

## PONTOCAINE HYDROCHLORIDE FOR BRACHIAL BLOCK ANALGESIA: ONE HUNDRED AND FIFTY CASES \*

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BRACHIAL block analgesia has been used for many years with excellent results. During World War II, with the tremendous increase in the use of regional and local analgesia, brachial block became a favorite type of anesthesia for operations on the hand. At our general hospital from 40 to 60 operations on hands are performed each month. Ninety per cent of these cases are done under brachial block technic; operative procedures last from ten minutes to four hours.

Taylor's method of locating the brachial plexus is used. This consists of having the patient lie in the dorsal recumbent position, his arms at his sides and his head turned to the side opposite the one being blocked. He is then told to lift his head off the table 2 inches, thus putting strain on the neck muscles. The clavicular head of the sternocleidomastoid muscle is palpated and the muscle lateral to this is usually the anterior scalenus; at its distal border the brachial plexus makes its exit. The determined point is marked with an eyebrow or soft lead pencil 1 cm. above the clavicle.

After painting the shoulder with an antiseptic, a skin wheal is made at the determined point. A 2-inch, 20-gauge intravenous needle on the end of a full 10 cc. Luer-Lok syringe is introduced downward, inward and forward until paraesthesias are *definitely* felt in the hand; then the drug is introduced at the rate of 1 cc. per second. If paraesthesias are difficult to obtain, the first rib is located and the needle advanced forward and backward along the rib until they do occur. If the anesthetist should enter the subclavian artery, there is no reason to become alarmed. The needle is merely withdrawn about 1 cm. and inserted again in a lateral direction. The brachial plexus will usually be entered with excellent paraesthesias. I use the short needle and full syringe to prevent pneumothorax of serious consequences, and to date this procedure has been successful. It has not been necessary to ring the upper arm with a skin wheal in operations below the elbow as the tourniquet causes no discomfort. In operations above the elbow

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it is wise to ring the arm since the intercostal brachial nerve is often missed in supraclavicular brachial block technic.

Until the early part of 1946 2 per cent procaine was used almost exclusively at this hospital. Occasionally intracaine in oil was tried, but it was thought that the small increase obtained in the anesthesia time did not warrant its continuance. The main difficulty was securing prolonged operating time. Two per cent procaine with epinephrine produced anesthesia lasting from forty-five minutes to one hour and thirty minutes, with an average of one hour and fifteen minutes. In exceptional cases anesthesia lasted two to three hours. All operations were done with a tourniquet at 300 mm. of mercury. In procedures lasting longer than one hour and fifteen minutes, sodium pentothal was the supplementary anesthetic agent. The patients were dissatisfied with this technic and became very skeptical of brachial block. A drug or technic, therefore, was sought which would increase the anesthesia time without increasing the toxicity of the anesthetic.

Pontocaine in 0.1 per cent solution has been used for the past three years in continuous caudal analgesia for obstetrical delivery. A single dose of pontocaine will produce anesthesia lasting from three to five hours. With this as a background, we began to use pontocaine in 0.1 per cent solution. First, the ampules of 20 mg. of pontocaine in solution were experimented with, but the results were unsatisfactory and the reason not determined. Then ampules were employed containing 250 mg. of pontocaine for caudal use only and mixed daily. This gave gratifying results. In a period of eight months 150 blocks were given. In the initial 58 cases 80 mg. of pontocaine hydrochloride in 80 cc. of normal saline solution plus four drops of epinephrine was employed. In the last 92 cases, 125 mg. of pontocaine in 90 cc. of normal saline solution with six drops of epinephrine was used. The effective operating time lasted five to six hours with 80 mg. and five and one-half hours to six and one-half hours with the 125 mg. Blood pressure, pulse and respiration remained the same as recorded before anesthesia was induced. From the surgical and anesthetic standpoint, none of the patients caused any anxiety, and successful blocks were obtained in 96 per cent of our cases.

Approaching anesthesia is heralded by dilatation of the veins and tingling and loss of motion of the hand. The patients often remarked that, when procaine with epinephrine was used, they had a flushed or nervous sensation. This has not been noted to date with pontocaine hydrochloride and epinephrine. When 0.5 cc. of suprenin was substituted for epinephrine, however, reactions to the suprenin occurred in 3 of the 25 cases. Therefore suprenin no longer is used. Sensory loss occurs ten to twenty minutes before muscular movements are abolished. This may aid the surgeon to a large degree. Pontocaine takes twenty to forty minutes to establish a working analgesia and at times this may be a drawback since anesthesia must be started early. Under such a

circumstance, 10 cc. of 2 per cent procaine may be injected into and around the plexus to initiate immediate analgesia, and then pontocaine may be employed. In 4 cases 40 mg. of pontocaine and 40 cc. of 2 per cent procaine were used. Anesthesia was established in ten minutes and an operating time of three hours ensued. These variations assured early anesthesia plus a prolonged action from the pontocaine. If anesthesia longer than five to six hours is desired, a larger dose of pontocaine may be used. I have obtained nine hours of operative anesthesia from 125 mg. of the drug, but this is the unusual.

Postoperatively, the patient has relief from pain for six to eight hours, and thus the use of narcotics is unnecessary during this time. No complications or injuries to the brachial plexus have occurred from the prolonged action of the pontocaine. The administration of pontocaine has been condemned by some anesthetists, their argument being that its toxicity is ten times that of procaine. This is true when the two drugs are compared milligram for milligram; however, by using a 0.1 per cent solution, the actual dosage toxicity is less with pontocaine. Table 1 illustrates this point.

TABLE 1  
COMPARATIVE TOTAL INTRAVENOUS DOSE OF LOCAL ANESTHETICS IN CATS (1)

	Average fatal dose. mg./kg.	Ratio compared with procaine	Equivalent dosage ratio	Corrected toxicity ratio compared with procaine
Procaine	49.6	1.0	1.00	1.00
Metycaine	28.8	1.7	0.80	1.36
Pontocaine	8.6	5.8	0.10	0.58
Nupercaine	3.5	14.2	0.05	0.71

If the anesthesiologist is skeptical of 0.1 per cent pontocaine, he may use a 0.05 per cent solution. It will take longer to establish anesthesia and the effective surgical time will be slightly shorter.

The method described has proved to be of great value in suturing tendons and nerves. In the taking of flexor tendons, sural nerves, and parts of the iliac or tibial bone for grafting to the upper extremities a satisfactory technic was developed which consisted of a brachial block combined with continuous spinal anesthesia. This allows the spinal agent to be given when the surgeon has measured the size of the graft. It also assures long anesthesia of the lower extremities. Before I started to use pontocaine for brachial blocks, it was necessary to insert the malleable spinal needle and then perform the brachial block. Two per cent procaine gave anesthesia for a limited operating time and often wore off before the surgeon had even called for the spinal anesthesia. This necessitated the use of pentothal or a reblock of the brachial plexus, and was unsatisfactory. With pontocaine, anesthesia of the hand may be established first and prolonged operating time will

be assured. This is a definite advantage since brachial block anesthesia is the more difficult to obtain and, once established, should last for the entire procedure. I believe that this technic is superior to that in which intravenous or general anesthesia is employed because it carries a lower anesthetic risk, does not produce total anesthesia, reduces nursing care, and allows the nurse to pay more attention to the nursing care of the hand rather than to the effects of the anesthetic agent. In all surgical procedures on the hand in which brachial block is contemplated, pontocaine hydrochloride has been a highly satisfactory drug.

#### SUMMARY

Brachial blocks in which 0.1 per cent or 0.15 per cent pontocaine solutions were employed gave five to six hours operating time.

Some of the unpleasant effects of procaine and epinephrine have not been noted and the patient was happier with this anesthesia.

Postoperatively there is no need for an opiate for six to eight hours.

Pontocaine in the dilutions used is no more toxic than procaine.

When pontocaine was employed anesthesia was established in twenty to forty minutes.

At the present no untoward effects have occurred during or following the use of pontocaine.

When spinal anesthesia is used with brachial block, pontocaine is the drug of choice because of its lasting effects.

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#### REFERENCES

1. Nowak, S. (Quoted by Saklad, Meyer): *Spinal Anesthetic Agents: Methods and Indications*, New England J. Med. **213**: 1226 (Dec.) 1935.

#### FUTURE MEETINGS

October 1 and 2—Ohio Society of Anesthesiologists, Toledo, Ohio.

October 7, 8, and 9—Philadelphia Society of Anesthesiologists.

November 4, 5 and 6—Annual Meeting, The American Society of Anesthesiologists, Inc., St. Louis, Missouri.

November—Texas Association of Medical Anesthetists.

December 9 and 10—Third Annual Postgraduate Assembly, New York City, N. Y.