal operation; one, operation in the lower limb; two, tooth extraction with acupressure. Of these 15

patients, two showed obvious facial expressions, shivering, and other signs of pain during incision of the skin, but on questioning denied having felt discomfort. About a third of the patients developed significant changes in heart rate and blood pressure, flushing of the face, muscle tension, and other signs of reflex responses to noxious stimulation. All six patients who underwent thoracotomy manifested signs and complained of symptoms of serious ventilatory and circulatory alterations, such as dyspnea, hypoxia, and paradoxical breathing (despite repeated instructions to the patient to breathe abdominally).

CONCLUSIONS AND QUESTIONS

I have no doubt that acupuncture analgesia is effective in permitting operation in certain highly selected patients. However, in reviewing the information I obtained, several perplexing points emerge:

- 1) There is great variation in the numbers of needles used and the sites of needling, not only among different anesthesiologists but by the same operator. I saw four thyroid operations being done with three different techniques of acupuncture.

- 2) Although every respondent claimed that the needles were inserted along traditional acupuncture points, in a number of cases I saw the needles were inserted not through classic acupuncture points but parallel or perpendicular to spinal nerves. When I questioned this discrepancy and seemed puzzled, I was told that the procedure is still experimental and they are trying to determine the best technique for each specific operation.

- 3) If acupuncture is in fact harmless, I wonder why it is not taught to surgeons and nurses who work in commune and district hospitals, which usually lack complicated anesthetic machines and trained personnel. I would think that the advantages mentioned above would be especially important under such circumstances.

- 4) Another paradox relevant to the above is that if the technique is harmless, why not use it in poor-risk patients, *e.g.*, patients with poor pulmonary function, bronchiectasis, extensive pulmonary disease, or those in poor physical condition because of complicating disease.

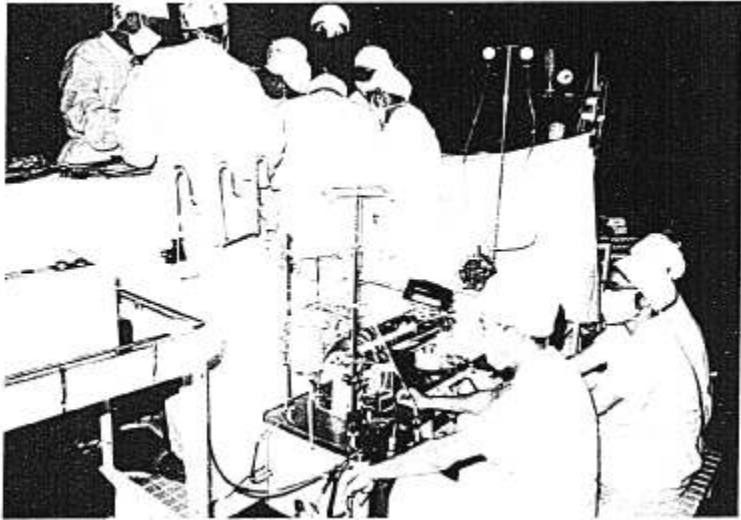


FIG. 7. Open-heart surgery using extracorporeal circulation at the Fu-Wai Hospital (Institute for Cardiovascular Diseases) in Peking. Pump technicians and other personnel monitoring the patient are under the supervision of the anesthesiologist.

RESEARCH ON ACUPUNCTURE ANESTHESIA

I was disappointed to learn that there has been virtually no clinical research done on patients operated upon under acupuncture anesthesia. This is especially surprising in regard to intrathoracic operations, in view of the fact that anesthesiologists and surgeons are fully appreciative of the problems of surgical pneumothorax and they do have the personnel and equipment capable of making appropriate measurements. I was informed that "a few" studies of blood gases had been done in "a few" patients in Peking and Shanghai, showing a modest rise in PaCO_2 and slight decrease in pH , but there are virtually no data on oxygen tension.

In contrast, basic neurophysiologic research is being done to determine the mechanisms of acupuncture analgesia in several research institutes. In Shanghai I had the pleasure of being the guest of Professor Chang Tsiang-

Tun, a highly respected neurophysiologist who spent 13 years in the United States and for the past 17 years has been head of the Brain Research Section of the Shanghai Institute of Physiology. Since the Cultural Revolution he and his colleagues have devoted most of their efforts to the study of mechanisms of acupuncture analgesia in rats, rabbits, and cats. They have evidence which suggests that electrical stimulation of certain acupuncture points stimulates receptors in muscles which evoke impulses that produce prolonged synaptic inhibition in several sites in the central nervous system.¹¹⁻¹² They have found that cells in the nuclei centralis lateralis and parafascicularis of the thalamus give rise to characteristic unit discharges in response to noxious stimuli and that these discharges are inhibited by electrical needling of certain acupuncture points, squeezing the Achilles tendon, or weak electrical stimulation of a sensory nerve.

They concluded that such an inhibitory mechanism, particularly at thalamic levels, is at least partially implicated in the production of acupuncture analgesia, or as Chang prefers to call it, hypalgesia. Since they found that duration of inhibition varied with the excitability level of the neurons, they suggest that the efficacy of acupuncture for analgesia may be determined mainly by the state of excitability of the brain. Other groups are studying the role of the midbrain reticular formation in acupuncture anesthesia,¹³ the effects of the procedure on the pain threshold of human skin¹⁴ and on the Hoffmann and other spinal reflexes,¹⁵ and the connections between acupuncture points on the limbs and the segments of the spinal cord by morphologic and electronmicroscopic studies.¹⁶

THERAPEUTIC ACUPUNCTURE

I observed patients receiving acupuncture therapy for chronic musculoskeletal pain, arthritis, poliomyelitis, facial paralysis, alopecia, gastrointestinal disorders, hypertension, periarthritis, facial spasm, and tremors of the hand, among other things. In contrast to its application to surgical anesthesia, acupuncture therapy is used almost exclusively by traditional medicine practitioners in the same manner used over the centuries. No evaluation of therapeutic acupuncture has been done using principles of controlled clinical trial, or even retrospective surveys. I gained the impression that acupuncture is being used for a variety of self-limiting disorders and in treating psychosomatic conditions, which are often benefitted by the placebo effect. We were given anecdotes of patients suffering from a variety of diseases for many months and years who were cured with acupuncture. Similar isolated cases have been reported in other countries, including the United States. It is possible that acupuncture is a therapeutic modality which through unknown mechanisms corrects physiopathology, but this can be ascertained only by well-designed clinical trials.

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