

(3) Such a technique has seemed to us to be an obvious extension of the technique described by Accardo and Adriani (Southern M. J. 42: 920, 1949). They state, however, that the nerve most frequently missed is the radial nerve. Since the musculocutaneous nerve and then the radial nerve may leave their proximity to the axillary artery while still in the distal third of the axilla, it would seem that injecting higher in the axilla would increase the number of satisfactory blocks. It is of interest to note also that there may be considerable overlapping in the cutaneous distribution of these two nerves at the wrist and near the base of the thumb. To further insure adequate radial nerve anesthesia, anesthetic solution should be deposited under the axillary artery as well. This can be done by moving the cutaneous wheel medially and inserting the needle at an angle of about 30 degrees with the skin until the needle lies below the artery with its point just below and lateral to it. Solution is then injected as the needle is withdrawn. This third injection, I believe, will guarantee fewer failures over a long series of cases.

(4) The small doses mentioned by Doctor Burnham may at times prove inadequate for adults. Our total doses have ranged from 3 cc. in infants to over 50 cc. for large, obese, or muscular adults. It seems to be true that significantly lower volumes of anesthetic solution are required by the axillary approach. However, all too often highly desirable block techniques (especially brachial plexus and spinal) have been abandoned and fallen into local disrepute because the anesthetist has been too puristic in the volumes of anesthetic solution injected. This, of course, must be considered with due regard for age, weight, physical status, and all the other factors which may influence drug reactions and overdosage.

(5) A cutaneous encircling cuff of anesthesia is unnecessary for the use of an upper arm tourniquet. When an adequate block is performed by either the axillary or the supraclavicular approach, such unnecessary injections serve only to increase the drug toxicity and delay the ever-urgent surgeon. It is probable that the intercostobrachial nerve is also blocked, since it runs just medial to the plexus in the axilla.

(6) Since no part of the deep structures of the shoulder girdle is anesthetized, conscious patients are able to move the arm at the shoulder and must be cautioned not to try to move the arm during operation. It is obvious also that axillary brachial plexus block cannot be applied for dislocation of the shoulder joint, as can the supraclavicular.

(7) Although the risk of pneumothorax is not present, we have not promoted axillary block to supplant the supraclavicular approach. However, it seems ideally designed for children, for bilateral brachial plexus block, for patients when the supraclavicular area is contraindicated or otherwise difficult to approach, when pulmonary disease contraindicates the even small risk of pneumothorax, or for use by the occasional anesthetist who may have more to fear from pneumothorax. Dr. George Small refers to a modified technique for axillary brachial plexus block anesthesia in his excellent paper on "Brachial Plexus Block Anesthesia in Children" (J. A. M. A. 147: 1648, 1951), but does not present the details of his technique.

(8) We have used axillary brachial plexus block anesthesia also in conjunction with heavy premedication or light basal narcosis for cardiac catheterizations in 51 children. This seems to have advantages over local infiltration at the site of insertion of the catheter. The pediatricians who do the catheterizations are most enthusiastic.

These remarks are submitted not to detract from the worthwhile observations of Dr. Burnham, but rather to supplement them with our experience and to encourage others to use this most satisfactory type of anesthesia.

KENNETH F. EATHER, M.D.
Seattle, Washington

To the Editor.—I am glad that Dr. Eather, too, is investigating the uses of regional block anesthesia at this level [see letter above] and would like to comment upon his remarks in the order that they are written:

(2) The landmark of the brachial artery is extremely important. I reported 10 consecutive successful blocks; 4 later cases were nearly complete failures. At the time of injection I was uncertain as to the exact location of the artery. The systolic blood pressure in each instance was below 90 mm. of mercury due to premedication, I believe, rather than to shock. All of our 38 other cases were successful. In each patient the blood pressure was over 120/60. I feel, therefore, that the systolic pressure should exceed 120 for a successful block. The pectoralis major tendon insertion is an equally important landmark. I inject within 1 to 2 centimeters distal to it. I have performed dissections upon several cadavers which show that

the radial and musculocutaneous nerves leave the neurovascular sheath within 4 centimeters distal to the tendon.

I, too, have performed the block successfully upon patients from the age of 2 to 25. Such a simple block as this could be used for all patients whether good or bad risks.

(3) In reading the literature before writing my brief paper, I discovered the technique described by Accardo and Adriani. I differ with them in that, whereas they indicate that one should seek paresthesia in each nerve they inject, I simply place the solution in the fatty tissue on either side of the artery whence it infiltrates the nerves. I cannot believe that methods which seek to impale the nerves upon a needle, injections within a nerve bundle or injection of huge amounts of solution are without danger to delicate nerve tissue.

(4) I agree that the small purist doses that I used in this first series of 10 cases would prove inadequate in many attempted blocks. One is apt to measure too conservatively at first in order to prove a theoretical point. I now use 7 to 8 ml. on each side of the artery, making 14 to 16 ml. total for adults and perhaps 3 or 4 ml. on each side in children.

It appears to me that the diameter of this fat filled neurovascular space varies little in the skinny and in the muscular adult. I, therefore, use essentially the same amount in each. The obese individual receives 2 to 3 ml. extra in order to give what I trust is an adequate amount to diffuse through the extra fat.

(5) A patient with sufficient premedication will accept the hemostatic blood pressure cuff at 280 mm. of mercury without any anesthetic block. This is tantamount to anesthesia by pressure. However, in order that we are not forced to rely upon pressure anesthesia, which still gives rise to pain at the proximal edge of the blood pressure cuff, we find it expedient to block the: upper lateral cutaneous nerve (the deep block is distal to the circumflex axillary nerve which gives origin to this sensory nerve), posterior cutaneous nerve, intercostobrachial nerve, medial cutaneous nerve, and supraclavicular (cervical plexus nerves have a variable distribution).

The additional 6 to 10 ml. of solution added to the 14 to 16 ml. placed about the artery total about 20 to 26 ml. I always use 1:200,000 solution of epinephrine and trust that the chemical brake upon absorption plus the pressure of the blood pressure cuff will obviate systemic toxic reactions.

(6) Well premedicated semiconscious patients may squirm after the first hour or so and even activate the prime movers of the humerus. This activity is reduced greatly by placing a small pillow beneath their backs, reassuring conversation, and augmentation of the preoperative medication.

(7) One should not use an unfamiliar block on the "bad risk" patient. To do so simply adds to the bad risk.

I would advocate the use of this block of the great nerves of the upper arm in all cases of surgical procedures below the elbow. I find the block more simple to perform than the sympathetic block for the upper extremity and, therefore, have used this method for daily interruption of sympathetic nerves to the severely injured hand.

I thank Dr. Eather for the fruits of his greater experience and for this opportunity to discuss more points about a technique and site of anesthesia which I believe will be used more and more. I would go a step further, however, in predicting that this simple technique, when it has been further developed upon numerous cases, will completely supplant the supraclavicular brachial block.

PRESTON J. BURNHAM, M.D.
Salt Lake City, Utah

Mouth-to-Mouth Resuscitation

To the Editor.—After reading about Dr. Peter Safar's method of mouth-to-mouth resuscitation in the November-December 1957 Issue of *ANESTHESIOLOGY* [page 904] I wish to make the following comment.

It is sometimes quite difficult to insert an airway in an unconscious patient, especially if one is not trained in such procedure. Since most efforts at mouth-to-mouth resuscitation will occur in patients who are not completely relaxed, we have devised a method which will enable anyone to adequately inflate the lungs of the unconscious patient with or without an airway. The apparatus consists of a tube about 12 inches