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NEURAL AFFECTIONS IN LEPROSY AND THEIR DIAGNOSIS, PATHOLOGY AND TREATMENT

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INTRODUCTORY

Opportunity has been had to examine many hundreds of cases of leprosy of various types in the outdoor clinic of the Calcutta School of Tropical Medicine. In most of these cases thickened cutaneous nerves could be demonstrated, especially in connection with macular lesions of nerve leprosy, and sometimes nerve abscesses are encountered. The involvement of the cutaneous nerves that supply macules, which is such a marked feature of leprosy in Calcutta, has been reported only infrequently in other places, and the question arises as to whether we here are dealing with a local peculiarity of the disease. Since I have studied leprosy only in Calcutta I can express no opinion on this point, but some experienced workers who have studied the disease both here and elsewhere are definitely of the opinion that this condition is peculiarly common here. This is a matter that should be investigated, but we have reason to believe that the attention of workers in most other regions has so seldom been drawn to the condition that they do not examine their patients for it thoroughly and systematically.

Thickening of cutaneous nerves is a very interesting phenomenon. In our work it often helps in making a diagnosis of leprosy when other signs of the disease are not very definite, or when the skin lesions are disfigured by corrosive applications. Marked nerve thickening usually indicates good resistance and a good prognosis. Proper treatment, however, is needed in order to ameliorate

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symptoms like pain, tingling and burning, and to prevent the occurrence of deformities when the nerve fibers are not already damaged beyond recovery. Therefore it is essential to know where and how to look for a thickened nerve, and what can be done in the way of treatment.

PRINCIPLES OF EXAMINATION

1. Thickening of nerves which supply the parts affected by the existing leprotic changes should be sought. These may be the cutaneous nerves supplying areas in which there are macules, or the nerve trunks supplying areas that show anesthesia and trophic lesions. One or all of the nerves supplying a given part may be involved.

2. Careful palpation should be performed across the course of a nerve that is sought. To determine whether a nerve that is palpated is actually thickened, the corresponding one on the opposite side should be examined in comparison. Thickened nerves are usually tender and on pressure the patient feels a tingling sensation passing down it, though tingling may be produced by hard pressure on a normal nerve.

3. More than one nerve may be thickened in a single individual. One part of a nerve may be definitely thickened while another part is normal. Therefore the examination should be thorough.

DISTRIBUTION OF NERVES AND LESIONS

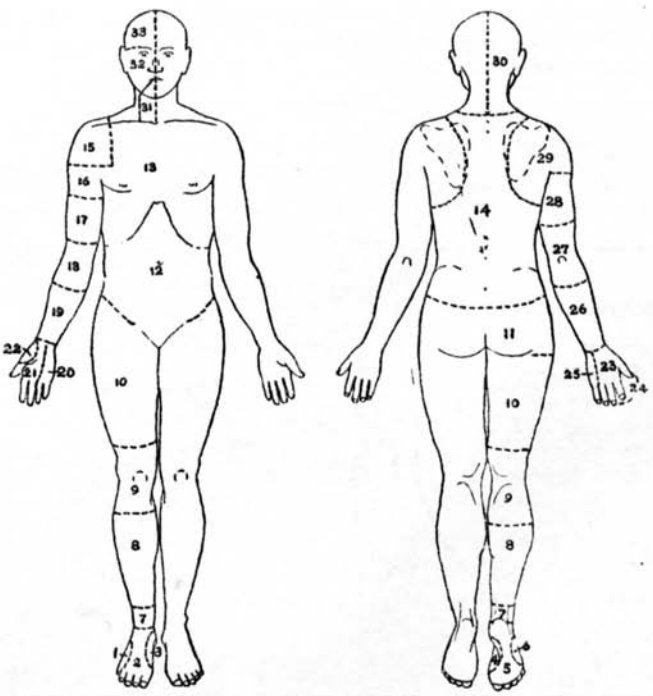
Skin lesions on particular parts cause thickening of one or more of the nerves supplying those parts. The normal distribution of the cutaneous nerves that are of most concern in leprosy are shown in Text-figs. 2, 3 and 4. For the sake of convenience in description the body surface has been divided into thirty-three areas, as shown in Text-fig. 1. The nerve thickening found in connection with lesions in all of these areas will be discussed. It will be understood that most of the photographs used to illustrate the conditions discussed (Plates 32 to 35) show the more marked grades of enlargement; the lesser grades are often not visible and frequently careful palpation is required to detect them.

Dorsum of foot (Areas Nos. 1 to 3).—(*a*) If there is a lesion in area No. 1 we may expect to find thickening of the sural nerve. The thickening may be in its terminal branch (lateral dorsal cutaneous) or in its course below the lateral malleolus, or higher up in the leg (medial sural cutaneous). The palpation of this nerve is facilitated when the muscles of the leg are made stiff. Occasionally a lesion in this area may cause thickening of the superficial peroneal. An example of thickening of both the sural and the superficial peroneal nerves is shown in Plate 32, Fig. 1.

(*b*) Thickening of the superficial or the common peroneal nerves, is usually

found with a lesion in area No. 2. The former is palpated most easily when the ankle joint is extended. The common peroneal is palpated behind the head of the fibula and beside the biceps femoris muscle; the knee should be extended and the examiner should stand in front of the patient and hook the fingers behind the neck of the fibula. Marked thickening of this nerve is illustrated in Plate 32, Fig. 2.

(*c*) The saphenous nerve usually becomes thickened with lesions in area No. 3, and occasionally the medial dorsal branch of the superficial peroneal is affected. The saphenous should be palpated along the medial surface of the tibia and lower down on the internal malleolus. Thickening of this nerve is shown in Plate 32, Fig. 3.



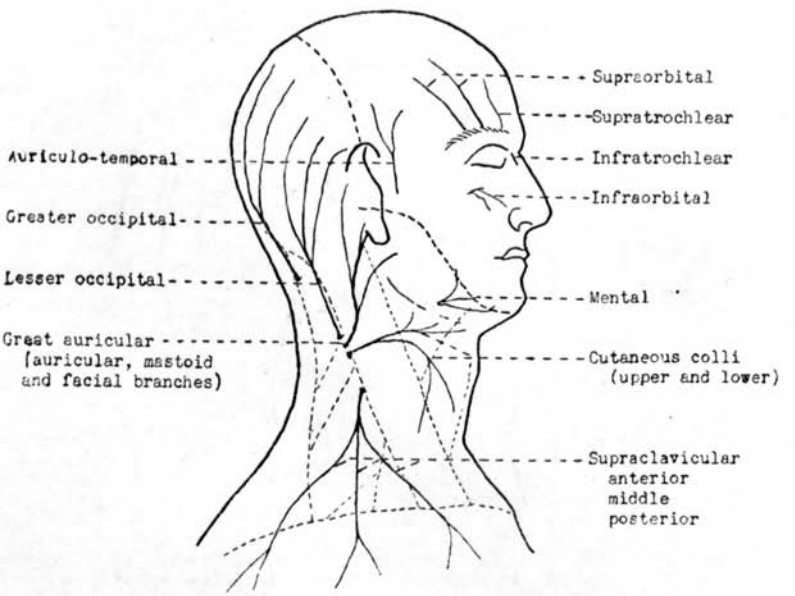
TEXT-FIG. 1.—Diagram showing the thirty-three regions into which the body is divided for the purposes of the present discussion.

Plantar surface of foot (*Areas Nos. 4 to 6*).—(*a*) With a lesion in area No. 4 the saphenous nerve is often thickened. (*b*) The tibial nerve is usually affected when there is a lesion in area No. 5; sometimes there is a perforating ulcer in addition to anesthesia. The nerve should be palpated on the medial side of the ankle joint below the malleolus, but in thin subjects it may also be felt in the popliteal fossa at the point where the sciatic divides into tibial and common peroneal nerves. (*c*) With lesions in area No. 6 the sural nerve is often thickened.

Ankle (*Area No. 7*).—This area is in the distribution of three nerves, the peroneal, sural and saphenous, and lesions that involve it may cause thickening of any or all of them.

Leg (*Area No. 8*).—Involvement of this area may also affect several nerves. (*a*) With lesions on the antero-lateral side of the leg the common peroneal and lateral sural cutaneous nerves may be thickened. (*b*) With lesions on the medial side the saphenous nerve may be enlarged. (*c*) With lesions on the posterior side the medial sural cutaneous nerve may be affected.

Knee (*Area No. 9*).—If there is a lesion on the knee usually the femoral cutaneous nerves (medial, intermediate, and posterior or lateral) or the infrapatellar nerve are thickened. The femoral nerves are most easily palpated when the knee joint is fully flexed and the muscles of the thigh made stiff; if there is much thickening the nerves stand out prominently. The infrapatellar can best be examined when the knee is partly flexed. Plate 32, Fig. 4 shows a large infrapatellar, and Fig. 5 a thickened medial femoral cutaneous nerve. Figs. 6 and 7 show an abscess of the intermediate femoral cutaneous nerve, before and during operation.



TEXT-FIG. 2.—Diagram showing the normal course of the principal cutaneous nerves of the head and neck that may be affected in leprosy.

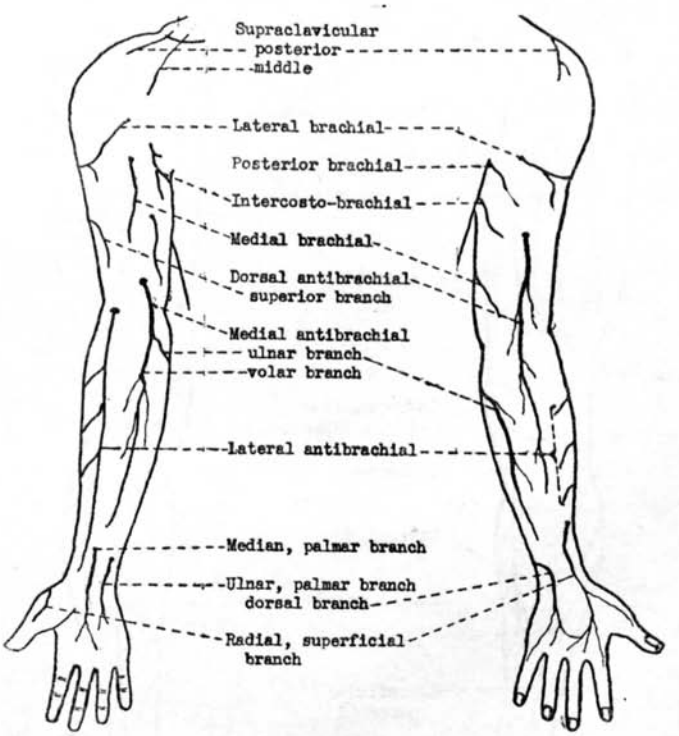
Thigh (*Area No. 10*).—With lesions on the anterior surface of the thigh any of the femoral cutaneous nerves may be thickened. The twelfth thoracic, lumbo-inguinal and ilio-inguinal nerves are rarely enlarged.

Buttock (*Area No. 11*).—With lesions in this area branches of the sacral, lumbar, ilio-hypogastric and twelfth thoracic nerves are occasionally affected.

Abdomen (*Area No. 12*).—It is usually impossible to find thickened nerves arising from lesions on the abdomen, though when they are on the upper part they may cause thickening of the lower intercostals.

Chest (*Area No. 13*).—Lesions on the chest may give rise to thickening of intercostal nerves, but the most commonly detectable change is when the upper part of the area is involved, in which case there may be thickening of

the middle or anterior branch of the supraclavicular nerve, according to the site of the lesion. Thickening of the middle one is shown in Plate 33, Fig. 8. In examining the supraclavicular nerves the patient's head should be turned to the opposite side and the skin of the affected side of chest pulled downwards. Large nerves will thus sometimes be rendered visible; slight degrees of thickening can be detected by palpating the nerves where they cross the clavicle.



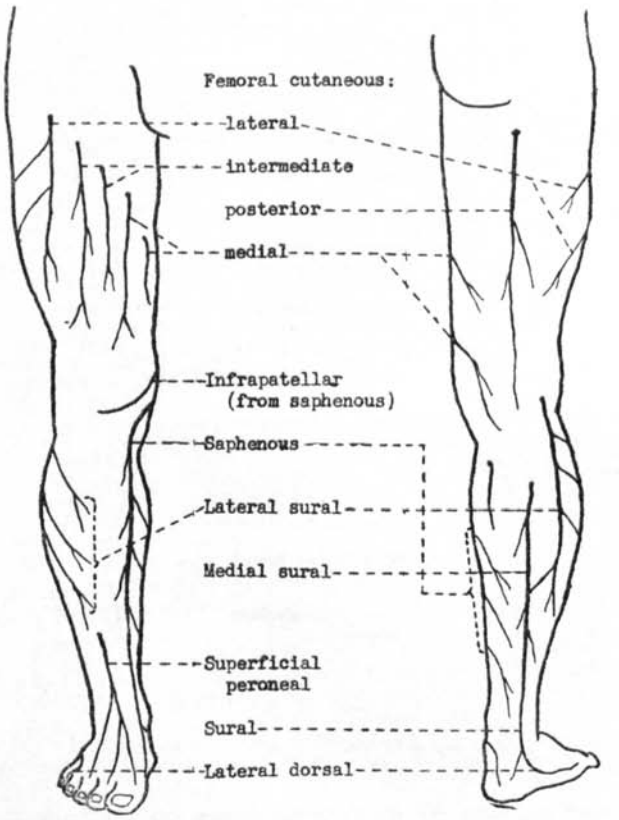
TEXT-FIG. 3.—Diagram showing the normal course of the principal cutaneous nerves of the upper extremity that may be affected in leprosy.

Back (*Area No. 14*).—When there are lesions on the back the posterior branches of the intercostal nerves may be thickened, especially near the spine. One on the upper part of the scapular region may give rise to thickening of a branch of posterior supraclavicular. Thickening of a posterior intercostal nerve is shown semi-diagramatically in Text-fig. 5, A.

Anterior arm and forearm (*Areas Nos. 15 to 19*).—(*a*) With a lesion in area No. 15 a branch of the supraclavicular nerve may be thick. (*b*) When area No. 10 is affected usually no enlarged nerve is found, though occasionally a supraclavicular may be involved. (*c*) With a lesion in area No. 17 the medial brachial cutaneous may be thickened, as shown in Plate 33, Fig. 9. (*d*) The medial antibrachial is often thickened when there is a lesion in area No. 18. Plate 33, Fig. 10 shows one that is thickened as far up as the axilla. Very exceptionally the lateral antibrachial or the ulnar may be affected. (*e*) With a

lesion in area No. 19 the medial or lateral antibrachial may be thickened, according to the site of the lesion, and sometimes the ulnar is affected.

Palm (Areas Nos. 20 to 22).—(*a*) With a lesion in area No. 20 the ulnar nerve is often thick, either the palmar or the dorsal branch, or the main trunk in the arm, or all of them. The ulnar at the elbow can best be palpated when the joint is semiflexed; it should be palpated from the sulcus nervi ulnaris upwards.

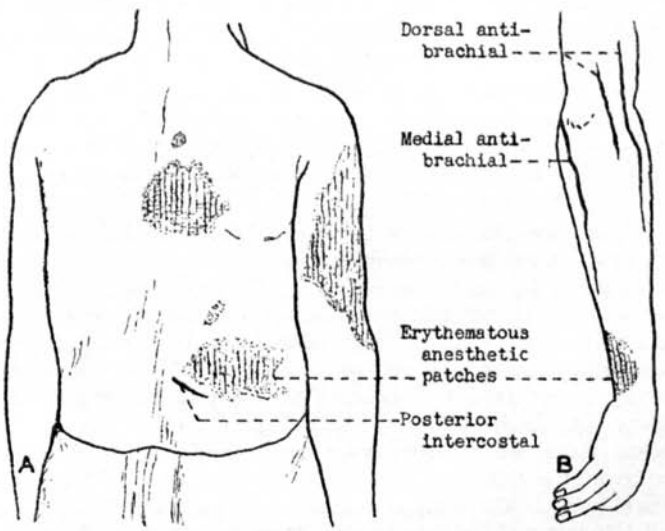


TEXT-FIG. 4.—Diagram showing the normal course of the principal cutaneous nerves of the lower extremity that may be affected in leprosy.

(*b*) With lesions in area No. 21 the median nerve is often affected, usually the palmar branch but sometimes the main trunk at the antecubital space, where tenderness can be detected. The palmar branch is not easily palpable because it lies behind the tendon of palmaris longus. Usually it is found tender on palpation between the flexor carpi radialis and flexor digitorum sublimis in the lower part of forearm. Sometimes there is swelling at that point, indicating the formation of nerve abscess.

(*c*) With lesions in area No. 22 the nerves that may be affected are the superficial radial and a branch of the lateral antibrachial cutaneous. The

former, when thickened, is palpable in the upper part of forearm, and also in the lower third where it winds around the radial side of the forearm to the dorsum of the hand and gives a branch to the base of the flexor surface of thumb; it is not palpable in the middle third of forearm where it lies behind the brachio-radialis. The lateral antibrachial is more superficial in position than the other, and when thickened may be palpable throughout its whole course on the flexor surface of forearm.



TEXT-FIG. 5.—A. Representation of a thickened posterior intercostal nerve, in relation to an erythematous anesthetic patch. B. Thickening of the dorsal antibrachial cutaneous and the ulnar branch of the medial antibrachial cutaneous nerves.

Dorsum of hand (*Areas Nos. 23 to 25*).—(*a*) With lesions in area No. 23 the superficial radial or a branch of lateral antibrachial may be involved. Plate 33, Fig. 11 shows thickening of the branches of the superficial radial, one going toward the interdigital space between thumb and index finger and another between the index and middle fingers; veins on the dorsum of hand are also visible in the photograph. (*b*) With lesions in area No. 24 the median may be affected, usually its palmar branch. (*c*) With lesions in area No. 25 the ulnar, in its dorsal branch or the main trunk, may be affected, and very rarely the superficial radial. Thickening of the dorsal branches of the ulnar, one of them communicating with the superficial radial, is shown in Plate 33, Fig. 12. Thickening of these nerves can be well demonstrated when the patient clenches his hand and flexes the wrist joint. The digital branches may sometimes be found thickened laterally in the fingers when there is any lesion there. The radial nerve in the arm can best be palpated by flexing the elbow joint fully and stiffening the muscles of the arm. Plate 33, Fig. 13 shows a thickened radial nerve.

Posterior surface of arm and forearm (*Areas Nos. 26 to 29*).— (*a*) With lesions in area No. 26 the ulnar division of the medial antibrachial is often thickened, or occasionally the dorsal antibrachial, and very rarely the lateral antibrachial.

Sometimes the ulnar trunk is thickened. Text-fig. 5, B represents a case in which there was thickening of the dorsal antibrachial nerve and the ulnar branch of medial antibrachial. (*b*) With lesions in area No. 27 branches of the medial antibrachial and the medial brachial nerves are thickened, and occasionally the ulnar. (*c*) With lesions in area No. 28 usually no nerve enlargement is found, but the intercosto-brachial and branches of the posterior brachial may be affected. (*d*) With lesions in area No. 29 the posterior division of the supraclavicular nerve may be involved.

Nape of neck and posterior part of scalp (Area No. 30).—With lesions in area No. 30 branches of the smaller occipital nerve are sometimes affected. Thickening of the greater occipital nerve has not been seen.

Anterior surface of neck and part of face (Area No. 31).—With lesions in area No. 31 the cervical cutaneous nerve may be thick, as illustrated in Plate 35, Fig. 14. For demonstration of the cervical cutaneous and great auricular nerves the head should be turned to the opposite side, which stretches the nerves on the affected side and makes them prominent.

Face and ear (Area No. 32).—With lesions of the ear and the adjacent part of the face the great auricular is commonly found thickened. The infratrochlear was found thickened in a patient having a lesion by the side of the nose near the inner canthus of the eye. Branches of the maxillary and mandibular divisions of the trigeminal are sometimes enlarged. The mental branch was found thickened in a patient who had a patch on the chin and the right side of face; there was also slight paralysis of the orbicularis oris, drooping of the angle of the mouth and difficulty in mastication. Although thickening of the facial nerve is rarely detected, facial palsy is often evident when there are lesions on the face or forehead. The first sign of involvement of this nerve may be fibrillary twitchings of the facial muscles or dribbling of saliva. When the orbicularis oculi is affected the first sign may be watering of the eyes and inability to close them completely. When the muscles of the forehead are affected there is impairment of the power of raising the eyebrows. Facial palsy is usually localized to groups of muscles near the site of the lesion.

The ear is supplied by four nerves, the smaller occipital, the auriculo-temporal, the auricular branch of the vagus, and the great auricular (auricular, facial and mastoid branches). Of these four nerves only the great auricular commonly shows thickening, this usually in its auricular branch. In thin persons this nerve is normally palpable and sometimes visible, but when it is thickened it stands out more or less prominently as a cord-like structure emerging from the posterior border of sterno-mastoid muscle and running towards the lobe of the ear (Plate 34, Fig. 15). Sometimes both of the branches mentioned are thickened, as shown in Plate 34, Figs. 16 and 17.

Forehead and anterior part of scalp (Area No. 33).—With lesions in this area the supraorbital and supratrochlear nerves are often thickened. If the lesion is erythematous and raised and is located in the lower part of forehead, palpation of these nerves may be difficult, but when definite thickening cannot be detected percussion or hard pressure over their course may cause the patient to feel acute pain and a tingling sensation passing into the scalp. Plate 34, Fig. 18 shows thickening of the right supraorbital and the left supratrochlear nerves.

CLINICAL FINDINGS AND POSSIBLE ERRORS

The nerves which may be found thickened in association with macular lesions in the various parts of the body having been indicated,

a few points regarding the clinical findings and possible errors in interpreting them will be mentioned.

CLINICAL FINDINGS

1. There may not be any appreciable thickening of a nerve though there may be an active skin lesion in its area of distribution.

2. Thickening if present may be found along the whole course of the nerve, but usually only a part of it is involved, above and below which it is less thick.

3. There may be slight thickening and slight pain, but the pain may be very acute and out of proportion to the thickening, particularly in nerve trunks like the ulnar.

4. The nerve may be as thick as a tendon, though the skin lesion may be very small or hardly noticeable. Pain may be slight or absent in spite of much thickening, but there may be a history of previous acute pain.

5. Sometimes the nerves show local swellings which indicate the presence of foci of caseation.

6. There may be abscess formation in the thickened nerve, and multiple abscesses may occur in different nerves in the same patient.

7. Late in the disease a nerve may be so much fibrosed that, instead of being appreciably thickened, it may be thinner than normal, though there may be anesthesia and deformity in its distribution. In such case the nerve is usually neither painful nor tender.

POSSIBLE ERRORS

1. A nerve abscess may be mistaken for an enlarged gland, a subcutaneous tumor, or a leprotic nodule; and the opposite is also true.

2. A nerve may be so much thickened that it may be mistaken for a tendon, especially if there is no pain. Usually the position and course of the nerve, and the tingling sensation which is produced by pressure and which radiates down to the skin lesion, differentiate a nerve from a tendon.

3. A varicose vein may look like a thick nerve, but it can be distinguished by careful palpation; a vein is much softer and collapses on pressure.

4. An artery which is superficially located may be mistaken for a nerve if the pulsation in it is not detected.

5. Long, enlarged lymphatic glands lying near nerves may be

mistaken for thickened nerves; e. g., cervical glands near the great auricular, or supratrocheal glands near the ulnar.

6. The course of a nerve may be abnormal. In some patients the ulnar moves to a position in front of the medial epicondyle when the elbow is flexed, and so may be missed even when large.

PATHOLOGY

NAKED-EYE APPEARANCES

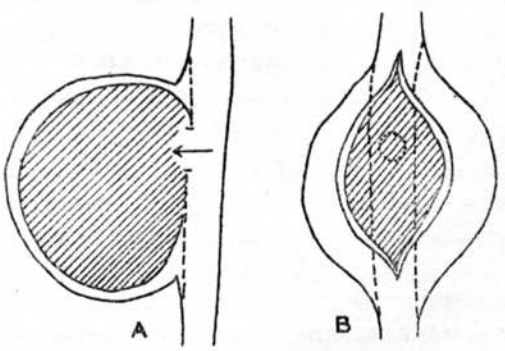
When a nerve is slightly affected its tissue may be more friable than normal. Upon incision the affected fasciculi can be distinguished from unaffected ones, being usually larger, more opaque and pinkish. In some cases there may be yellowish areas indicating caseation; there may be one such focus or many of them, in which case they may be discrete or joined by a strand of caseous tissue. When a nerve is greatly enlarged it may be very firm, the epineurium much thickened and densely adherent to the nerve cord, and on section there may be seen caseous areas of various sizes, located quite superficially or deep in the nerve trunk.

When liquefaction takes place the pus often escapes from the nerve cord through a small opening in the perineurium, usually on the superficial aspect of the nerve. The pus accumulates under the epineurium, and bulging of this causes a swelling outside the nerve. Ultimately the abscess may become adherent to the skin, and even burst through it. The discharge of pus continues for a very long time and the nerve remains thick and indurated. Sometimes, however, there is found a small opening in the skin, or a scar along the course of thickened nerve, and no discharge of pus, indicating that there was an abscess previous to the time of examination. Plate 34, Fig. 19 shows scars of two healed abscesses, and also a newly-formed small one in the course of the medial antibrachial cutaneous nerve.

Nerve abscess is usually produced by a chronic process of inflammation, caseation and liquefaction. Sometimes it is precipitated by lepra reaction. An abscess inside the nerve sheath is often very painful, especially when it develops acutely, but when it bursts through the sheath the pain is less. In Text-fig. 6 is shown diagramatically a large abscess of the ulnar nerve that was absolutely painless, though slight tenderness was elicited by pressure upon the nerve itself. The perineurium had given way on the anterior surface of the nerve and the epineurium had formed a firmly attached sac, the inner surface of which was rough because of the caseous tissue attached to it.

MICROSCOPIC FINDINGS

When a nerve is slightly thickened, sections show increase of connective tissue (peri- and epineurium) surrounding the nerve fiber bundles (fasciculi), and some cellular infiltration in the bundles and the surrounding tissues. The blood vessels (vasa nervorum) are thickened. Acid-fast bacilli can usually be demonstrated in teased preparations or in sections. The types of cells which are found are mainly small round cells, epithelioid cells and fibroblasts. A cross section of a slightly thickened branch of the superficial peroneal nerve is shown in Plate 35, Fig. 20. Typical giant cells are not present in this particular section, but there are several foci with small multinucleate cells. A section of the skin lesion in the area supplied by this nerve gave similar findings. A more advanced condition is characterized by more cellular infiltration and the presence of typical giant cells. Acid-fast bacilli are few or absent.



TEXT-FIG. 6.—Diagramatic representation of a sac-like nerve abscess, showing the opening through the perineurium and the abscess wall formed by the epineurium. A, lateral view, before opening. B, vertical view, after opening.

In Plate 35, Fig. 21, is shown a section through a thickened nerve having a focus of caseation in the center. The nerve fibers are pushed to either side. In Plate 35, Fig. 22, is shown a section through the wall of a nerve abscess found in connection with the superficial radial nerve. In the inner layer there was a preponderance of epithelioid cells.

When the inflammation in an enlarged, noncaseating nerve has subsided, fibroblasts are found to predominate, giant cells are absent or few, and usually no acid-fast bacilli can be found. The nerve fibers are largely replaced by fibrous tissue. This condition is shown in Plate 35, Fig. 23.

TREATMENT

Treatment should vary according to the condition of the nerve,

the degree of thickening, the presence of pain or acute inflammation or of abscess formation. The question whether the pain, when present, is associated with lepra reaction is also to be considered.

Thickened and tender nerves.—Subcutaneous injections of hydnocarpus oil along the course of the nerve usually serve to reduce pain and thickening. Sometimes treatment by diathermy becomes necessary. In certain cases surgical treatment is advisable. The most useful procedure is the removal of the nerve sheath (decapsulation). Decapsulation should always be done carefully, especially in a mixed nerve like the ulnar. If the epineurium is not much thickened it can be separated from the fascicles by careful dissection and excised. This operation often relieves pain. If the epineurium is much thickened and densely adherent to the fiber bundles of a mixed nerve, decapsulation should not be attempted, but longitudinal incisions should be made through the sheath to relieve compression. If strips of epineurium can be dissected out carefully, the result will be more permanent. In the case of the ulnar, the nerve should first be freed from the intermuscular septum, which is often found to be much thickened and pressing on the nerve.

Acute pain, with or without much thickening.—Acute pain is a very troublesome condition in leprosy. The nerve may be only slightly thickened but the pain may be very severe. It is often brought on by an attack of influenza or some such illness, or by lepra reaction. Hot fomentations give temporary relief. Some cases do well after subcutaneous injections of adrenalin chloride, or after injections of ephedrine in 0.5 per cent of sodium bicarbonate solution along the nerve. Diathermy is very useful in most of these cases. In some cases these remedies fail. Sometimes nerve pain, especially if associated with lepra reaction, is relieved by intravenous injections of 5 cc. of calcium gluconate (10 percent), with or without potassium antimony tartrate, on alternate days. One worker has reported the use of injections consisting of five grains of chloretone dissolved in 1 cc. of olive oil, the injections being given along the nerve.

Nerve abscess.—If a nerve abscess is not opened it may in the course of time burst through the skin and continue to discharge for some time thereafter. If the pus in an abscess is not thick, aspiration by a syringe may be tried but it often fails to give relief. If the pus is thick and the abscess large or painful it should be dealt with surgically. The nerve with its abscess is dissected out of the surrounding tissues and opened, exposing the opening through the nerve sheath. If possible the whole of the abscess wall is dissected

out. The wound is closed with a few stitches, but drainage may be necessary for a few days. Even after surgical and other measures, subcutaneous injections of hydnocarpus oil along the nerve may be continued; I have found that operation followed by injection gives better results than operation alone. These injections should not be given when there is lepra reaction.

I am deeply indebted to Dr. J. Lowe, officer-in-charge of the Leprosy Research Laboratory, for very valuable suggestions and for permission to publish this note.

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DESCRIPTION OF PLATES

PLATE 32

FIG. 1.—Thickening of the sural and superficial peroneal nerves. A, superficial peroneal; B, sural; C, lateral dorsal cutaneous. Anesthesia of the whole of the dorsum of the foot; no macule discernible.

FIG. 2.—Thickening of the common peroneal nerve, in a very thin patient.

FIG. 3.—Thickening of the saphenous nerve above a conspicuous, raised, macular skin lesion.

FIG. 4.—Thickening of the infrapatellar nerve, made conspicuous by flexing the knee.

FIG. 5.—Thickening of the medial femoral cutaneous nerve.

FIG. 6.—Abscess of the intermediate cutaneous nerve on thigh (A). Macular lesion just above knee (B). (See Fig. 7.)

FIG. 7.—Abscess of the intermediate cutaneous nerve (case shown in Fig. 6), exposed by operation.

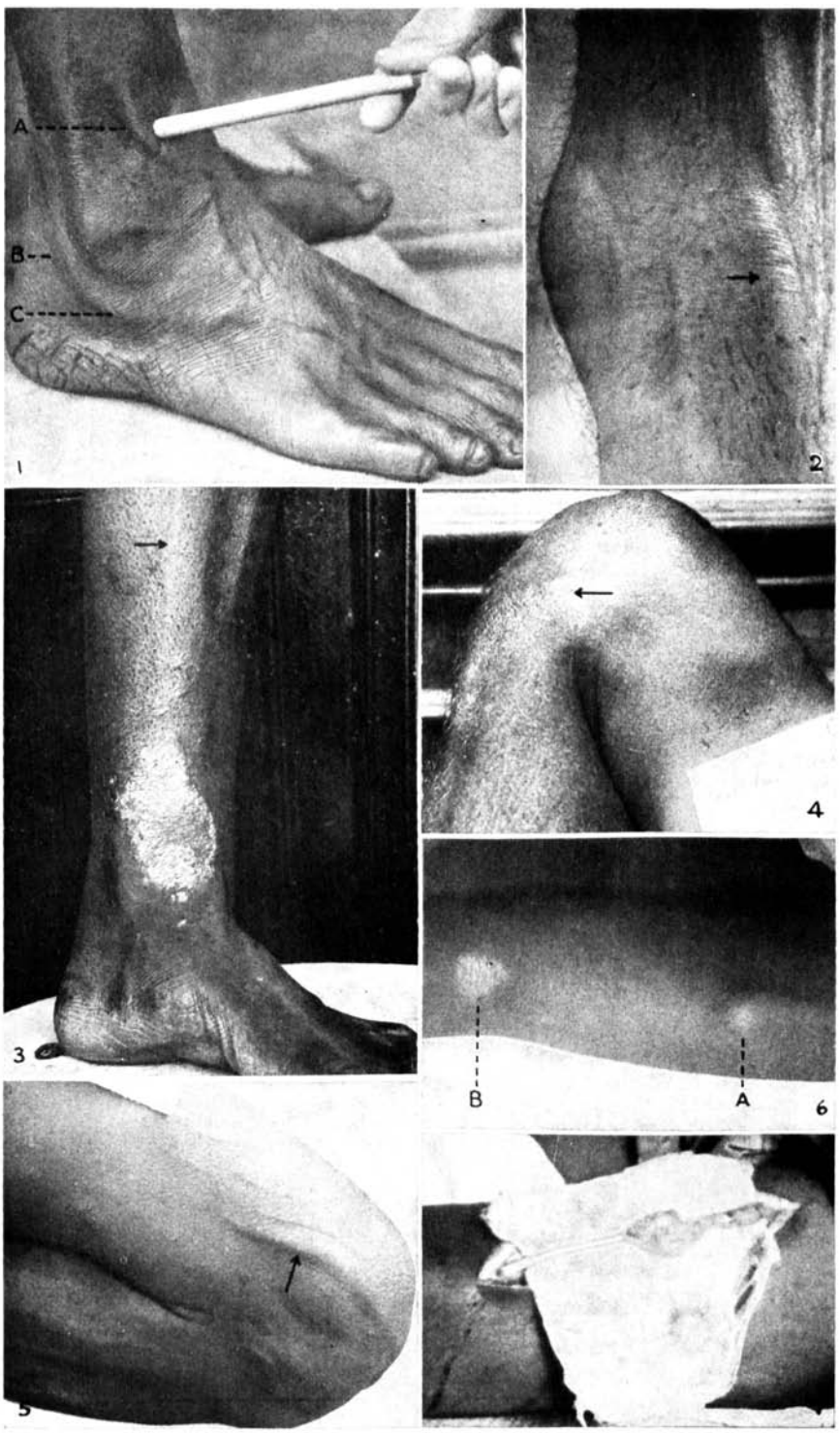

Plate 32

PLATE 33

FIG. 8.—Thickening of the middle supraclavicular nerve, with skin lesion in its area of distribution.

FIG. 9.—Thickening of the medial brachial cutaneous nerve.

FIG. 10.—Thickening of the medial antibrachial cutaneous nerve, from wrist to axilla. The nerve stands out conspicuously at the elbow.

FIG. 11.—Thickening of the branches of the superficial radial nerve, one going toward the interdigital space between the thumb and index finger, another between the index and middle fingers. Veins are also visible.

FIG. 12.—Thickening of the dorsal branches of the ulnar nerve, one of them communicating with the superficial radial.

FIG. 13.—Thickening of the radial nerve.

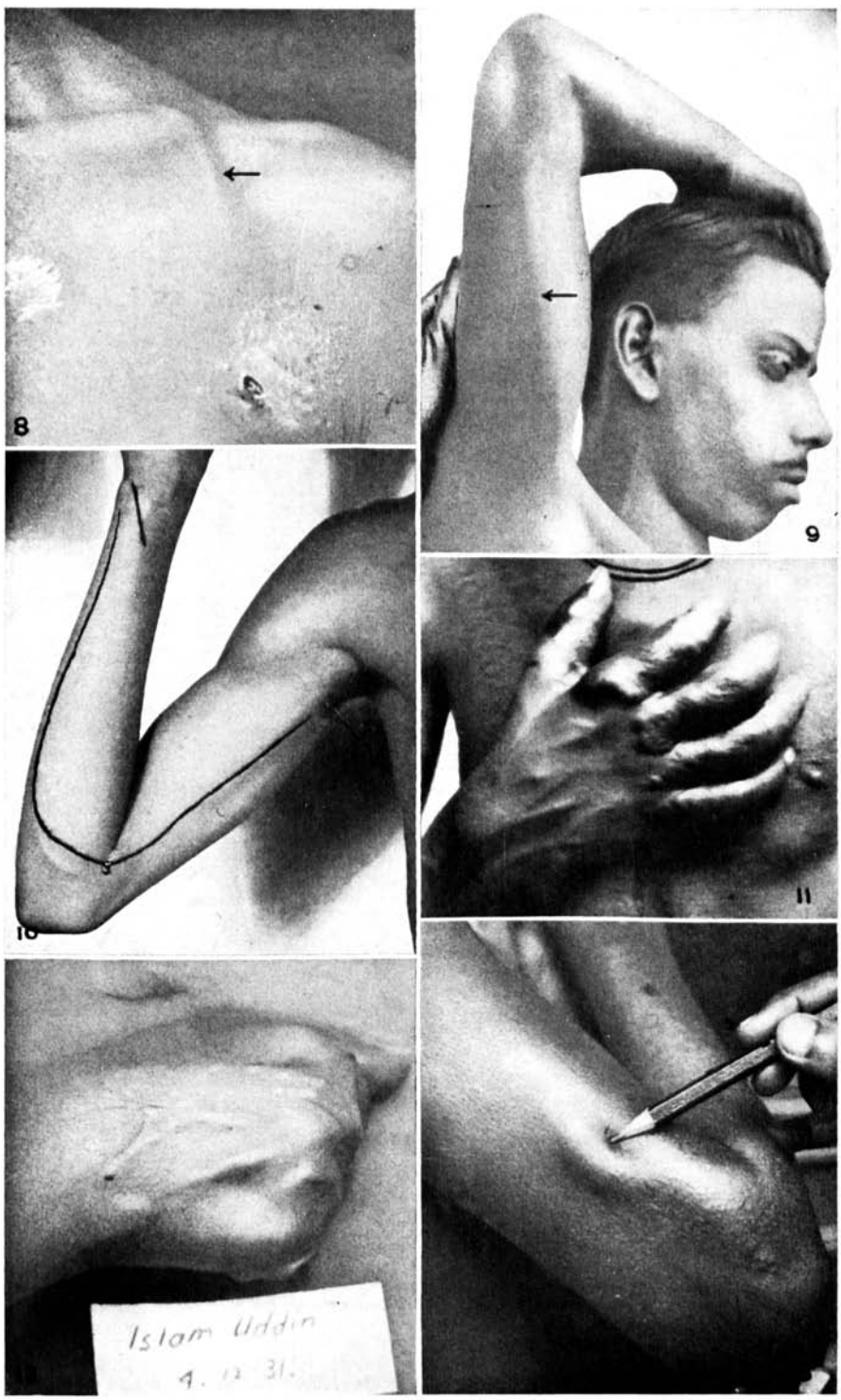
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Plate 34

Fig. 14.—Thickening of the cervical cutaneous nerve. Macular lesion on cheek.

Fig. 15.—Thickening of the great auricular nerve, auricular branch.

Fig. 16.—Thickening of mastoid and auricular branches of the great auricular nerve (A and B, respectively).

Fig. 17.—Thickening of the facial and auricular branches of the great auricular nerve (A and B, respectively).

Fig. 18.—Thickening of the right supraorbital and left supratrochlear nerves (A and B, respectively).

Fig. 19.—Showing scars of healed abscesses (A, A) and one newly-formed, small abscess (B) in the course of the medial antibrachial nerve.

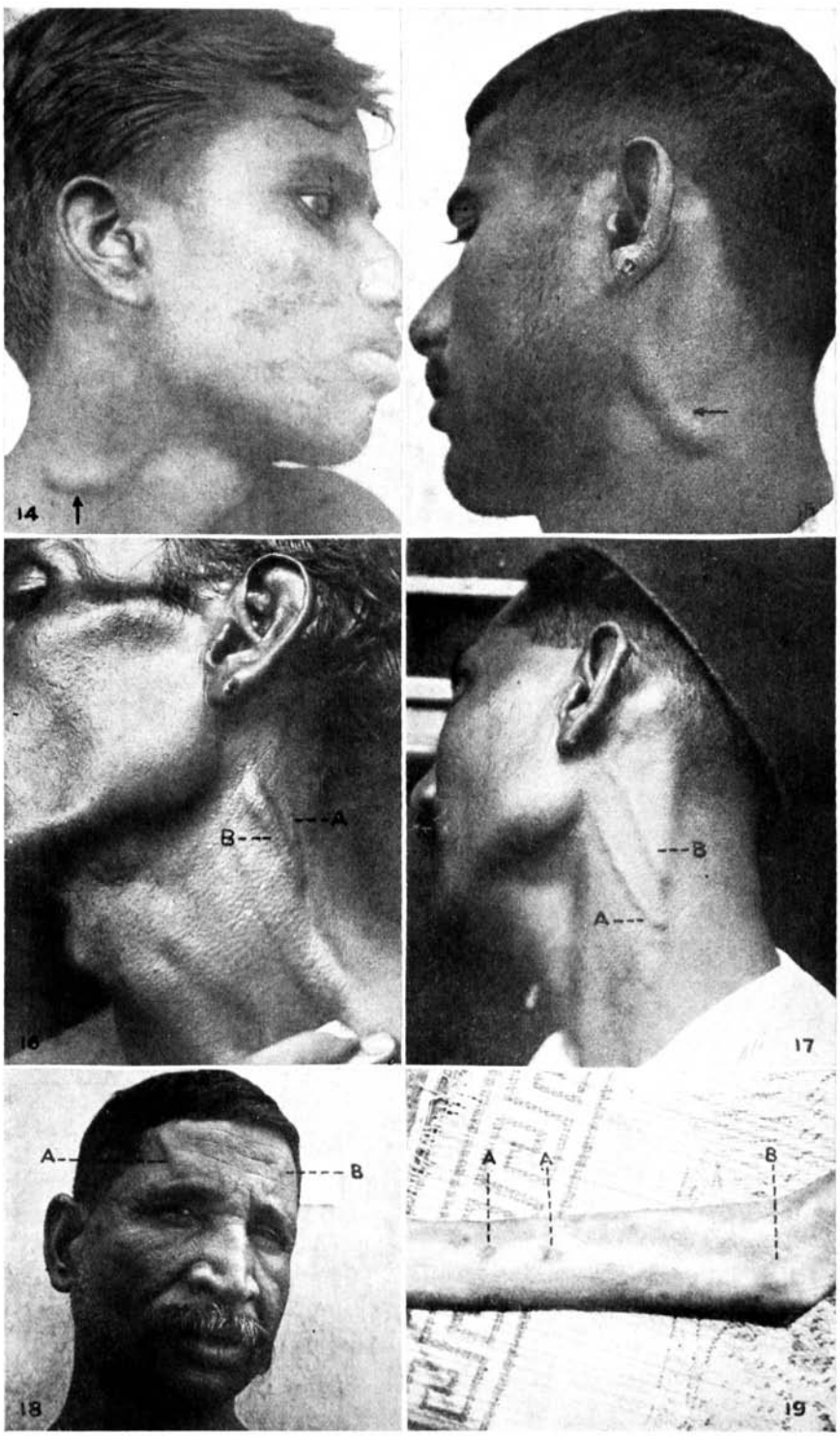

PLATE 34

PLATE 35

FIG. 20.—Cross section of a slightly thickened nerve, containing numbers of small multinucleate cells but no typical giant cells.

FIG. 21.—Longitudinal section through a thickened nerve containing a focus of caseation.

FIG. 22.—Section through the wall of a nerve abscess. The inner layer contains a preponderance of epithelioid cells.

FIG. 23.—Fibrotic condition in a nerve after the subsidence of the simple (noncaseating) granulomatous condition.

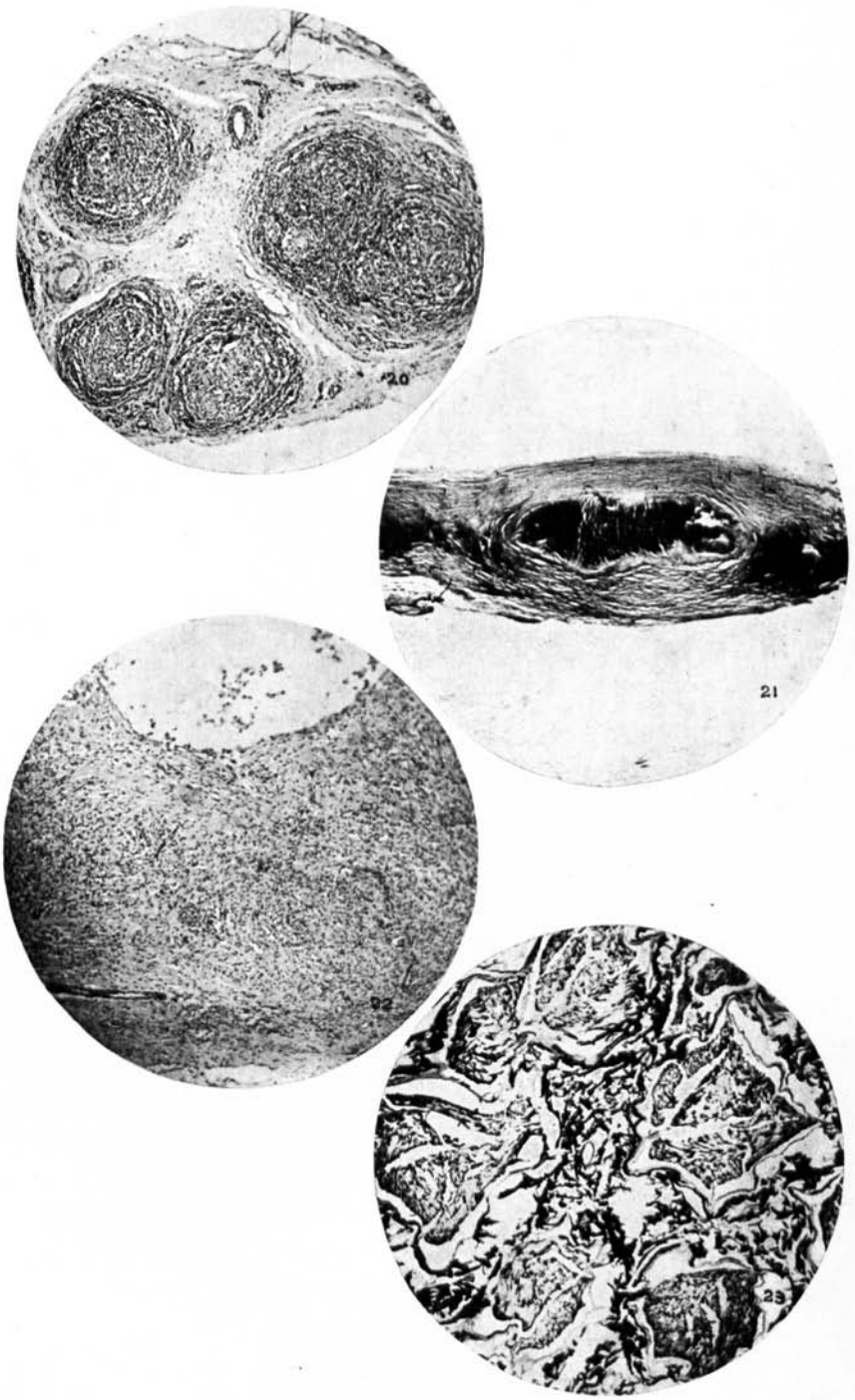

PLATE 35