ous difference in effect. The muscular relaxation appears to be maximal but in animals the use of ether seems to reduce the relaxant effect. A mixture of decamethonium iodide, 4 mg., with thiopentone 1 Gm. has been successfully used. The drug is about 5 times as potent as d-tubocurarine and is marketed in solution containing 2 mg. per 1 ml. Experience suggests that it is a safe and effective substitute for d-tubocurarine chloride.

C. S. J.

MUSHIN, WILLIAM W., AND BAKER, L. RENDELL: *Intravenous Procaine: A Review.* Lancet 1: 619–620 (April 9) 1949.

The intravenous injection of procaine which was for so long regarded as an accident to be avoided is now being used for a host of conditions. Twenty-five years elapsed between Bier's original intravenous injection of procaine distal to a tourniquet for local anesthetic purposes to the deliberate intravascular use of procaine by Leriche and Fontaine in 1935 for endarteritis obliterans.

During the recent war the use of intravenous procaine in continuous infusions of 0.1 per cent or weaker was stimulated by Gordon's report in 1943 of the analgesic effect of such infusions on the painful dressing of burns. Independent work along the same lines was pursued in France, as well as elsewhere, where its use in relief of the dyspnoea due to a variety of pulmonary and cardiac causes was thought promising.

Procaine, di-ethyl-amino ethyl -p-amino benzoate belongs to the alkaline ester group with a basic stricture similar to those of atropine, curare and the antihistaminics so that it is not surprising that procaine may show several lesser actions in different fields. The degraduation products of the action of the liver on procaine are p-amino-benzoic acid and di-ethyl-amino-ethanol. Benda and Benda claim that the former is as effective and less toxic than procaine.

Procaine and other local anesthetics have been shown by Daves (1946) to have a direct quinidine action on heart muscle when injected intravenously. The anti-histaminic effect is probably the reason for the reported success of intravenous procaine in urticaria, asthma and other allergic manifestations and many of procaine's properties may be the result of its antagonistic effect to acetylcholine.

The powerful effect of intravenous procaine in relieving pain may be due in part to Dixon's law and to the fact that the increased capillary permeability in inflamed tissues allows a greater concentration of procaine here (7 to 8 times greater than other tissues).

Intravenous procaine medication has been reported upon favourably in a host of painful syndromes, in cardiac surgery and cardiac irregularities during anesthesia, especially in chest operations, in many allergic conditions and to secure vasodilatation in peripheral vascular disease. The authors report the successful use of 10 ml. of 1% procaine injected slowly intravenously to abort a condition of status asthmaticus. The use of this emergency dosage (i.e., 10 ml. of 1% procaine) and the infusion of 0.1% solution must be carefully supervised and thiopentone should be held ready for use if convulsions develop. 36 references.

C. S. J.

WILSON, GEORGE; RUPP, CHARLES, AND WILSON, WILLIAM W.: *The Dangers of Intrathecal Medication.* J. A. M. A. **140**: 1076–1079 (July 30) 1949.

The authors are re-emphasizing the dangers and critically re-evaluating the rationale of the intrathecal route for administration of drugs. The in-

jection of any foreign substance into the subarachnoid space produces an aseptic meningeal reaction characterized principally by pleocytosis and increased protein content. Reactions to purely diagnostic lumbar puncture have been reported, including headache, nuchal stiffness, stupor, delirium and fever.

Each new drug and antiserum introduced and used intrathecally has been followed by reports of serious damage to the nervous system.

Neurologic disturbances following the injection of alcohol and spinal anesthetics are examples of complications of a previously normal nervous system. There is a case of Brown-Séquard paralysis following paravertebral alcohol injection for angina pectoris. One case receiving 16 cc. of absolute alcohol intrathecally between the fourth and fifth thoracic vertebrae developed a complete paraplegia below that level.

In Thorsen's series of 5493 cases of spinal anesthesia, one in 800 had aseptic meningitis, while symptoms pointing to injury of the medullary substance, nerve roots or cauda equina occurred at least once in every 200 cases. Many types of neurologic disorders have occurred following spinal anesthetics.

It is usually accepted that a history of some previous disease or injury involving the nervous system, particularly the spinal cord, is a definite contraindication to the use of spinal anesthesia. A case history of a 44 year old woman receiving a spinal anesthetic with following spastic paraplegia is cited. Patient had poliomyelitis at two years of age.

Spinal anesthetics may also precipitate the appearance of symptoms and signs of some neurologic disorder previously latent. A case is cited in which an unsuspected spinal cord tumor was lighted up by a spinal anesthetic.

Cases of well defined vitamin deficiency should not be given a spinal anesthetic. A case of adhesive arachnoiditis mentioned in a debilitated patient given a spinal for gastric resection.

Intrathecal sulfa drugs have caused paraplegia and many neurologic disorders. Penicillin, when given with a carinamide, will give a high spinal fluid concentration even via the intramuscular route.

Penicillin intrathecally has caused many neurologic disturbances and the neurotoxic action of penicillin has been investigated.

Fatal neurological reactions have resulted from the intrathecal use of streptomycin.

In conclusion, one must consider whether intrathecal administration is necessary, and, if it is, whether the benefits derived therefrom outweigh the potential hazards. In reference to spinal anesthesia Kennedy has stated that "the gravity of possible spinal arachnoiditis and subsequent paralysis must enter into the mediations of surgeons and anesthetists when determining procedure." Certainly an adequate neurologic history and examination should be completed for every patient considered for spinal anesthesia and another anesthetic should be chosen if any abnormalities are observed. 23 references.

R. M. J.

HINGSON, ROBERT A.: *Continuous Caudal Analgesia in Obstetrics Surgery and Therapeutics.** Brit. M. J.; 2: 177–181 (OCT. 8) 1949.

"Continuous caudal analgesia has returned to womankind the privilege of being present in comfort for the baby's birth. Its judicious use provides the safest labor and delivery available for the patient with cardiac disease, nephritis, pulmonary disease, metabolic disease and toxaemia.

* Read in opening a discussion in the Section of Anaesthetics at the annual meeting of the British Medical Association.