# E. A. Rovenstine Memorial Lecture

## Introduction

THE subject for the Fifth Annual Rovenstine Memorial Lecture is "Regional Anesthesia—A Critical Assessment of its Place in Therapeutics." The theme is altogether fitting for the occasion since this problem was of particular interest to Dr. Rovenstine for many years. In thinking about one who should give this address, it quickly became apparent that it would be eminently appropriate to invite one of Dr. Rovenstine's most illustrious students; our speaker is just such a person. He is also the first anesthesiologist to serve as the Rovenstine Lecturer. I will not attempt to enumerate his many contributions to anesthesiology and to our society. However, it is safe to say that during the last 25 years, he has served us well on virtually every scientific and educational committee and board in anesthesiology, both nationally and internationally. He is Professor and Chairman of the Department of Anesthesiology at Columbia University and most recently he has served us as the first Vice President of our Society and as Principal Consultant to the National Institute of General Medical Sciences of the National Institutes of Health in Washington. It gives me great personal pleasure to present the Rovenstine Lecturer for 1966, Dr. Emanuel M. Papper.

# Regional Anesthesia
# A Critical Assessment of Its Place in Therapeutics

*E. A. Rovenstine Memorial Lecture*

*E. M. Papper, M.D.**

I FEEL signally honored to have the privilege of giving the annual Rovenstine Lecture. The honor is heightened by both pleasure and humility. My years with him were cherished. The opportunities which he provided for me are impossible to describe fully and I cannot express sufficiently my gratitude to him. I have undertaken a critical discussion of a subject that was dear to his heart—a field that has always fascinated me as it did him—the field of therapeutic and diagnostic nerve blocks. It is one that I find perplexing now. I wish to share these controversial and puzzled views with you, from the perspective of old and recent developments in this field. Before doing so, I wish to pay a short tribute to a great man, in words which, I hope, will also set the background for the remainder of this lecture in his honor and in his memory.

E. A. Rovenstine was one of the most distinguished of anesthesiologists of his time. He may very well have had a greater influence on the development of this specialty than any other physician because of his versatility as a teacher, clinician, and clinical investigator. Born in Atwood, Indiana, in 1895, and educated at Wabash College and Indiana University, Rovenstine came to New York from Wisconsin in 1935 to start the first academic department of anesthesiology in that city. His medical interests were incredibly wide and his skills magnificent. He was far ahead of his time in recognizing the future importance of

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the physical as well as the biological sciences to anesthesiology. He predicted as early as 1947 that physics, electronics, and even automatic devices would one day have a great impact on clinical anesthetic practice.

He had a remarkable interest in the application of regional anesthetic procedures to surgical operations. He extended this interest thereafter to the study and therapy of other diseases, many of them painful: hence our discourse today. He brought the knowledge of the anesthesiologist in the control of pain to aid in the diagnosis and therapy of many different diseases. His favorite clinical problems for regional block were patients with trigeminal neuralgia, the painful shoulder, and the causalgic states. The pain of cancer interested him to a lesser degree, an irony of sorts in view of his eventual tragic battle with a prostatic cancer which finally took him from us in 1960.

His marked curiosity and interest in painful states was a logical development in view of the opportunities that Rovenstine had and utilized to further this particular skill. He was, in fact, almost preoccupied with this aspect of anesthetic care. His interest in this field began when he met Gaston Labat, the distinguished French surgeon who had turned regional anesthetist. Labat at that time was performing much of the regional anesthesia in Bellevue Hospital and also consulted at The Presbyterian Hospital in New York. Rovenstine also became a close friend of another surgeon interested in regional anesthesia who remained a practicing surgeon, Dr. Hippolyte Wertheim. The welding of the superb anatomical knowledge of Wertheim and the amazing technical skill of Labat with the inquisitive scholarly and clinical knowledge of Rovenstine, resulted in a cohesive direct attack upon the problems of diagnosis, prognosis and therapy of diverse abnormalities which had in common only the transmission of impulses, painful or otherwise, over nerve pathways.

Rovenstine's interest in therapeutic nerve block carried him to the point where he intended to write, with Madame Labat's approval, a second edition of Labat's classic book on Regional Anesthesia. He never produced this work because he disliked the discipline of

E. A. Rovenstine, M.D.

tedious application necessary in the compilation, digestion, and production of material for bookwriting. He preferred to look forward to new things rather than write about the old—even though he wrote easily and with a grace that had ever so small a touch of the flowery. However, he did secure from Madame Labat a large collection of drawings and plates which were to be used for a subsequent edition of the book. Some of these magnificent drawings have, fortunately, not been lost, and were utilized by Vincent J. Collins in his textbooks on anesthesiology. Many drawings and plates were also commissioned and drawn by a now well-known artist, a friend of mine from World War II days, Carroll N. Jones, Jr.; some of these have also appeared in Collins' works.

Rovenstine's interest in this subject carried him even further. He instituted courses in cadaver dissection in regional anesthesia which were available to the residents of the Bellevue Hospital Department and were also highly popular with anesthesiologists from other parts of the country. Among the students in these

TABLE 1. Summary of Recent Experience at The Presbyterian Hospital with Nerve Blocks

| Diagnostic and Therapeutic Nerve Blocks | |
|---|---|
| Period | 4.5 years (1962–1966) |
| Total | 1336 |
| Diagnostic & Prognostic | 41% |
| Therapeutic | 59% |

early courses were Doctors Dripps, Lamont, Collins and Gonzalez—to name only a few individuals who subsequently achieved prominence. Rovenstine taught much of the didactic part of this course and was a demonstrator of therapeutic nerve block on patients for the students. He was always at his best when he could demonstrate before and teach a group of postgraduate students.

## Rovenstine's Attitude Toward the Control of Pain

In a paper in which I had the privilege of being co-author, published in 1948, we described the obligation of the anesthesiologist and his opportunity to participate in the therapeutics of pain, in this way: "Events in the changing medical world have made it imperative that our functions be broadened and we accept the challenge of pain occurring outside the surgical amphitheater. Such a concept fully justifies an anesthesia clinic on the therapy of pain." "Pain, whose unheeded and familiar speech is howling and keen, shrieks day after day."—as Shelley put it.

## General Remarks as Justification for Considering a Critical Assessment of the Place of Regional Anesthesia in Therapeutics

One of the underlying problems in the assessment of nerve block is that the literature is prolific in praising and recommending the value of nerve blocks in an uncritical way, and does not take fully into account some of the problems that have to be considered. We shall concern ourselves with a detailed consideration of a few of the problems and raise some of the questions that need to be asked. It is important to state at this point that one of the tacit assumptions always made by the writers in the field is that the simple interruption of a conducting pathway is destined by that very act to prevent noxious, harmful or painful impulses from reaching the central nervous system, and therefore to alleviate discomfort. This is not necessarily so, as we shall see, for a multitude of variables impinge on the therapeutic value of nerve block.

## Recent Clinical Experiences at the Columbia-Presbyterian Medical Center

Table 1 summarizes some of the recent experiences at The Presbyterian Hospital. It will be noted that of the total number of procedures, something over 1,300 performed in the last 4½ years, approximately 60 per cent were done for therapeutic purposes and some 40 per cent for diagnostic purposes. The diagnostic aspect of regional anesthesia is very often neglected. Its role here is extraordinarily useful and critically important in selecting those patients in whom surgery or psychiatry may offer definitive help. In 1965, Jones of The Mayo Clinic suggested that neurosurgery may be the treatment for certain painful states, and that diagnostic nerve block may be useful in indicating in which of these states it may be applied; *e.g.*, pain over the distribution of a peripheral nerve may be better controlled by neurectomy; pain over the distribution of a spinal nerve may be better controlled by rhizotomy.[1] The latter preserves motor function and can destroy the sensory function of a nerve; it is therefore more selective than nerve block. Pain over an extensive area can be best controlled by chordotomy which may be attended by fewer complications than multiple injections of nerves. Perhaps just as important but almost never mentioned is that nerve block can sort out those patients who would be poorly managed by either surgery or destructive nerve block with phenol or alcohol.

For instance, one of the procedures that we have found valuable even in pain resulting from cancer is to do a "dummy" or placebo nerve block with saline, in order to evaluate the effect of psychological factors in the gene-

sis of pain. The placebo block connotes a potent procedure to a patient, *i.e.*, the insertion of needles and the implied promise of relief from suffering. The placebo effect can be great, and it must be evaluated for at least two reasons. The decision to destroy a nerve requires that one be absolutely certain that the nerve must be destroyed in order to relieve the symptom, otherwise the patient has a great disservice rendered him. The understanding of pain or the disturbed neurophysiological process implies that the removal of nerve impulses is critical to the alteration of the syndrome. In our hands, the placebo effect of saline block has been important in something over 30 per cent of all patients studied, regardless of the source of pain.

The obvious conclusion from such experience is that a block with saline should be done in at least the doubtful cases. The incidence of pain relief after a block with local anesthetic must clearly exceed 30 per cent in order to be acceptable as a useful clinical procedure. Therefore, as a practical measure, I would recommend that a block with saline be instituted after a successful block with an aqueous solution of a local anesthetic, before making a definitive judgment as to the ultimate therapeutic procedure to be used if destruction of nerve is involved.

At The Presbyterian Hospital in the last 4½ years the largest number of patients were inpatients, and approximately little more than ⅓ were outpatients (Table 2). It is also of interest that over this period when diagnostic and therapeutic nerve blocks were in relative disfavor and on the decline, there were nonetheless still nearly 300 blocks performed, on the average, per year. These comprised 1.1 per cent of all anesthetic procedures done by the Department of Anesthesiology and some 7 per cent of all regional anesthetic procedures. Prior to 1962, more diagnostic and therapeutic blocks were performed for more diseases than is true at the present. Some reasons for this decline will be discussed.

TABLE 2. Summary of Patients Given Nerve Blocks at The Presbyterian Hospital in Recent Years

| Diagnostic and Therapeutic Nerve Blocks | |
|---|---|
| Period (1962–1966) | 4.5 years |
| Inpatients | 1039 |
| Outpatients | 297 |
| Total | 1336 |

## The Mechanism of Pain

The uncertainties and disquietudes about the role of regional anesthesia in clinical conditions, especially in painful states, may be due to a variety of factors; one is lack of understanding of the mechanism of pain. For instance, the basic assumption that the destruction of a neuronal carrier of impulses to the central nervous system is the way to attack pain could be wrong or at least only partially adequate for some disorders. The anesthesiologist must understand and do something about unraveling the mechanism of pain in order to evaluate his participation as a therapist.

A definition of pain is extraordinarily difficult to phrase because it basically is a subjective sensation which can properly be experienced only by the person who has it, and not all people experience pain. It has been stated that pain experience is the sensation derived from noxious impulses traveling specific pathways. Such phenomena may be followed by the familiar and predictable feeling states. This "specific" theory has been known as the physiological theory of pain. It certainly does not explain all the phenomena of pain. For instance, the impulse which causes a feeling of pain may certainly not be noxious. A light brush of the skin in a patient with causalgia can cause the most unholy of terrors. The pathways are certainly far from specific—a concept implicit in this theory.

Also, the concept that there is a specific sensory unit consisting of specific free branched naked nerve endings in the periphery, especially in skin, which are connected to a single cell in the dorsal root ganglion, is clearly naive in the light of recent studies.

Another objection to the "specific" concept is that there are patients who are congenitally insensitive to pain and as far as one can tell have absolutely normally conductive neural

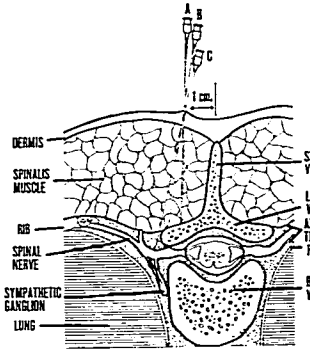


FIG. 1. Technique or thoracic and lumbar somatic block as described by Shaw.[4]

pathways. There are the classic papers of Jewesbury [2] and others who describe this finding. In fact, one went so far as to state that pain was not an essential biological adjustment and cited three boys, brothers, with insensitive skins who plagued their mother by exhibitionistic self-torture.

## The Spatial or Psychological Theory of Pain

This concept contends that pain is an interpretive rather than a specific phenomenon. The proponents of this theory believed that, neurophysiologically, a change in the intensity of the stimulus may progress through sensations of touch, heat, and pain, all carried over the same neural pathways. In certain diseases or abnormal states touch may be interpreted as pain. Examples of these conditions are causalgia, spinal anesthesia and nerve block anesthesia for operation. The past experience of the patient also enters into the interpretation of the phenomenon.

Adding immeasurably to these concepts is the suggestion that an internuncial group of neurones can become hypersensitive because of repetitive bombardment at different rates of speed through short and long fibers, and become hyperconductors, as it were, of normal stimuli. This was the so-called "irritable focus" by which the persistent pain of causalgia and other states were propagated. This theory has also been shown to be inadequate.

Neither of these theories adequately explains all aspects of the mechanism of pain. A new theory of the mechanism has just been proposed; the so-called gateway theory, by Melzack and Wall.[3] Insufficient time has elapsed to interpret the impact of the Wall theory on the comprehension of the pain process. I recommend that the studies of these investigators be watched with interest as they appear.

## The Problem of Accuracy in Nerve Block

Even though one assumes that there is sufficient knowledge about which nerves are to be blocked, diagnostically or therapeutically, the question arises as to how accurately one can place a needle near the nerve to be blocked, through the unbroken skin. It goes without saying that a precise knowledge of anatomy is extremely important so that the regional anesthesiologist can visualize the direction of the thrust of his needle. He should have a three dimensional sense as to where needles should go in relation to bony landmarks and soft tissues. There is no substitution for acquiring this skill in repeated cadaver dissection.

However, even with this knowledge, there are certain points about the accuracy of needle placement that are useful. One should not be bound by tradition in the technical approaches to nerve block. For instance, paravertebral thoracic and lumbar somatic block are still performed by the method of Labat or the modifications of Rovenstine; these methods are not wholly satisfactory. A more accurate method for these blocks has been described

TABLE 3. Method for Proper Placement of Needle —Relation Between the Voltage Required to Stimulate and the Distance from the Nerve

| Distance-Voltage Relation | |
|---|---|
| Touching nerve | 1 to 2 volts |
| 3 mm. | 3 to 5 volts |
| 6 mm. | 10 volts |
| 8 mm. | 15 to 20 volts |
| Over 8 mm. | No stimulation at higher voltages |

by Shaw.[4] The technique has, unfortunately, not gained popularity, probably owing to lack of awareness of its description. This approach is shown in figure 1, not only as a good method in itself, but an illustration of the fact that technical proficiency in nerve block has not died with the old masters and that a renewed study of applied neuroanatomy will be rewarding to those interested in this field.

The proper placement of the needle requires as much assistance as can be obtained. One of the ways in which this has been done was advocated by Greenblatt and Denson in 1962.[5] This method involves the use of an electrical stimulator to locate the peripheral nerves. These authors found a relation between the voltage required to stimulate and the distance from the nerve (table 3). If nerve destruction is contemplated, obviously the closer the needle is to the nerve the greater the likelihood of success. Our experience with the electrical stimulator has been good in those procedures wherein precise location of nerves is difficult, *e.g.*, obturator nerve block. It is not the complete answer to those blocks which must be done with destructive agents, although it is certainly helpful.

Another method of precise location of the place of injection is by means of radiographic control. By and large the anesthesiologist will do well to associate himself with a skilled person in radiology, preferably one with an interest in neuroradiology. Figures 2 and 3 are from studies done in collaboration with Doctor Gordon Potts of the Department of Radiology at Columbia University. Figure 2 is a basilar view of the skull which has been retouched with barium to demonstrate the openings of the foramina ovale. This approach is most useful for the proper performance of gasserian ganglion block. A lateral view (not shown) is also necessary. Figure 3 is a view employing radiographic control in the performance of block of the mandibular branch of the fifth nerve. This needle at the foramen ovale is blurry and perhaps should have been retouched for greater clarity. The patient was an intelligent, middle-aged woman who had a classical tic douloureux of the third division of the fifth nerve. The true nature of the pain was proven on two separate occasions

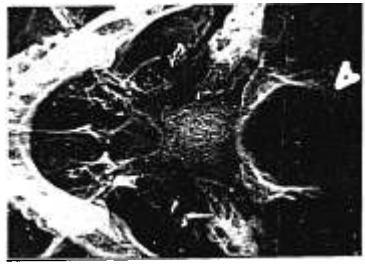

FIG. 2. Basilar view of the skull, retouched with barium, demonstrating the openings of the foramina ovale.

FIG. 3. Lateral view of the skull employing radiographic control in the performance of mandibular branch of the fifth nerve.

with block with lidocaine (Xylocaine) and subsequently with saline. This figure demonstrates the value of radiography in locating the exit of the nerve from the foramen ovale.

## The Problem of Anesthetic Agents to be Used

It is apparent that the anesthesiologist must have a clear concept of the materials to be used in order to achieve diagnosis and adequate results with regional anesthetic methods. If the goal is that of nerve destruction he must recognize the fact that the commonly used neurolytic agents, absolute alcohol and phenol, produce a relatively small area of destruction, approximately a few millimeters for one ml.

of the substance used. He must also recognize that there will be some degree of neural irritation produced in a certain number of patients. The incidence of neuropathy with heightened pain patterns is variably reported, but in our experience affects nearly 10 per cent of those patients treated locally with absolute alcohol. The neuropathy is believed to be due to partial destruction of neural fibers.

In addition, the anesthesiologist must be aware (even if he does not use them) that for destruction of nerves such modalities as ultrasound, radioactive materials (*e.g.*, radio Strontium-Yttrium in a dose range of 50 millicuries or so) can also be used for nerve destruction via properly placed needles.

In those circumstances where he intends to use aqueous solutions of anesthetics for therapeutic effect or diagnostic purposes, the anesthesiologist should understand something of the mechanism of action of these drugs in order to predict the result. Without such understanding the discovery of new drugs is subject to or doomed to failure or delay.

To summarize the essentials—it is now conceded that aqueous local anesthetics work by interference with the uptake of sodium by the nerve. This mechanism has been clarified by recent studies on tetrodotoxin, a potent poison extracted from the tissues of the puffer fish. This substance blocks only uptake of sodium and is probably the most potent local anesthetic agent known since it produces a permanent state of non-conduction. Most of the conventional local anesthetics block sodium uptake by nerve cells, and appear, in addition, to exert an influence on potassium flux. However, this mechanism is not uniformly agreed upon. The work of Ritchie at The Albert Einstein College of Medicine suggests that the basic form of the local anesthetic is necessary for penetration of the nerve sheath, but that the activity at the nerve membrane depends upon ionization.[6] Ritchie's observations have been confirmed with employment of the type of Ringer's solution that he uses. However, if the Ringer's solution is of the more conventional type, the classic view that the basic form of the local anesthetic is more active is supported regardless of whether one is dealing with a myelinated or unmyelinated nerve.

Other physiological changes also influence nerve conduction. For example, carbon dioxide has a depressant effect upon nerve conduction. In order to evaluate the effects on nerves of aqueous solutions of anesthetics for diagnosis and therapy, such considerations must be borne in mind. It is not sufficient to say that patients vary so much that patient variability will account for the changes.

When one looks at the experimental data and thinks of synthesis of new local anesthetic agents which may be time controlled for various purposes, it appears as though the most exciting advance in recent years in the chemistry of local anesthetics may be in unraveling the complicated structure of tetrodotoxin. It is a fascinating material in many ways including the fact that it has a very low lipid solubility. Classically, it has always been stated that effective local anesthetics must have a high lipid solubility. Chemists are attempting to synthesize tetrodotoxin and to modify it chemically in order to produce local anesthetics with the desired spectrum of effects.

## Total Management of the Patient

In addition to matters of technical skill and chemical solutions, the total management of a patient in need of therapeutic regional anesthesia is of considerable importance. The physician must choose his patients, must be aware of the natural history of the diseases that he is concerned with, and must recognize the role that he plays as a physician in the overall management of a patient who requires regional anesthetic procedures. In the light of these comments, it would serve us well to consider some specific problems that have been dealt with over the years with regional anesthetic methods.

## The Treatment of Patients with Cancer

Much has been written on this subject and it is well to examine some of the results obtained so that the anesthesiologist will be provided with information with which to compare his own experience.

The female genitourinary tract, the breast, the pelvis and the lower gastrointestinal tract account for over 50 per cent of the pain resulting from malignant disease (table 4),

TABLE 4. Source of Cancer Causing Pain in Women

| | | |
|---|---|---|
| Genitourinary tract | 150 | Over 50% |
| Breast and pelvis | 112 | |
| Lower gastrointestinal tract | 124 | |
| Others | 328 | |
| (Perese 1961[7]) | | |

Most patients fall into the middle-age group. The large majority of patients have had pain somewhat less than six months when they present themselves for treatment.

In the normal course of events, palliative surgery, radiation and narcotics are the most commonly used procedures in the therapy of cancer pain (table 5). When cancer pain is systematically attacked by a group of physicians interested in the problem, nerve block, chorodotomy and narcotics became the mainstays of treatment (table 6). This is not surprising in view of the fact that the large majority of patients have pain in those nerve tracts amenable to destruction either by regional anesthetics or by operation, *i.e.*, the female genitourinary tract, the breast, the pelvis. This is also a commentary on how much more important nerve block could become in planned therapy.

Nerve block therapy for cancer patients, according to Bonica, yields approximately 60 per cent complete relief of pain and nearly 15 per cent failures, with intermediary effects in the others.[8] These results should be evaluated in accordance with the now well established placebo effect, that is, a 30 per cent "cure" rate for any therapeutic measure even in cancer pain.

The use of subarachnoid alcohol block has waxed and waned over the years. The results of one such study are shown in table 7 in which approximately 50 per cent of patients were completely relieved of pain due to cancer and another 33 per cent had partial relief. These data must also be interpreted cautiously in view of the placebo effect and the fact that this method has not really stood the test of time. Despite reported successes, our experience at The Presbyterian Hospital with splanchnic nerve block or subarachnoid alcohol block for visceral pain, especially that due to extension from hollow organs or the pancreas, has been disappointing. We have done very much better for the relief of pain in those patients who have extension to skeletal areas that are amenable to segmental paravertebral block according to the method of Shaw, and where life expectancy would probably not exceed six months.

TABLE 5. Usual Therapy for Cancer Pain from a History of 714 Patients

| | Patients |
|---|---|
| Nerve block | 21 |
| Narcotics | 242 |
| Palliative surgery | 106 |
| Radiations | 100 |
| Other methods (Perese 1961[7]) | 45 |

TABLE 6. Systemic Therapy for Cancer Pain in 714 Patients at Presbyterian Hospital

| | Patients |
|---|---|
| Nerve block | 14 |
| Cordotomy | 113 |
| Narcotics | 113 |
| Radiation | 53 |
| Other methods | 293 |

TABLE 7. Results of Subarachnoid Alcohol Block in 106 Patients

| | |
|---|---|
| Complete pain relief | 50% |
| Partial pain relief | 33% |

We have also had success in treating cancer pain in those areas which are within the clearly defined limits of a peripheral nerve, *e.g.*, a cranial nerve, especially a branch of the fifth nerve. Some types of head and neck cancer pain are well treated in this way.

A question still remains as to why various methods of treatment appear to help approximately two thirds of patients with cancer pain, limited to a period of months. No biological explanation is yet available and studies are sorely needed.

## Tic Douloureux

A problem presents itself in tic douloureux which is of great interest and illustrates one of the reasons why anesthesiologists must be

TABLE 8. Results Obtained in Trigeminal Neuralgia Using Carbamazepine (Tegretol)

| | | |
|---|---|---|
| Total | 97 | Patients |
| Favorable sustained relief | 73 | (75%) |
| Remission (Tegretol stopped) | 19 | (20%) |
| Side effects | 10 | (10%) Amols |

alert to the development of new concepts in the control of pain. The use of nerve block for treatment of trigeminal neuralgia is time-honored and very impressive in most reports. In fact, it was one of the favorite diseases for which nerve block was used by Rovenstine and his associates. As is commonly the case in all painful states, it is instructive to look at the natural history of the disease before we attempt to evaluate the results of treatment.

Rushton at the Mayo Clinic, as early as 1953, analyzed the natural history of the disease, and showed that in trigeminal neuralgia, approximately 50 per cent of patients had a spontaneous remission for six months or more.[9] Approximately 25 per cent of patients had a spontaneous remission for more than one year. This obviously means that one is unable to judge the efficacy of nerve block or any other procedure without taking into account the natural history. I would think that pain relief in 60 per cent of patients by nerve block might not be as impressive as it sounds, unless the relief were either permanent or were of the magnitude of two years or more. Obviously clinical judgment must temper this opinion and one should not be too harsh in making the judgment; but it is well to keep in mind what the story can be with and without treatment.

The problem is even complicated by newly developed specific drugs for the therapy of tic douloureux; one of these drugs studied by Amols at our institution is Tegretol, a drug which is both anticonvulsive and a psychic energizer. Using Tegretol, Amols attained sustained relief of pain for a period of two years and a remission incidence after Tegretol was discontinued, of some 20 per cent, in trigeminal neuralgia (table 8).

The drug is not harmless in that it produces complications referable to the blood-forming elements and to the central nervous system in about 10 per cent of patients. However, treatment is so useful with this drug that it has completely changed the picture of nerve block and the need for intracranial operation at our Neurological Institute. It can be seen from the next chart that in the third year of the drug study there were no intracranial 5th nerve operations and very few nerve blocks except in Tegretol failures compared to an average of 28.1 intracranial operations annually prior to the use of this drug.

## Shoulder Pain

Nerve block therapy of shoulder pain, one of the most impressive and popular procedures that Rovenstine used, has receded to a position of historical interest because of the combined effects of anti-inflammatory agents, the direct injection of such substances as cortisone into inflamed areas in the shoulder and the greatly increased sophistication of rehabilitation procedures for these patients. It can be truly said that the nerve block treatment for shoulder pain is obsolete except in rare instances.

## The Matter of Vascular Insufficiency

Nerve block was very widely used to produce vasodilatation. It was most commonly performed in the approach to diseases of the extremities characterized by vasospasm. The most common methods used were stellate and thoracic sympathetic block for the upper extremities and epidural block and lumbar sympathetic block for the lower extremities. These methods, too, have seen less frequent use except for problems in the lower extremities where epidural block has retained a place of usefulness. Here it provides surgical anesthesia as well as vasodilatation for operations that may prove to be necessary. An important reason for the change in approach to these diseases appears to be the remarkable progress of vascular surgery in which the combination of parenteral vasodilating agents can be used with reconstruction of peripheral vessels of

varying size, including very small vessels. Even nerve injury, a previously important cause of causalgia, is susceptible to better repair with newer techniques.

An example of another type of block that has fallen into relative disuse is stellate ganglion block for the treatment of cerebral vascular insufficiency and stroke. It is now well established that the major control of the cerebral circulation lies in the $P_{CO_2}$ of arterial blood in the cerebral vessels and not via neural vasomotor tone. Therefore nerve block is not rational. Although never widely accepted, block is not used now for the treatment of asthma in view of the greatly increased efficiency of drug treatment of this disease coupled with the rehabilitative approaches to proper respiration, and the use of mechanical ventilators.

It appears therefore that there has been a significant change in the direction of diminution of the importance of diagnostic and therapeutic nerve blocks as a traditional form of therapy. This is largely the result of the changing and increasingly successful pattern of therapeutics with drugs and surgical procedures. The listener has the right to expect a more definitive answer from a speaker who has told you essentially that there are not only many problems concerning diagnostic and therapeutic nerve block, but that the method has lost usefulness. How do diagnostic and therapeutic block fit into therapeutics at the present time?

The answer based upon analysis falls into two main categories. One obvious thought is that the regional anesthesiologist who chooses to use these methods must learn more about precisional anatomy, the potential, the nature of, and the development of both destructive agents and temporarily active anesthetics if his patients are to benefit. He must also become familiar with other methods of destroying nerves. He must take an interest in the precise localization of his needles. He must take a strong interest in understanding the mechanisms of pain so that he does not function as a technician whose results turn out, by and large, to be unsatisfactory and who will cease to have patients referred to him for treatment because of his failures. He must be in the position, if interested in the problems, both to take part in the total care of the patients and to contribute to a better understanding of the problems of pain. If these essentials are achieved, then a list of useful procedures, as seen by this observer, can be developed, one that he owes to this audience in view of his critical and unfavorable comments concerning therapeutic nerve block.

*Diagnostic Nerve Block:* (1) To establish with certainty whether pain is organic or functional in nature. (2) To decide whether surgical destruction or destructive nerve block of a given conducting pathway is advisable, or necessary. (3) To aid in the differential diagnosis of the source of pain, e.g., pain can reverberate from one area to another subserved by a branch of a major nerve. It is possible to have toothache in the lower jaw originating from a lesion in the upper jaw. These can be differentiated by appropriate diagnostic blocks. (4) The use of nerve block procedures as a research method in unraveling the complexities of pain itself.

*Therapeutic Nerve Block—Present Values:* (1) Therapeutic block of a temporary nature is valuable in the management of certain self-limited processes which would ordinarily require substantial doses of narcotics, or the interference with other physiological functions. The use of paravertebral block for the management of patients with fractured ribs is a good example. (2) The control of postoperative pain is a method that is insufficiently used because of problems in the extravagant use of personnel. However, where necessary and where possible, the management of postoperative pain without narcotics and without restrictive dressings is a most valuable aspect of diagnostic and therapeutic block as has been pointed out by Bonica and by Thorpe. It should be used much more often than it has been in the past. (3) The epidural route is useful when the combined vasodilatation and surgical anesthesia are necessary. (4) The management of pain in labor, prior to obstetrical delivery. (5) Another use of epidural block is found in patients with peripheral vascular disease who are to undergo definitive operations upon blood vessels. (6) In the management of pain resulting from cancer,

the method has merit if the cancer is confined to the distribution of a readily accessible peripheral nerve or to a few peripheral nerves. (7) In the study of baffling clinical problems where nerve interruption will be helpful in correcting the abnormal physiology of congenital urinary tract disease. (8) In the study of pain. (9) In patients where the newer drugs have failed to provide relief.

## Summary

An analysis from an historical, physiological, pharmacological and clinical point of view of those elements that are concerned with critical assessment of the role of regional anesthesia in diagnostic procedures and therapeutics has been presented. Some of the traditional uses of this method are outmoded and have become less useful. Suggestions as to those areas of clinical practice where diagnostic and therapeutic block is useful have been made.

## References

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## Nervous System

**EEG** Electroencephalograms from 650 patients, 466 of whom were neurologically normal, were examined. EEG abnormalities were found in 32.7 per cent of the neurologically normal subjects and 44.5 per cent of those with some degree of neurologic deficit. The presence or absence of EEG abnormalities did not correlate with the incidence of systolic blood pressure elevation over 200 mm. of mercury. Among subjects at least one year after an apoplectic episode, 14.5 per cent of those with hemiplegia and 22.7 per cent of those with hemiparesis exhibited normal EEG tracings. Flat EEG's were found in 8.6 per cent of neurologically normal subjects. (*Otomo, E., and Tsubaki, T.: Electroencephalography in Subjects Over 60 Years of Age, Electroenceph. Clin. Neurophysiol. 20: 77 1966.*) ABSTRACTOR'S NOTE: Preoperative baseline EEG tracings are essential when one is called upon to evaluate postoperative EEG after surgical procedures involving the cerebral vasculature, especially in geriatric patients.

**PAIN AND HYPNOSIS** When pain is induced by immersing a subject's hand and forearm in circulating ice water, a rating scale (0–10) can be developed so that a straightline function emerges when the logarithm pain-state report is plotted against the logarithm of time. It was found that hypnotic suggestion of analgesia reduced the amount of pain reported corresponding to the susceptibility to hypnosis. The most highly susceptible subjects blocked out the pain completely. Although no physiologic correlate was blocked, this does not negate the reduction of the pain by hypnosis, but indicates that the locus of the effect must be in higher neural centers concerned with attention and alterations in consciousness. (*Hilgard, E. R.: Quantitative Study of Pain and Its Reduction through Hypnotic Suggestion, Science 156: 539 (April) 1967.*)