

ment materials were given in adequate amounts."

M. L. B.

WHITE, JAMES C.: *Pain After Amputation and its Treatment*. J. A. M. A. 124: 1030-1035 (Apr. 8) 1944.

Very little progress has been made in the relief of painful amputated stumps since the Civil War. Most of the attempts to relieve pain following the last world war were directed to reamputation resulting in no relief and further mutilation, the author points out. As a result of the interest of Leriche, Livingston, Riddoch and the author a more satisfactory approach to this problem is being reached.

"Why most neuromas should be painless and others the cause of long lasting torture is quite unknown." "The fact that more proximal crushing or chemical destruction by infiltrating the nerve trunk with alcohol fails to give relief has forced investigators to predicate a central extension of the pain mechanism." This central disturbance is probably from reflex changes in the spinal or cortical levels. "When pain of this type is allowed to become chronic, the cerebral cortex may become involved in its projection, and in addition the patient usually develops an addiction for morphine. . . . A waiting period of over six months in any but the most stable individuals is dangerous because the psychic changes may become irreparable."

The author evaluates the various methods that have been used to relieve this pain and points out the recommendation of the military neurosurgeons. The use of procaine injection in early neuroma as a diagnostic procedure before surgery is attempted is discussed. If procaine relieves the pain then a simple resection of the neuroma is worth trying. Sympathectomy has given beneficial results. White suggests a diagnostic block

(sympathetic) with procaine. He points out that in the occasional case this block will give enduring results. The use of alcohol injection for permanent results, the author believes, is not as effective as a surgical interruption of the sympathetic fibers. Section of the spinothalamic tract has given good results when the right area has been severed.

In conclusion and summary the author states:

"1. Incapacitating pain after amputation may be due either to irritation of end-bulb neuromas in the stump or in the case of a phantom limb with persistence of pain and postural sensations, to their projection from the sensory areas of the cerebral cortex.

"2. Local pain, burning and tenderness which are confined to the actual stump can be relieved by: (a) Chemical or surgical interruption of the regional sympathetic outflow. These relatively minor and nonmutilating procedures are effective in an encouraging proportion of cases, especially when vasoconstriction and sweating are present to an abnormal degree. (b) Section of the spinothalamic tract (chordotomy).

"3. The peculiar pain and unpleasant postural sensations of the phantom limb will occasionally respond to sympathectomy or chordotomy, especially if the operation is performed at an early date, but these procedures invariably fail when the personality has started to deteriorate from prolonged suffering, introspection and morphine addiction.

"4. In treating difficult problems of this sort it must always be borne in mind that any ineffectual and mutilating procedure, by adding another psychic trauma, must inevitably result in further suffering and loss of morale.

"5. Experience has taught that a single resection of a neuroma is justifiable if it is definitely tender and the

pain can be relieved by infiltration of procaine hydrochloride. Repeated excision of neuromas, neurectomy, reamputation at higher levels and resection of posterior spinal roots consistently fail and should never be used.

"6. In the most severe forms of phantom limb pain, where in the past patients have sunk into hopeless invalidism, become morphine addicts or suicides, it may be possible to obtain relief by new types of surgical intervention directed at the highest centers in the brain. These comprise resection of the contralateral postcentral sensory convolution, from which the phantom sensations appear to be projected, or bilateral division of the frontal association fibers, which may be effective by freeing the patient of his intense introspection and anxiety. At present both must be regarded as purely experimental procedures, which will require extensive investigation before their therapeutic value can be estimated. The reason for presenting these procedures in their present theoretical stage is to call attention to their possibilities with the hope that they may aid in the solution of a hitherto insoluble problem."

M. L. B.

ELDER, CHARLES K., AND HARRISON, EVERETT M.: *Pentothal Sodium Slough: Prevention by Procaine Hydrochloride*. J. A. M. A. 125: 116-117 (May 13) 1944.

Because of the incidence of extravascular injection of sodium pentothal solution resulting in tissue reaction and even slough the authors set out to find a means of preventing this reaction.

A series of paired injections were made on the backs of rabbits. Pentothal was used in dilutions of 2.5 per cent, 5 per cent, and 10 per cent. At the paired sites one was injected with 5 cc. of 1 per cent procaine hydrochloride (in isotonic solution of sodium

chloride) in and around the site after 5 cc. of freshly prepared pentothal was injected. The most severe reaction was noted at the site of 10 per cent injection of pentothal, but the paired site where procaine hydrochloride had subsequently been injected showed no reaction. This was true for the sites of 5 per cent and 2.5 per cent. Where procaine had been injected following the pentothal, the skin remained normal and hair began to grow normally. A total of sixteen injections were studied.

The only explanation for this result was the possibility that procaine prevented a vasoconstriction of the local tissue and allowed vasodilatation to occur.

There were no clinical cases reported. In conclusion, the authors suggested the use of 2 per cent pentothal and better care in avoiding extravascular injections. "Subcutaneous injections of 2, 5, and 10 per cent solutions of pentothal sodium result in reactive and destructive tissue lesions in the skin of rabbits. They believe that when extravascular injections occur procaine per cent should be injected immediately into the area to avoid tissue reaction or slough. Hot applications to the extravascular site of injection further aid in vasodilatation to the affected area.

M. L. B.

McCORMICK, C. O.; HUBER, C. P.; SPAHR, J. F., AND GILLESPIE, C. F.: *An Experience with One Hundred Cases of Continuous Caudal Anesthesia*. Am. J. Obst. & Gynec. 41: 297-311 (Mar.) 1944.

"Our study covers one hundred cases conducted in the obstetrical department of Indiana University. Fifty-one of the deliveries were performed at the William H. Coleman Hospital for Women and forty-nine at the Indianapolis City Hospital. The technical conduct of the anesthesia was done