INTERPHALANGEAL JOINT INFECTIONS

BY

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Comparatively little attention has previously been paid to the uncommon but disabling condition of interphalangeal joint infection. Lowden (1955) stated that it was rare, and Riddell (1950), in a survey of 2,000 septic conditions of the hand, was able to describe only five cases, although Bentley (1950) considered that it was not uncommon following direct injury to the fingers, or as a complication of spread of infection to the joint from local sepsis. It is less rare in our experience than acute suppurative tenosynovitis, to which more attention is usually devoted in the literature of septic conditions of the hand.

The condition, despite its comparative rarity, merited further investigation, as it results in considerable disability, and usually requires prolonged hospital supervision and treatment. In addition, the recommended methods of treatment appeared to be drastic and diverse, Bunnell (1948) and Lowden (1955) favouring early amputation to reduce the total time of treatment, while Riddell (1950) and Bentley (1950) recommended arthrotomy. Bunnell (1948) stated that at an early stage interphalangeal joint infection may be aborted by repeated aspirations and instillations of penicillin (2,000–5,000 units per ml.). He noted that, although with this treatment advanced joint infection might subside, movement would be limited owing to damage; no cases were quoted.

Present Series

Material.—The following series of 18 cases of interphalangeal joint infection were collected during a survey in the septic hand clinic of the casualty department at the Birmingham General Hospital during the period October, 1956, to March, 1957. The clinic deals with some 5,000 new cases annually. Male and female cases were almost equally distributed, the largest proportion being concerned with heavy or light industry. The percentage incidence in this clinic, therefore, is approximately 0.7%, as compared with 0.25% found by Riddell (1950).

Aetiology.—The causes of infection of the interphalangeal joint could be placed in two well-defined groups: the 13 cases that resulted from a penetrating wound in the region of the joint, from lacerations of the skin on the dorsum, or from compound fractures of the terminal phalanx with skin loss over the joint; and the five cases that developed infection of the joint as a result of spread of adjacent infection, such as an abscess of the pulp space, paronychia, or dorsal furuncles.

Analysis of Joint Involved and Age and Sex Incidence.—Analysis of the cases shows that the terminal interphalangeal joint is most commonly involved (12 cases); six cases had involvement of the proximal interphalangeal joint, and there was only a single case of a metacarpo-phalangeal joint infection. The index finger was involved in nine cases, the middle finger in five, and the other digits in the remaining four.

A slightly higher incidence was found in the males—11 as compared with 7 females; in the series reported by Riddell (1950) all five cases occurred in males of working age. In such patients there is clearly a greater likelihood of penetrating injuries and infections of the fingers. The condition appeared to be definitely more common over the age of 35 years (11 patients), whilst only two of the other 7 were under the age of 20.

Clinical Features

Early in the investigation it became apparent that infections of the interphalangeal joints could be divided into two main groups: (1) early non-suppurative arthritis, and (2) late suppurative arthritis.

Early Non-suppurative Phase.—The chief features of this early phase seem to be pain and swelling well localized to the joint. Joint movement is extremely

FIG. 1.—Terminal interphalangeal joint infection. The discharging sinus on the dorsum lies directly over the joint, which is grossly swollen and subluxated. This was one of the cases treated by nail traction.

painful, and early in the progress of the lesion a well-marked laxity of the collateral ligaments of the joint occurs, producing the characteristic coarse grating on passive movement. On occasion there may be a discharging sinus—often following the track of the original penetrating injury—facilitating relatively easy diagnosis (Fig. 1). In interphalangeal joint infections which result through spread from adjacent infections such as abscess of the pulp space, paronychia, or dorsal furuncles, the primary lesion may mask the early infective signs. All cases of sepsis in the region of an interphalangeal joint should therefore be carefully examined in order to diagnose this early stage. In this connexion the tourniquet, of proved value in treatment of the septic hand, allows the easy recognition of deep communication with the joint, otherwise obscured by the blood and pus in the operative field. A radiograph at this stage reveals no definite lesion other than slight joint-narrowing and osteoporosis (Fig. 2).

FIG. 2.—Early terminal interphalangeal joint infection with osteoporosis. The great laxity of the joint capsule and collateral ligament is seen especially well in this case.

Suppurative Arthritis.—Untreated in the early phase, the condition progresses to the stage of established suppuration where diagnosis is clinically and radiologically obvious. The joint is grossly swollen, relatively painless, very unstable, and usually exudes pus or sero-sanguineous fluid from one or more discharging sinuses. The radiograph (Fig. 3) reveals varying amounts of joint destruction with small punctate or large irregular erosions of the articular surface, and occasionally a sequestrum along the sinus track.

FIG. 3.—Late terminal interphalangeal joint infection with gross erosion, osteoporosis, and sequestra formation. Good function is obtained after conservative treatment.

Methods of Treatment

Of the 18 cases in the series, 15 were examples of the early non-suppurative type of infection and three were examples of the late suppurative stage.

Early Non-suppurative Arthritis

All the cases in this group were treated by systemic antibiotic therapy, immobilization, dry dressings, and, when necessary, local operation for the excision of slough. In addition one of the cases received a short course of short-wave diathermy, and in another the immobilization was combined with traction through the nail.

The antibiotic used was benethamine penicillin ("benapen"). This, the N-benzyl- β -phenylethylamine salt of benzylpenicillin, is available as a ready-prepared aqueous suspension containing 300,000 units per ml. It has been stated (Nelson *et al.*, 1954) that a single intramuscular injection will maintain a bacteriostatic level in the blood for at least three days. Accordingly, an intramuscular injection of 2 ml. of benethamine penicillin was given to all cases, and repeated, when required, according to response at appropriate intervals.

The affected finger was immobilized by a volar plaster-of-Paris slab, and the limb rested in a sling. The plaster was removed at intervals for inspection; otherwise the immobilization was maintained until recovery.

The type of dressing influences the rate of healing, the only dressing used in this series being dry sterile gauze, as is the normal practice with other septic conditions of the hand. The use of petroleum jelly gauze, we feel, is

contraindicated, as it produces tissue maceration and further infection and delays healing.

The operative technique used in cases with obvious pus and slough was excision of slough and evacuation of pus, using a finger tourniquet with 2% lignocaine finger block.

In addition to the above standard treatment, four of the cases were treated by intra-articular injection of 500,000 units of crystalline penicillin, injected direct into the joint, using a lateral approach, the joint surfaces being separated either by distraction or by abduction.

Late Suppurative Cases

In this group are three cases which clinically and radiologically presented with established suppurative arthritis late in the progress of the condition.

Case 1.—Woman aged 59. Paronychia of right index finger of three week's duration, with involvement of the terminal interphalangeal joint, previously treated by own doctor with chlortetracycline. Treated by incision and drainage of paronychia combined with intra-articular injection of 500,000 units of crystalline penicillin into joint. In addition 2 ml. of benethamine penicillin given systemically, nail traction, and plaster-of-Paris immobilization. Nail traction discontinued after a few days because of pain, but immobilization in plaster maintained. Developed a sinus communicating with joint, which closed following spontaneous discharge of a sequestrum.

Case 2.—Woman aged 35. Referred to clinic by doctor. Large slough overlying terminal interphalangeal joint of left middle finger following an attempt to cauterize a wart on the dorsum. Clinically an obvious infection of the terminal interphalangeal joint with an overlying ulcer and slough and radiological evidence of osteitis of the terminal phalanx. Treated by removal of nail and slough, systemic penicillin, and immobilization in plaster-of-Paris, with later Thiersch graft to the skin defect on the dorsum of the joint. Patient discharged from the clinic, but returned two months later with persistent discharge. After spontaneous discharge of two small sequestra the condition improved.

Case 3.—Man aged 40 presented with a discharging sinus over dorsal aspect of terminal interphalangeal joint of right ring finger. Previously he had sustained severe burns of the right hand and fingers with scar healing, and already had a fibrous ankylosis of the interphalangeal joint. Treated by excision of slough, systemic penicillin, and prolonged immobilization in plaster-of-Paris.

Analysis of Results

Non-suppurative (15 cases).—A questionnaire sent to all patients two months after discharge from hospital produced the following results. (a) *Cases treated by systemic penicillin and immobilization.*—Eleven of these patients reported normal mobility of joint, no stiffness or pain, no interference with their working capacity, and no recurrence. They all assessed their end-result as good, although their total time of treatment varied from 4 to 46 days. (b) *Cases treated with systemic*

Results in the Suppurative Arthritis Group

	Case 1	Case 2	Case 3
Normal mobility of joint	Yes	No	No
Pain in joint	No	Yes	Yes
Stiffness of joint	"	"	Yes
Affecting working capacity	"	No	No
Recurrence	"	"	"
Total time of treatment (days)	76	71	77
End-result	Good	Poor	Good

Addendum to Case 3.—As noted in the case report, the affected joint had a fibrous ankylosis, and the end-result, reported as a stiff immobile joint, is thus accounted for. Actually the patient was satisfied with the result, which had restored the finger to the previous state.

penicillin, immobilization, and intra-articular penicillin.—Of the four patients in this group only two reported with normal mobility, no joint stiffness or pain, and no effect on their working capacity. They assessed their end-result as good. Their total time of treatment was 24 and 6 days. Two patients did not reply. Their times of treatment were 65 and 24 days.

Suppurative Arthritis.—The results obtained in this group are set out in the Table on the opposite page.

Organisms and Sensitivity

Ten of the cases were investigated bacteriologically (five were penicillin-sensitive and five penicillin-insensitive); the remaining eight had no bacteriological examination, either because they were cases of early non-suppurative arthritis or because by error a swab was omitted. The commonest organism was *Staphylococcus aureus*.

The mean total time of treatment correlated with penicillin sensitivity was: penicillin-sensitive cases, 36 days; penicillin-insensitive cases, 12 days; where no swab was taken, 24 days. We were unable to find any correlation between the length of treatment and the administration of penicillin.

Discussion

Previously, insufficient attention has been paid to the aetiology of interphalangeal joint infections. The recognition of two groups—those due to injuries in the joint region, and those complicating local sepsis—is thought to be important in the early diagnosis and treatment of these infections, as influencing the period of incapacity and ultimate restoration of function.

The relatively thin skin and poorly developed posterior capsule of the terminal interphalangeal joint, to which Lowden (1955) draws attention, probably accounts for the early involvement of the joint following lacerations of the dorsum. From a consideration of these factors, therefore, we recommend that systemic penicillin be given to all cases of hand sepsis, and especially to injuries in the region of the interphalangeal joint, to avert the later development of this disabling condition.

The total time of treatment in this series averaged 28 days. In this connexion Riddell (1950) remarked that the total period of disability could be attributed to delay in beginning treatment, delay in making the diagnosis, and delay in return to work, as physiotherapy was required for a long period. We also found that delay in treatment led to prolonged disability. In two of our late cases of suppurative arthritis there was a considerable delay before treatment was begun, and in the third there was previous fibrous ankylosis of the joint. Physiotherapy was not required in our cases during or after discharge from the septic hand clinic.

In this study we eventually came to believe that the treatment should be systemic penicillin, prolonged immobilization, and intra-articular penicillin. Nail traction was discontinued early in the investigation because it caused severe pain and rather frightening laxity of the collateral ligaments. We realize that the results appear equally good with or without intra-articular penicillin, implying that the essential parts of the treatment are systemic penicillin and immobilization. We believe, however, that the treatment of suppurative arthritis of these small joints should not differ in any

way from that of any major joint. We have found this treatment to be successful and less drastic than methods previously recommended. However, as previously stressed, early recognition of the condition is important, before extensive destruction of joint cartilage and bone supervenes.

An analysis of the results of treatment in these early cases shows that in some 70% we have succeeded in obtaining a painless and mobile joint which has not interfered with the patients' working capacity and has caused no further trouble since discharge. Riddell (1950) in his series was able to show a relatively short stay in hospital, but the end-result of all cases was a fixed joint to a greater or less degree. Disability because of a stiff, painful, deformed finger may seriously interfere with a person's working capacity, and in our analysis of results particular attention has been paid to the restoration of normal working ability.

Summary

A series of 18 cases of infection of the interphalangeal joint are reported.

Stress is laid on the diagnosis of the early non-suppurative stage of the condition.

Treatment of the early non-suppurative stage and late suppurative stage is discussed, and an analysis of the results is presented.

The treatment advocated is systemic penicillin, intra-articular injection of penicillin, and prolonged immobilization.

The decision to undertake arthrotomy, or, rarely, amputation, should be delayed until conservative measures have been fully exploited.

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To doctors, as to artists, the human hand has always been an object of special attention, for it may reveal much about its possessor's health, character, and, as Sherlock Holmes pointed out, occupation. A distinguished psychologist, the late Professor Géza Révész, of Amsterdam, in the course of a lifetime's study of human communication and sensory experience found that "there is scarcely a domain of social life in which the hand does not play a distinctive role." These words come from the preface to a book which first appeared in 1943 and is now published in an English translation by Professor John Cohen (Routledge and Kegan Paul, 21s.). In 138 pages the author ranges over recorded history and beyond into zoological comparisons, lightening his text with 37 illustrations, many of them striking and even bizarre illuminations of his theme. It is a scholarly work which delves into many curious byways of human behaviour and expression. The translation seems to be excellent.