

local infiltration is of use in traumatic surgery. . . . Regional analgesia . . . provides excellent relaxation and nerve block is useful for injuries of the leg or chest, but not so satisfactory in the arm. . . . Spinal analgesia is not suitable for patients already shocked. . . . Intravenous barbiturates should be given slowly through a fine needle, and on no account should any standard dose be adopted, but each case watched closely throughout the induction. . . . The tolerance for these drugs is considerably reduced in shock, and the rate of elimination is also reduced. . . . Nitrous oxide is unsuitable alone, but when used with oxygen is probably the best and safest of the common anaesthetics for this type of patient. . . . Ether is probably the most popular anaesthetic. It is easy to use, is safe, and satisfies most of the requirements of an anaesthetic. . . . Divinyl ether is more expensive than di-ethyl, but has some advantages over it provided that the necessary apparatus is at hand. . . . Cyclopropane has three very great advantages. Very high oxygen percentages may be used (75 to 90 per cent), there is a slight increase in blood pressure, and there is little toxicity or lung irritation. . . . Chloroform, owing to its high toxicity, is unsuitable in shocked patients."

J. C. M. C.

KAUFMAN, P. A.: *Gangrene Following Digital Nerve Block Anesthesia; Report of a Case*. Arch. Surg. 42: 929-938 (May) 1941.

"Among the commonest of the so-called bread and butter surgical procedures are minor operations on the fingers and toes under regional anesthesia produced by blocking the digital nerves at the base of the digit. As commonly employed the technic involves the injection of a 0.5 to 2 per cent solution of freshly prepared procaine hydrochloride (with or without a small amount of epinephrine added)

into the base of the proximal phalanx either by circular infiltration or by deposition of the anesthetic in the region of the lateral digital nerves. It has been generally recommended that a tourniquet be applied at the base of the digit in order to delay absorption of the procaine into the general circulation, thus enhancing its local effect. Garlock, in pointing out that this widely followed procedure is not entirely without danger and that gangrene of the involved digit may supervene, attributed this complication to the use of the tourniquet. . . . It is indeed strange that gangrene following digital nerve block has received so little attention in the American literature. Except in Garlock's report it has not even been recognized here. A survey of the European literature, however, uncovered 25 cases published in greater or lesser detail. . . .

"Age and sex do not appear to play decisive roles in this condition. . . . It appears reasonable to suppose . . . that a tight tourniquet may contribute to local vascular injury, and I personally feel that it should be counted a contributory factor in those cases in which it was used. . . . A word or two should be added about the danger of hot soaks immediately after an operation under nerve block anesthesia. In my own case, as well as in that reported by Halla, a severe burn was caused by the patient's immersion of the anesthetized digit in boiling water. It is possible that this may have occurred in other cases in this series without even coming to the attention of the respective authors. If the universally discredited phenol dressing can result in gangrene, then certainly boiling water can easily do the same. . . . One observation stands out clearly in all the cases in the series: The extent of the gangrene is uniformly limited proximally by the level of the injection. . . . The exact nature of the factor producing the local vascular injury

is not yet entirely clear. That the tourniquet and the epinephrine may be factors has already been indicated. Direct pressure by the mass of the injected material may play a role in view of the lack of tissue distensibility at the base of the digits. Minute quantities of protoplasmic poisons derived from chemical changes in the anesthetic drugs must also be considered, as well as a peculiar local allergic response. Susceptibility to vascular thrombosis may be increased by the slowing of the blood stream attendant on a local inflammatory lesion or perivascular lymphangitis. . . .

"In only a few of the recorded cases did the patient apply for treatment before an obviously irreversible process had occurred. Koschucharoff was able to begin treatment only two hours after the operation, when his attention was called to the blanching, pain and stiffness of the involved finger. He immediately instituted massage, movement and warm soaks, with the result that the circulation was restored and gangrene avoided. Heinicke advised that a pancreatic extract (padutin) be administered in the hope of relieving arterial spasm. After gangrene has become inevitable one should be guided by general surgical principles. It is advisable to wait for a well defined line of demarcation, and the choice between operative and spontaneous amputation can be made on the basis of functional and plastic considerations. . . . Until a fuller understanding of the cause of gangrene following nerve block is achieved, one cannot offer a technic which is entirely safe. On the basis of present knowledge, however, the following precautions seem advisable: Digital nerve block is contraindicated in all cases in which there is preexisting vascular disease. A contraindication likewise exists in the presence of any inflammatory process or lymphatic involvement at the projected site of the block. The use of a

tourniquet is not advisable. . . . The use of epinephrine should be avoided in digital nerve block procedures. . . . Small quantities of fluid should be injected directly over the lateral digital nerves rather than a large volume of fluid that will completely encircle the base of the finger and produce blanching of the tissues by local pressure. Where feasible, the lateral injections should be made at different levels in order to avoid too great a distention of tissues at one level. . . . After completion of the operative procedure it is wise to massage the site of the injected fluid in order to promote its prompt absorption and to reduce pressure on the vessels. Makai has advised that all patients who have been subjected to nerve block anesthesia be seen again one hour after the operation in order to determine whether the circulation is adequate. This may permit active therapy before irreversible changes have occurred. Patients should be cautioned about the use of hot soaks in the immediate postoperative period. They should be told to try out the temperature of the solution with the hand which was not operated on so that burns of the anesthetized digits can be avoided." 29 references.

J. C. M. C.

BOROFF, DANIEL A.; COOPER, ANITA, AND BULLOWA, JESSE G. M.: *Inhibition of Sulfapyridine by the Procaine in Chest Fluids After Procaine Anesthesia*. Proc. Soc. Exper. Biol. & Med. 47: 182, 1941.

Procaine and other derivatives of para-aminobenzoic acid have been shown to exert an inhibitory effect on sulfanilamide. Procaine is widely used as a local anesthetic for pleural aspirations and it is possible to demonstrate its presence in the fluids removed. A study has thus been undertaken to determine the amount of procaine present and the inhibitory effects of these amounts on sulfapyridine.