AXILLARY BLOCK OF THE BRACHIAL PLEXUS

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Regional nerve block of the upper limb is a useful anesthetic technique. Much upper extremity surgery results from trauma; therefore it occurs acutely and must be scheduled on an urgent basis often with little time to prepare the patient adequately for surgery and anesthesia. General anesthesia performed on such an emergency basis is not without hazard. The danger of aspiration of gastric contents is ever present. Cardiopulmonary disorders are frequently encountered, especially in the elderly. Patients who are debilitated or in shock are not good candidates for general anesthesia. A simple, safe and reliable method of regional anesthesia of the arm and hand is the anesthesia of choice for many operations on the upper extremity, since with this method the patient remains awake, retains his protective reflexes and breathes without respiratory depression.

Regional block of the brachial plexus provides ideal operating conditions for the surgeon because it provides: (1) complete relaxation of the muscles of the upper extremity thus simplifying closed reduction of fractures and dislocations, or the approximation of severed tendons, and (2) sympathetic block of the blood vessels which lessens postoperative vasospasm, pain and edema.

Regional block, from the patient’s viewpoint, is advantageous since he can enjoy a postoperative period free from nausea, vomiting, cerebral depression and immediate postoperative pain.

Why is brachial plexus block little used by surgeons and anesthesiologists alike when its advantages over general anesthesia are apparent? The answer is: The incidence of complications from the widely taught supraclavicular approach is too high. As stated by Accardo and Adriani, “When [we] use the supraclavicular route, [we] do so with a certain amount of fear and trepidation.” The most feared complication is pneumothorax; an incidence of 1–4 per cent is common. The author’s own incidence is 2.5 per cent (2 pneumothoraces in 80 cases). Such a major complication need occur only once in a private practice to have the anesthetist who only occasionally uses block return to a less controversial technique of anesthesia. Other complications of supraclavicular brachial plexus block are of lesser consequence. These consist of spread of the local anesthetic to block the stellate ganglion, vagus nerve or phrenic nerve. Neurological sequelae from the supraclavicular brachial plexus block are occasionally seen in the form of paresthesias or hypesthesia. Supraclavicular block is not well suited for pediatric practice, even though a regional block of the arm would appear to be particularly adaptable to pediatric anesthesia practice.

Efforts towards lessening the complications associated with the supraclavicular approach to the brachial plexus have followed several avenues. Bonica and Moore have stressed careful and gentle technique, thorough familiarity with anatomical relationships, and use of the first rib as a protective shield over the lung. The use of a short, fine needle, avoiding the need to probe for the first rib and accidentally tear the cupula of the lung, is a step forward. A different solution towards finding a safer and more acceptable technique of brachial plexus block consists of obtaining access to the plexus at a point removed from the critical structures in the neck. The axillary approach seems closest to the ideal of obtaining complete block of the upper extremity with a minimum of discomfort, complications and side effects.

Axillary Block

First mention made of the axillary approach to the brachial plexus is by Hirschel, who
directed a 2½-inch needle towards the apex of the axilla. Pitkin\(^8\) modified Hirschel’s technique by following the plexus through the apex of the axilla, over the first rib, to the transverse processes of the sixth and seventh cervical vertebrae. This approach, requiring two insertions of a needle up to eight inches in length, understandably never became popular.

A well-illustrated axillary block technique is presented by Adriani.\(^9\) A more complete discussion of different aspects and techniques of the axillary approach may be found in papers by Accardo and Adriani,\(^7\) Hudon and Jacques\(^10\) and Burnham.\(^11,\)\(^12\)

With Adriani’s technique of axillary block, adequate anesthesia of the median, ulnar and radial nerves sufficient for operation on the hand can be obtained consistently. When operations extend beyond the hand to the wrist or forearm, however, frequent spotty cutaneous anesthesia, especially of the antero-lateral surface of the forearm and incomplete muscular relaxation of the flexor system of the elbow, made supplementation by infiltration of local anesthetic or general anesthesia necessary. This obviates the advantages of a regional block procedure. These anesthetic deficiencies directed the author’s attention to a closer investigation of the anatomical relationships of the brachial plexus in the axilla, in an attempt to find a technique to provide a more complete block of the brachial plexus via the axillary route.

**Anatomy**

On the basis of 7 complete anatomical dissections of the axilla performed on fresh cadavers ranging in age from premature infants to adults, a description of the anatomical relationships of the brachial plexus in the axilla is presented. Dissections and photographs were made with the arm at right-angle abduction (axillary block position).

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**Fig. 1.** The muscular walls of the axilla. Note the course of the neurovascular bundle through the axilla. (Modified with permission from: Thorek, P.: Anatomy in Surgery, Philadelphia, J. B. Lippincott Company, 1951.)
Axillary Fossa: The axilla is a pyramidal space lying between the medial side of the upper arm and the lateral surface of the upper chest wall. Like a pyramid, the axilla has four walls, a base and an apex (fig. 1). The boundaries of the axilla are lined by fasciae, which, although described and named separately, in actuality form a complete and continuous investment of the axilla and define the limits of the physiological axillary space.

The anterior wall is formed by the broad pectoralis major muscle, easily identified from the surface. Deep to the pectoralis major lie the pectoralis minor and subclavius muscles, ensheathed in the clavipectoral fascia.

The posterior wall is formed by the latissimus dorsi and teres major muscles, identifiable as one single thick and broad muscle band from the surface, and the deeper, more mesial subcapularis muscle.

The lateral wall is formed by the coraco-brachialis muscle which overlies the bicipital groove of the humerus (containing the tendon of the long head of the biceps). The ridges of the bicipital groove provide attachment to the humerus for the tendinous insertions of the muscles of the anterior and posterior axillary walls. The lateral wall is easily palpable on the medial surface of the upper arm, lying between the tendons of the pectoralis major and latissimus dorsi.

The medial wall is formed by the serratus anterior muscle overlying the upper lateral chest wall from the second to the sixth rib. It is best palpated with the arm abducted.

The base or floor of the axilla consists of the firm axillary fascia which is a continuation of the pectoral fascia. It bridges the space between the anterior and posterior axillary walls. With the arm adducted, the flexible floor relaxes, allowing manual exploration of most of the axilla.

The apex of the axilla is an opening outlined anteriorly by the clavicle, medially by the first rib and posteriorly by the upper border of the scapula. The axilla communicates with the supraclavicular fossa of the neck through the apex. The apex transmits the large vessels and nerves (neurovascular bundle) from the root of the neck to the axilla and thence to the upper extremity.

Contents of the Axilla

Fat. The bulk of tissue occupying the axillary fossa consists of fat, loosely filling the space. This fat is semiliquid at body temperature, lying in lobules of areolar tissue.

Nodes. Four groups of lymph nodes, draining the upper extremity and the lateral chest wall, lie within the axillary fossa. Of these only the lateral (brachial) group is of interest, since it accompanies the axillary vein and is thus closely related to the neurovascular bundle. This lateral group of lymph nodes receives lymphatics from the upper extremity; it is the first group involved in lymphangitis of the hand and forearm.

The Axillary Artery is the direct continuation of the subclavian artery where the latter crosses the lateral border of the first rib to enter the apex of the axilla. On leaving the axilla at the lower border of the teres major muscle, the axillary artery continues as the brachial artery, supplying the upper extremity. The cords and terminal branches of the brachial plexus are grouped around the axillary artery. The third (terminal) division of the axillary artery is remarkably superficial in the lateral wall of the axilla and is easily palpated, even in the obese, through the thin and lax floor of the axilla.

The Axillary Vein is formed from the union of the two brachial veins with the basilic vein. The cephalic vein enters it just below the clavicle; veins of the upper lateral chest wall also communicate with the axillary vein. The vein lies in close approximation to the axillary artery throughout its course in the axilla. With the arm at right-angle abduction (axillary block position) the vein lies directly in front of the axillary artery, protecting the latter from perforation with the block needle.

The Axillary Sheath (figs. 1 and 2) is important to the anesthetist. It is a sturdy tube of deep fascia derived from the cervical prevertebral fascia. In the posterior triangle of the neck the brachial plexus and the subclavian artery lie underneath the prevertebral fascia. On leaving the supraclavicular fossa between the scalenus anterior and medius muscles, the plexus and the artery come in close proximity, forming a neurovascular
bundle. This relationship continues through the axilla towards the upper extremity. At the apex of the axilla the neurovascular bundle invaginates the scalene portion of the prevertebral fascia, forming a firm tubular, fascial sheath, the axillary sheath, which surrounds the neurovascular bundle throughout its course in the axilla. This sheath continues down the upper arm, where it fuses with the anterior surface of the medial intermuscular septum. Thin areolar septa within the axillary sheath support the individual nerves and vessels, maintaining a close relationship between the cords of the plexus and the axillary artery. The axillary sheath completely envelopes the neurovascular bundle, forming a closed compartment with a diameter of 2 to 3 cm. in the adult and about 1 cm. diameter in the child. Fluid injected within this compartment is confined by the axillary sheath, preventing spread away from the nerves. Fluid can only spread up or down inside the compartment, parallel with the neurovascular bundle.

The Brachial Plexus is formed by the anterior roots of the fifth, sixth, seventh and eighth cervical and first thoracic spinal nerves. Anterior roots of the fourth cervical and of the second thoracic spinal nerves frequently make contributions to the plexus in addition to the above. The roots combine, divide and recombine to finally give off the great nerves to the upper extremity. On the middle scalene muscle the five spinal roots form three trunks as follows: upper trunk—fifth and sixth cervical roots; middle trunk—seventh cervical root; lower trunk—eighth cervical and first thoracic roots. At the lateral margin of the anterior scalene muscle each one of the three trunks divides into
an anterior and a posterior division. The six divisions (three anterior and three posterior) pass over the first rib between the insertions of the anterior and the middle scalene muscles, where they are joined by the subclavian artery. The divisions, as they course over the first rib, lie rather superficially, and are therefore accessible to a needle, as in the commonly performed supraclavicular approach to the brachial plexus. The six divisions regroup into three cords as the plexus enters the apex of the axilla, as follows: lateral cord—anterior divisions of the upper and middle trunks; medial cord—anterior divisions of the lower trunk; posterior cord—all three posterior divisions from the three trunks. The three cords lie grouped around the axillary artery in its second portion, underneath the pectoralis minor muscle. From their position relative to the axillary artery, the cords are identified as medial, lateral and posterior. In the midaxilla the cords give off several important branches supplying the muscles of the shoulder girdle and lateral chestwall. The medial cord also gives rise to the medial brachial and antebrachial cutaneous nerves in the midaxilla. These cutaneous branches, however, do not separate from the neurovascular bundle and continue their course toward the arm in close proximity to the axillary artery and remain within the confines of the axillary sheath. At the lateral margin of the pectoralis minor muscle, the cords finally form the terminal nerves to the upper extremity. After giving off the musculocutaneous nerve, the lateral cord continues as the (lateral head of the) median nerve. The medial cord continues down the arm as the ulnar nerve after giving off the medial head to the median nerve. From the posterior cord, the axillary and subscapular nerves arise; its terminal continuation is the radial nerve.

Terminal Nerves

Variations from this complex arrangement are numerous and frequent, but the basic relationship of the three cords grouped around the axillary artery in its midportion is constant. The third (terminal) portion of the axillary artery, emerging from under the pectoralis major muscle, lies superficially, is easily palpable and is the key landmark to the brachial plexus. In this region the cords have already formed their terminal branches, which still lie close to the artery and within the confines of the axillary sheath, but each will shortly go its own separate way down the arm.

The Median Nerve is the largest and most superficial of the terminal branches of the plexus. Arising from two heads, it is the continuation of the lateral cord. It follows the course of the brachial artery in the arm.

The Ulnar Nerve is the continuation of the medial cord. It runs medial to the artery together with the median antebrachial cutaneous nerve in the proximal half of the upper arm.

The Radial Nerve, being the continuation of the posterior cord, retains its position posterior to the artery in the distal axilla. It starts its spiral course around the humerus, separating from the artery, distal to the insertion of the latissimus dorsi and teres major tendons.

These three nerves, which supply the hand, maintain their proximity to the artery for some distance (fig. 3). They are therefore easily blocked with small amounts of anesthetic solution. For complete anesthesia of the upper extremity however, block of the median, ulnar and radial nerves alone is not sufficient. Inclusion of the musculocutaneous nerve in the axillary block is essential to provide analgesia and muscular relaxation of the wrist and forearm.

The Musculocutaneous Nerve branches off from the lateral cord at the lateral edge of the pectoralis minor muscle. It immediately leaves the neurovascular bundle to enter the substance of the coracobrachialis muscle, where it continues its course parallel to, but removed from, the artery (fig. 4). Although the nerve does lie lateral to the axillary artery, it does not lie within the confines of the axillary sheath, it does not lie superficial and it is not as easily accessible to a needle as is shown in some anatomical sketches. Attempts at blocking this nerve anterolaterally to the axillary artery will not only be anatomically difficult, since the nerve lies deeply within muscle substance and is without adequate landmarks, but will also require use
of a longer and heavier needle, increasing the risk of hematoma formation and injury to the terminal nerves.

The musculocutaneous nerve can only be reached consistently when sufficient solution is injected inside the neurovascular compartment to diffuse upwards to reach the lateral cord.

The Axillary Nerve, a branch from the posterior cord, leaves the vicinity of the main neurovascular bundle at the lateral border of the subscapularis muscle, some distance removed from the block site in the distal axilla. As in the case of the musculocutaneous nerve it is blocked only when sufficient anesthetic solution is injected inside the neurovascular compartment to reach the posterior cord.

The Intercostobrachial Nerve innervates the medial, inner surface of the upper arm. It must be interrupted to provide complete brachial anesthesia for operations proximal to the elbow or when the upper arm tourniquet is applied. The intercostobrachial nerve is the lateral branch of the second intercostal nerve. It is not a component of the brachial plexus and is therefore not affected when a brachial plexus block is performed. The nerve runs subcutaneously from the chestwall (medial axilla) through the axillary floor to reach the upper arm at the lateral axillary wall, between the insertions of the pectoralis major and latissimus dorsi. After supraclavicular block this nerve has to be injected separately (usually with a subcutaneous infiltration half-ring of the upper arm). But since the site of entrance of the intercostobrachial nerve into the upper arm is the very site of injection for axillary block, it follows that the subcutaneous infiltration performed at the start of the axillary block suffices to block the intercostobrachial nerve at the same time with the same injection.

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**Fig. 3.** Initial dissection of the terminal great nerves in the distal axilla (4 year old child). The neuromuscular bundle (fig. 2) has been dissected. The median nerve runs horizontally in the picture from right to left. The ulnar nerve courses towards the lower left-hand side. The radial nerve is indicated with a retractor at the point where the nerve enters into the substance of the triceps muscle. Arm in axillary block position.
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Figure 4. Deep dissection of the neurovascular bundle in the distal axilla (muscular young adult). In the lower right-hand side lies the flat tendon of the latissimus dorsi and teres major muscles. To the right of that tendon lies the subscapularis muscle over which the axillary nerve curves. The median, ulnar and radial nerves lie closely grouped around the flat band of the axillary artery. The musculocutaneous nerve is exposed with the aid of two fork retractors which have lifted part of the coracobrachialis muscle. Note that although the musculocutaneous nerve runs parallel with the neurovascular bundle, the coracobrachialis muscle separates the nerve from the neurovascular compartment. The arm is in axillary block position.

**Block Procedure**

**Position and Landmarks.** The patient lies supine, the upper arm at right-angle abduction to the body. The forearm is flexed, externally rotated and the dorsum of the hand brought to rest on the table; a position akin to a military salute. In this position the brachial plexus is stretched and fixed and the artery is rotated to a more superficial position between the broad muscular bands of the anterior and posterior axillary walls (fig. 5). The entire block procedure is performed in this position. The axilla is shaved, if necessary, prior to block.

The pulsations of the axillary artery are palpated at the axillary surface of the upper arm, midway between the tendons of insertion of the pectoralis major (anterior) and latissimus dorsi (posterior). Identification of the artery, even in obese or muscular individuals, is not difficult. Once the artery has been found, an attempt is made to trace the arterial pulsations to their most proximal, palpable location on the upper arm.

The most convenient position for the physician is to stand next to the patient, facing the latter’s axilla.

**Instruments.** The axillary block is performed with a 26 gauge, 1/2 inch needle which is of sufficient length to penetrate through the axillary sheath into the neurovascular compartment, even in the largest patient. The needle’s small diameter makes damage to the nerves unlikely and perforation of the vein or artery inconsequential; while its shortness prevents too deep penetration beyond
the lateral wall of the compartment. A 10-ml. three-ring aspirating block syringe has been most satisfactory in use.

Agent. Any proven local anesthetic drug will perform satisfactorily in axillary block as long as the drug is deposited close to a nerve and within the neurovascular compartment. In the author’s hands, 1 per cent lidocaine hydrochloride (Xylocaine) has performed well and is recommended. This results in rapid, deep and prolonged anesthesia, while its excellent diffusability aids in the spreading of the anesthetic solution through the neurovascular compartment. Epinephrine is nearly always added to the local anesthetic solution to produce a final concentration of 1/250,000 (0.2 ml. of 1/1,000 epinephrine dissolved in 50 ml. of solution). Epinephrine may reduce the incidence of toxic reactions and it prolongs the duration of anesthesia by preventing rapid absorption of local anesthetic drug. Epinephrine in the concentration and amount recommended has not given rise to systemic effects, even in the elderly.

Incomplete block of some of the branches of the brachial plexus in spite of positive evidence of correct location of the needle tip within the neurovascular compartment (paresthesias or aspiration of blood) may be traced to injection of an insufficient volume of solution. The neurovascular compartment at the block site must be filled to aid in the proximal spread of the anesthetic drug towards the cords of the plexus in the midaxilla. A cylinder of length \( l \) and diameter \( d \) has a volume of \( \pi d^2/4 \times l \). The neurovascular compartment has a diameter of approximately 3 cm.; 7 ml. of solution are therefore required to fill a segment 1 cm. long. The axillary site of injection is about 3 cm. distal to the point where the cords of the plexus terminate into the great nerves of the arm.
Assuming equal proximal and distal spread of injected fluid inside the compartment, and ignoring distention of the sheath, a cylinder of fluid 6 cm. long (3 cm. proximal and 3 cm. distal to the site of injection) should be sufficient to completely bathe all branches of the brachial plexus distal to the cords. This is 42 ml. Fifty milliliters of solution is the maximum recommended volume for healthy male adults. This amount is revised downwards proportionally for women, older people, children and debilitated patients.

Injection. After antisepctic preparation of the axilla, a skin wheal is raised with the 26-gauge block needle at the previously marked site of the upper arm. By depositing a few milliliters of anesthetic solution in the subcutaneous tissues, the intercostobrachial nerve and the medial brachial cutaneous nerve are effectively blocked. The needle with attached syringe is then directed inward perpendicularly to the skin towards the humerus. After advancing through the skin for only a few millimeters, slight resistance of the axillary fascia is felt, which is penetrated with a most characteristic palpable and audible “snap” or “pop.” Advancing a few more millimeters places the tip of the needle through the axillary sheath and inside the neurovascular compartment. Two needle insertions are made through the axillary sheath into the neurovascular compartment. One slightly above (anterior to) the artery and one slightly below (posterior to) the artery. If the landmarks have been carefully identified and if the characteristic snap of the axillary sheath has been perceived, then there is little doubt that the needle tip lies within the neurovascular compartment. Nevertheless, positive evidence of correct placement of the needle tip should be searched for prior to injection of anesthetic solution. Such evidence may consist of either a characteristic paresthesia shooting into the hand, sign of proximity to one of the great nerves, or it may consist of aspiration of blood into the syringe, sign of entrance into the axillary vein or artery. In either case the neurovascular compartment has been identified beyond doubt.

When a paresthesia is obtained the needle is arrested and 10 to 20 ml. of solution is injected slowly, with repeated aspiration for blood. The needle tip is withdrawn to the skin and redirected inwards at a different angle in an attempt at obtaining paresthesias of one of the other nerves. The median, ulnar, and radial nerves are usually easily stimulated. A paresthesia, as in other nerve blocks, is the reassuring forerunner of a successful block. In the heavily sedated or stuporous patient, the only indication of proximity to a nerve may be a sudden twitch or jerk of the hand or fingers: an objective sign equally as valuable as the subjective paresthesia.

Aspiration of blood need not cause concern. Rather, a valuable landmark has been precisely localized, since the vessels lie centrally within the neurovascular compartment. Redirecting the needle (after withdrawing to the subcutaneous tissues) to the same depth in an anterior and then a posterior direction to the vessel will place the needle tip in the desired relation to the nerves. Since the needle is small, puncture of a vessel is not likely to be of consequence.

After one or two paresthesias have been obtained, the remainder of the calculated volume of solution is deposited in a fanwise manner inside the neurovascular compartment. Approximately one half the amount is injected anterior to the artery, the remainder is injected posterior to the artery, to about the same depth of insertion at which previous paresthesias have been observed. The position of the upper extremity is not changed during the procedure.

Local infection in the axilla or inflammatory response of the axillary lymph nodes to infection in the arm constitutes absolute contraindications to the axillary block procedure.

Onset and Duration. If a paresthesia has been obtained, the onset of anesthesia will be rapid. Warmness and tingling of the arm, progressing to numbness, is evident within minutes, followed shortly by muscular weakness and loss of coordination of the extremity. One nerve may be affected before another, but diffusion is usually sufficient within fifteen minutes to assure complete block of all the nerves. Loss of proprioception may be striking, the patient imagining his arm to lie across the chest. Sympathetic block is
gradually evident; the hand becomes hot, dry and flushed and the superficial veins are markedly dilated.

The block, unsupplemented, has been used in upper extremity operations of up to three hours in length. With lidocaine and epinephrine, postblock analgesia lasts on the average four and a half hours. The shortest recorded time in this series was three hours. Several patients had freedom from pain lasting up till six hours. Even though effect of the block will outlast operation, it might be considerate to the patient to administer superficial narcosis during an excessively prolonged operation. Patients become restless and irritable after lying several hours in the same position on a narrow table.

Distribution of Analgesia. If adequate volume of local anesthetic solution has been injected in the proper anatomical location, all terminal great nerves of the brachial plexus are anesthetized. In addition, the initial subcutaneous infiltration at the site of injection anesthetizes the intercostobrachial and medial brachial cutaneous nerves. Consequently, the entire upper extremity is analgesic, with the exception of the proximal deltoid surface, supplied by the lateral supraclavicular nerves.* The pneumatic tourniquet is tolerated comfortably without additional infiltration.

Occasionally, full surgical anesthesia of the hand is encountered, associated with incomplete analgesia and muscular relaxation of the forearm and arm. This situation is observed if less than the recommended volume of anesthetic solution is used for the axillary block. Supplementation, either with additional regional block or with general anesthesia, will then be necessary.

Results. From April 1959 through October 1960, ninety-four axillary blocks were performed on 93 patients (one bilateral block). Twenty-four patients were under 15 years of age, the youngest patient was one and a half years old. One patient, in whom the neurovascular compartment was not adequately identified, failed to demonstrate anesthesia. In addition, 7 patients had incomplete analgesia, requiring supplementation either with local infiltration or general anesthesia. Five of the latter group had anesthesia of the hand, but the wrist and forearm were only hyposthetic. In 91.5 per cent of the cases (86 out of 94) fully satisfactory surgical anesthesia was obtained.

Complications. The only likely complications with axillary block are injury to the nerves and vessels or intravascular injection of local anesthetic agent. No instances of postblock hematoma or infection have been observed. There was one case of postblock ulnar nerve hypesthesia without motor weakness which persisted for 24 hours. No other neurological symptoms were observed. The axillary vessels were frequently pierced, as evidenced by the aspiration of blood. No instance of major drug reaction occurred in the series.

Summary

The axillary approach to the brachial plexus for anesthesia of the upper extremity has been discussed. The close association of the brachial plexus and axillary artery within the axillary neurovascular compartment which becomes superficial and accessible in the distal axilla has been emphasized. The key to the axillary block is the axillary artery, easily palpated, after proper positioning, on the axillary surface of the upper arm. A technique using a short, fine needle, an aspirating syringe and a moderate volume of anesthetic solution to fill the neurovascular compartment has been described. Completely successful block was obtained in 86 out of 94 blocks (91.5 per cent).

Absence of undesirable complications in addition to ease and safety of performance makes axillary block more acceptable to physician and patient than other approaches to the plexus.

REFERENCES

PAIN IN THE AGED  Two hundred normal subjects from two poles of life, young (20–30 years) and aged (65–97), were tested for cutaneous pain sensitivity by the Hardy-Wollf-Goodell dolorimeter. It was found that pain sensitivity decreased with age, as manifested by increased average values of the pain threshold in the older group. This finding was constant in three racial groups studied. (Sherman, E., and Robillard, E.: Sensitivity to Pain in Aged, Canad. M. A. J. 83: 944 (Oct. 29) 1960.)

OBJECTIVE PAIN EVALUATION  The pain in lumbosacral radiculitis was evaluated by galvano-palpation. The indifferent electrode was placed on the abdomen, and the active electrode on symmetrical parts of the skin. Increased galvanic conduction on the affected side was shown by the differences between the galvanometric readings on symmetrical parts of the skin which enabled the determination of the exact topography of the pain. In 105 out of 114 patients tested the absolute galvanometric readings were considerably higher on the affected side than on the opposite side. When the pain increased the galvanic conductivity of the skin increased. When the clinical condition of the patient improved the galvanometric differences between symmetrical parts of the skin decreased. This method of objective evaluation of pain can be easily carried out both in hospital wards and out-patient departments. (Bugaenko, P. A.: Objective Evaluation of Pain in Lumbosacral Radiculitis, Vrach. Delo 9: 981, 1959.)

CONGENITAL ANALGIA  The rare syndrome congenital analgia results from inability to synthesize stimuli into a meaningful concept. Infants with this disorder often bite their tongues, fingers, and lips and the wounds heal slowly. Skin and nerve biopsies show normal nerve fibers. Congenital analgia may be differentiated from familial dysautonomia in that the deep tendon reflexes are normal, tear secretion is present and the electroencephalogram is normal. A case is reported. (Gillespie, J. B., and Perucca, L. G.: Congenital Generalized Indifference to Pain, Selected Papers of Carle Hospital Clinic and Carle Foundation 13: 9 (July) 1960.)