SURGICAL PROCEDURES IN GENERAL PRACTICE

This is one of a series of articles contributed by invitation

INFECTIONS OF THE HAND AND FINGERS—II

BY

NORMAN C. LAKE, D.Sc., M.D., M.S., F.R.C.S.

Mode of Infection

Infection may reach the fingers and hand in many ways. The most obvious and important is by penetrating and lacerated wounds, especially those produced by the prick of needle or pin or other sharp-pointed instrument. The reason why penetrating wounds of this type appear to be more prone to the development of infection than others is probably because the organisms are implanted along the long narrow track through which the natural flushing of protective serum and exudates is impossible. There can be little doubt that a large number of organisms are mechanically removed during the penetration of the tough superficial layers of the skin, especially on the volar aspect, otherwise infection would be even more frequent. Extensive lacerated and incised wounds of the hand, too, are probably more likely to lead to infection than in many other regions of the body. This may be due to the fact that many of the divided structures retract well away from the wound, and so carry organisms into parts which are neither flushed by the natural transudation of lymph nor easily reached by such primary antiseptic measures as may be used.

The second mode of origin of infection is from small superficial skin lesions, especially around the nails. In particular a "hang-nail" is a common portal of entry. Dermatological lesions of the skin also may form the primary source of infection, and these, of course, not infrequently prove to be of vocational origin. The question of blood-borne infection of the fingers and hand is a moot one, since minute portals of entry can so easily be overlooked. There are, however, exceptional cases in which it appears beyond doubt that the infection reached the part from some other focus via the blood stream. In all cases of apparently spontaneous infection the suspicion must arise of an underlying constitutional condition, such as diabetes, or of a pyaemia. These suspicions must obviously be confirmed or confuted before any surgical means of treatment are entertained.

Spread of Infection

It will be readily recognized that infection of one part or tissue may arise by spread from another; thus infections of the palmar spaces often follow a primary infection in the finger. In many instances this spread is a continuous one, the infection extending along the subcutaneous tissues or in the thecal sheaths, which latter may subsequently burst at their proximal ends into the cellular tissues of the palm. It is because extension of this type tends to be, at least temporarily, controlled by certain anatomical features that so much attention has been paid to these in the previous section. In other cases the spread is a discontinuous one. Here the organisms travel from the fingers along the lymphatic spaces or vessels, are arrested in the palm, or even higher, and there set up a new zone of infection. Spread may occur

distally as well as proximally; the classic "Kanavel hand" arises when deep palmar suppuration extends distally along the lumbricales to the web spaces, there to discharge spontaneously through multiple sinuses.

Sometimes infection is complicated by the retention of foreign material in the wound; in these circumstances its detection and removal may constitute an important part of the treatment. Metallic foreign bodies are obviously easily displayed and localized by radiography. Cloth, leather, etc., can only be discovered by thorough exploration of the wound. A very common foreign body is glass: the coarser varieties contain enough lead and other heavy materials to render them more opaque than the body tissues to the rays, but the finer varieties may give such a poor shadow as to be easily missed. Wood, another common foreign body, is as easily penetrated by the rays as the body tissues, and therefore cannot easily be detected by this means. Luckily, splinters of wood often have a coating of paint or other opaque material, which aids greatly in their detection.

Infections arising from injury may also be complicated by lesions of tendons, nerves, vessels, or other bones. Such complications must be recognized in the early stages, since they may necessitate considerable modification of the treatment otherwise proper to the case.

Chronic Infections

Chronic infections of the hand fall outside the scope of this article, but as they may enter into the question of differential diagnosis it is necessary to state here the chief ways in which chronic infections manifest themselves. In syphilis the primary chancre may appear on the finger-tip, especially in dentists, doctors, nurses, and others having to deal with these cases. The palm of the hand is a common site for the appearance of the secondary rashes, but as these are always bilateral they rarely occasion mistakes. Tertiary lesions in this situation are exceedingly rare, but gummata arising in the periosteum of the bones and even from the soft tissues have been recorded.

Tuberculosis may affect the hands in three chief ways. The skin may be the seat of a local tuberculous process due to direct implantation of the organisms in surgeons, pathologists, and the like. This gives rise to the well-known verruca necrogenica. In children a tuberculous osteitis of the metacarpals or phalanges produces the so-called tuberculous dactylitis (spina ventosa). The diagnosis of this condition is confirmed by radiography, an unusual feature being the laying down of fresh bone under the periosteum, even in the absence of a secondary infection. In later life tuberculous infection of the palmar bursa may arise.

In this the exudation distends the whole palmar sheath, and so appears as an hour-glass swelling, partly distal and partly proximal to the annular ligament, giving through fluctuation. In this variety of tuberculous tenosynovitis the production of numerous "melon-seed" ("rice") bodies is usual.

Other chronic infections have been known to appear in the hands, but their incidence is so rare that they can be ignored.

Diagnosis

The diagnosis of infection of the hand and fingers is usually self-obvious. The determination of its site and anatomical localization, however, is much more difficult and of far greater importance. It has already been pointed out that the position of maximum swelling is not necessarily a guide to the location of the infection. Thus in inflammation of the palmar and thenar spaces the maximum swelling is always seen in the dorsum of the hand. The position of maximum tenderness is of greater value, but even this gives no indication of the depth of the infection. In the more superficial infections—that is, subcuticular, subcutaneous, or subungual whitlow—the limits of the infection are usually clear. When the thecae are involved there is swelling corresponding to the anatomical limits of the particular sheath involved, and there will be pain upon all movements of the digit, both active and passive. It is extremely important to note the range of movement over which pain is elicited, for pain upon movement in one direction only may arise when the infection lies outside the sheath if the inflamed part is compressed by the movement. In these cases, however, movement in the opposite direction usually brings relief, which of course is not the case when the theca is involved. Inflammation in a joint, too, may give rise to pain on all movements, but here the localization of the swelling to the vicinity of the joint enables the distinction to be made. In this instance pressure along the longitudinal axis of the digit is painful, whereas this is practically painless when the theca only is involved. End pressure upon the nail elicits local pain in the case of onychia or when the terminal phalanx is affected. Suppuration in the nail bed can often be seen through the translucent substance of the nail: a greenish-yellow area indicates the site of the pus.

Infections of the palmar and thenar spaces produce a fullness of the corresponding site of the palm, with obliteration of the normal hollow (cup of the palm) and local tenderness. If the anatomical limitations of these spaces be remembered there will be little difficulty in detecting which space is involved, but in addition the situation of the swelling in the web spaces and on the dorsum of the hand will afford corroborative evidence. The inner three web spaces are affected when the palmar space is involved, the first web space and sometimes the second when the thenar space is involved. If the thecae are not also infected a limited degree of movement of the fingers is possible without pain.

Infection of the palmar bursa (common flexor sheath) also causes fullness in the palm, best marked on the ulnar side. This can be distinguished from infection of the areolar space by noting that the swelling extends above the annular ligament, and that the movements of all the fingers are extremely limited and painful in the early stages. A swelling proximal to the annular ligament may be due to infection of the deep space of the forearm by extension from the palmar space. This is distinguished from a bursal swelling by the fact that it is less well defined and arises at a later stage of the disease when the palm is already extensively involved.

To complete the examination a search must be made for the presence of lymphadenitis in the axillary glands, rarely in the epitrochlear also, and for lymphangitis. The superficial lymphatic vessels for the most part travel in a spiral fashion, passing from below upwards and inwards around the forearm. The red, tender, and indurated streaks of a lymphangitis follow this course.

Finally, the general condition of the patient must not be overlooked. The extent of increase of temperature and pulse and the occurrence of rigors are all important diagnostic features.

Pre-operative Considerations

The foregoing section has dealt with the anatomical limitations of an infection, but before rational treatment can be undertaken it is necessary, in addition, to form a conception of the type and virulence of the infecting organisms: the conduct of the case will depend upon this as well as upon anatomical considerations. The organisms most commonly found are, of course, staphylococci, streptococci, and more rarely *B. coli*. Of the former the *aureus* variety has a special virulence which may approach that of many streptococcal infections; it may produce a lymphangitis not unlike that of a streptococcus. The well-known predilection of this organism for bone will naturally arouse a suspicion of some bone involvement, but in the hand this distinction is of less importance than it would be in many other regions. A lymphangitis can, however, usually be accepted as evidence of a streptococcal infection, especially if it be associated with a widespread infection which displays little tendency to localization or suppuration, if the patient develops rigors, or if his general condition appears to be unduly bad in proportion to the extent of the lesion. Sometimes, when a wound is already present, the actual organism may be identified by bacteriological examination, and when possible this should be done. Frequently, however, the nature of the infection has to be decided from clinical observation only. In the presence of lymphangitis, lymphadenitis, high temperature, and rigors the infection may be assumed to be a streptococcal one and treatment instituted accordingly. If involvement of bones or joints is suspected, a skiagram should be taken before the diagnosis is considered complete. A similar precaution should also be observed when the possibility of a foreign body arises. In the case of lacerated wounds a careful search must be made for evidence of damage to nerves or large blood vessels.

It cannot be too strongly urged that the preliminary examination should be thorough, for only in this way can a complete picture be formed that will enable one to deal with the case efficiently. It has already been remarked how important the hand is from the economic point of view; if the maximum of function is to be retained in an infected hand there must be no hurried surgical intervention before the case has been studied completely.

It has for long been customary to classify whitlows into subcuticular, subcutaneous, subperiosteal, subungual, and thecal, but, although this subdivision has its virtues, it conveys an idea of detachment that is quite alien to the general tendency to spread from one structure to another which these infections display. Such a detached pathology is apt to lull one into an unjustified sense of security, which may cause delay in the recognition of important extensions and so produce tragic results.

Treatment

The treatment of these cases depends upon the localization and the nature of the infecting organism. The general principle of rest to an acutely inflamed part, however, is applied to all, whether operative treatment is necessary or not. Rest tends to limit the spread of the infection, and is particularly useful when the thecae are threatened or involved. It is achieved by appropriate splinting. Often the best form of splint to use is that

constructed of stout wire bent by the surgeon to suit the individual requirements of the case while allowing the necessary dressings, baths, etc., to be carried out without disturbance. There is no need here to detail the construction of these splints: their efficacy is often a measure of the mechanical ingenuity of the doctor. In some instances plaster slabs may be moulded to immobilize larger parts; they, too, must be applied in such a way as to allow the dressing to be carried out without movement of the joints or tendons.

If the suspicion arises that the case is due to infection with a streptococcus, special caution is necessary in its conduct. Owing to the fact that violent streptococcal infections, here as elsewhere, are associated with some degree of septicaemia in the earlier stages, and that there is little tendency to localization, operative treatment, with certain exceptions to be mentioned later, should be avoided. The old idea of making multiple incisions into the infected areas "to relieve tension" has little to recommend it, and may be definitely harmful by helping to spread the infection and breaking through any resisting barrier which may be forming. In the initial stages the treatment of such cases may be along general lines. The recent introduction of drugs of the sulphonamide group has placed in our hands a potent weapon for dealing with streptococcal infections. Since, in reasonable dosage, they appear to be devoid of any serious untoward effects, their use is justified in suspected cases, even before the nature of the organism has been definitely proved. The original materials, given by injection, have been largely supplanted by others for oral administration. *Prontosil*, *proseptasine*, *streptocide*, etc., may all be given in $7\frac{1}{2}$ -grain doses four times a day. *Sulphaemoglobinaemia* and *albuminuria* have both been reported following the use of these drugs, but the special precautions to be taken will be considered in a future article in this series. Antitoxic streptococcal sera are also of proved value in these streptococcal cases, and should be used when other means fail to arrest spread. *Lymphangitis* and *lymphadenitis* are similarly dealt with. If the infection is a very superficial one (*erysipelas*) it may be reached by ultra-violet irradiation, which has a definite limiting effect and is of considerable value.

The rule that streptococcal infections are not to be treated by operation is subject to two important exceptions. If the vitality of a digit is threatened by the extreme tension of the exudate, which is obviously interfering seriously with the blood supply, some small incisions into the subcutaneous tissues are proper in an attempt to reduce the tension and so save the finger. In cases of this type the simultaneous administration of the sulphonamides is advisable to avoid blood-stream infection. The second indication for operation arises in the later stages, when frank suppuration has occurred. The appearance of localized pus in a streptococcal case is a sign that the patient's resistance is dealing adequately with the infection, and in these circumstances drainage may be instituted as for other infections.

With these important exceptions infection of the hand and fingers should receive energetic surgical treatment in as early a stage as possible. Damage may be done both by delay and by too vigorous and extensive initial treatment, but there can be no doubt that the commoner errors are those of delayed and timid surgery. An early infection is sometimes dealt with by a minute incision under an ethyl chloride spray which lets out a bead of pus but fails to arrest spread at the periphery. The surgeon probably thinks that a larger incision will take a long time to heal, forgetting that a widespread infection, inadequately treated, will take much longer still and may

lead to great disability. These cases must be attacked in no half-hearted way; but as a corollary to this it is most important that the surgeon should have a clear idea of the aim of the operation and of the anatomy of the parts, so that he may design his incisions to produce proper drainage without endangering any important structures, spreading infection, or producing disability by his very procedure. Every case must be carefully worked out on its merits, but there are certain general rules which form a valuable guide in the majority of instances. It must be stressed that all operations of this type should be performed deliberately under full general anaesthesia, with good illumination, and, preferably, in a properly equipped operating theatre. To attempt to drain an infected hand or finger, other than a very superficial infection, in the surgery or the casualty ward under a short gas anaesthesia is courting disaster. Local anaesthesia is not usually suitable for these cases, with perhaps the exception of the terminal phalanx, where regional anaesthesia may be produced by circumferential infiltration at the base of the digit. The use of the ethyl chloride spray, even for fairly superficial infections, is not to be recommended: the local freezing devitalizes the parts and facilitates the spread of infection. Gas-and-oxygen or *evipan* anaesthesia is quite adequate for these cases, and should supplant all local measures.

A tourniquet should be used only with the greatest of reluctance for fear of devitalizing tissues; if it is employed at all it should remain on for a short time only, and in no circumstances should *Esmarch's* bandage be applied.

(To be continued)

MEDICAL DEFENCE UNION

At the annual meeting of the Medical Defence Union, held on September 27, it was announced that during the year 1,627 new members had been elected, and that in July last the total membership stood at 21,231. The number of cases handled during the year was 1,814. The investments now amount, at market value, to over £102,000.

The Matrimonial Causes Act

One matter to which the Council of the Union has given careful consideration during the year has been the application of the Matrimonial Causes Act, 1937. The Council aligns itself with the British Medical Association in the view that when a practitioner is approached for an opinion by a declared prospective petitioner as to the incurability of the mental condition of the respondent or as to a medical condition existing at the time of marriage, he would be well advised to decline to express such an opinion, except at the direction of the court, or to a guardian *ad litem* if appointed, though he might conceivably place his records of the case at the disposal of an independent medical expert nominated by the petitioner or by his authorized legal adviser. It is anticipated that there will be developments affording practitioners a fuller degree of protection than they now possess and permitting the proper operation of the Act without the risk of an action for defamation being brought against the practitioner. One suggestion is the establishment of a panel of medical examiners, as at present in nullity suits. Another is that Section 16 of the Mental Treatment Act, 1930, should be applied to preclude any person starting an action against a certifying practitioner until the court is satisfied there is substantial ground for his contention.

Allegations of Negligence

The annual report includes a useful series of typical cases dealt with during the year. It illustrates incidentally the