ORIGINAL ARTICLE

Bacterial Hand Infections : An Analysis of Cases Presenting at the University Hospital, Kuala Lumpur

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Summary

A significant number of hand infections were found to occur in college students, a group not associated with manual labour. Diabetics did not have a significant delay in recognising the symptoms but have a significant longer period of hospitalisation. The right hand was predominantly involved especially the thumb, index finger and the thenar region. *Staphylococcus aureus* was the commonest infecting organism.

Key Words: Hand infections, Diabetes mellitus, *Staphylococcus aureus*

Introduction

The majority of hand infections present with simple dermal abscesses although in a minority they may extend into deeper structures like tendon sheaths or bones. Although most cases respond very well to surgical treatment and antibiotics, a few cases, may present a challenge to the managing surgeon.

This study was aimed at identifying the age group, sex, occupation, site of infection, presentation delay and hospitalisation period between diabetics and non-diabetics, the causative bacteria and the susceptibility of the main infecting organism towards various antibiotics in both acute and chronic bacterial infections.

Materials and Methods

This is a retrospective study conducted in the University Hospital, Kuala Lumpur between January 1988 till June 1993 involving 171 cases. One patient presented twice after a gap of three years and was considered as a separate case.

The study only included cases that were deemed serious enough to be admitted into the wards by the doctors. Cases included in the study were those with a history of pain, swelling, wound discharge, changes in colour and loss of function of the affected parts that arose either spontaneously or secondary to trauma at working places, schools, homes or during recreational activities. Cases associated with open wounds requiring suturing, burns, secondary to open fractures or major surgery like reimplantation were excluded. Also obtained were the age, sex, occupation, site of involvement, presentation delay, history of previous medical and surgical treatment, medical history like diabetes, leprosy, previous hand maladies and other similar conditions. Physical examination was done to rule out fever, anaemia, jaundice, ankle oedema and signs of peripheral vascular disease. Local examination at the site of involvement was to confirm the signs and extent of inflammation and the presence of any discharge. Radiographs were ordered if the clinical examination suggested joint involvement, osteomyelities or if a foreign body was suspected.

All patients were started empirically on intravenous ampicillin and cloxacillin with doses calculated according to weight and later changed according to the sensitivity report. This practice continued till mid-

1988, thereafter only cloxacillin was used. This decision was made after it was discovered that the most common organism involved in bone and soft tissue infections (that was *Staphylococcus aureus*) was resistant towards ampicillin. Swabs for bacterial culture and sensitivity were taken from all discharging wounds. All patients, except three, had surgical drainage of abscesses done in the operation theatre either under general anaesthesia or axillary block with tourniquet application. Again swabs were taken from all exudates deep in the abscess cavities. Only results taken from these intraoperative procedures were taken into account so as to rule out normal skin flora contamination. Swabs taken earlier before operation were discounted.

During the procedure, a skin incision was extended up to the extent of the lesion. Pus was evacuated, necrotic tissue excised and the wound cleansed with hydrogen peroxide and normal saline. Granulation tissue that looked suspicious or any history that suggested chronic inflammation were biopsied. Tenosynovitis was treated by inserting a catheter throughout the whole length of tendon sheath and out through a counterincision in the palm. Sodium hypochlorite solution was flushed down the catheter regularly and the catheter was removed after forty-eight hours. In cases of osteomyelities, sequestrectomies were performed to remove dead bone and the bare bone were curetted till they bled. All the wounds were left open and packed with either sodium hypochlorite or Eusol solution. The remaining cases were found to be cellulitis on review and were then treated conservatively.

Postoperatively the hand was splinted, elevated and the wound inspected the following day and daily dressings were instituted thereafter. Intravenous antibiotics were continued for a minimum period of twenty-four hours or until fever subsided and then continued with oral substitutes.

If afebrile, patients were discharged after a twenty-four stay post-operatively and had their dressings done in the outpatient or their own general practitioner clinics. Some patients were sent on home-leave but had their dressings done in the wards. These patients were still regarded as being hospitalised. Those with osteomyelities and tenosynovities were kept in the wards until they had completed treatment. The wounds were allowed to heal by secondary intention.

Once discharged, they were seen within a week at the outpatient clinic. The wounds were inspected and functional assessment of the affected digits were made. Occupational therapy was regularly prescribed for stiffness. About twenty-one patients, because of the distance of their homes from our hospital requested that they be managed further by their own doctors or at other hospitals after the first follow-up at the clinic. This was arranged with accompanying letters containing their diagnoses, treatment and further instructions. The complete follow-up took about six months and that was the duration of the study.

Results

Patient data

The mean age was 26.9 years (Range 1-17 years) and the male to female ratio was 3.2:1. The largest age group was of the 21-30 year-old range, comprising of forty-four (25.17%) cases (Fig. 1). In eighty-eight (51.1%) patients, the cause was trauma related.

Occupation

Vocation-wise they were categorised into seven groups.

1. Manual workers – includes semi-skilled or unskilled

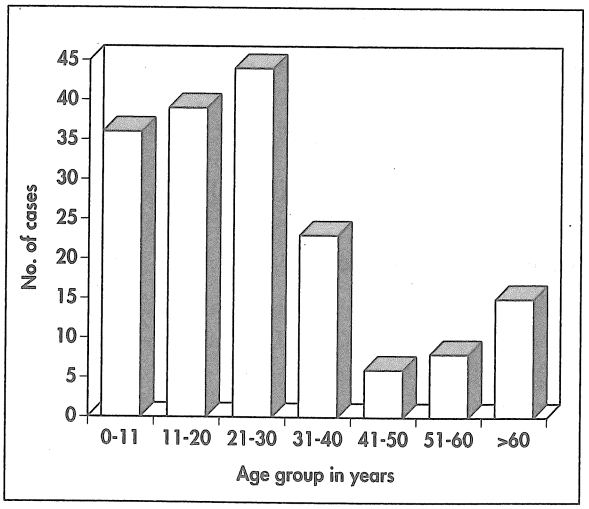

Fig. 1: Number of cases in each age group

workers eg. labourers, lumberjacks, cooks, drivers, electrical technicians, factory workers etc. They were the majority with 53 (31.0%) cases.

2. Students – schoolgoing children above the age of six years (42 cases).
3. Sedentary workers – mainly office workers and includes clerks, typists, teachers, computer programmers and the like (17 cases).
4. Unemployed – may occasionally be employed on a part time basis (17 cases).
5. Children (below seven years old) accounted for 15 cases.
6. Pensioners (includes retirees and not working presently). There were 14 of them.
7. Housewives (13 cases).

Initial treatment

Forty-two (24.6%) patients had initially sought medical treatment elsewhere eg. general practitioners or at hospital accident and emergency units. They were given treatment ranging from medication to surgery and were referred to our department following treatment failure. Two patients initially consulted traditional medical practitioners but the nature of the treatment was unknown.

Delay in presentation and period of hospitalisation

The median delay in presenting to this hospital was 7 days (Range 1-150 days) and 46.8% presented between 5 to 7 days.

The median delay for the diabetics was 7 days (Range 2-30 days) and for those who had sought previous treatment had a median delay of 18 days (Range 3-150 days). For the non-diabetics the median delay was 6 days. Statistically the difference in delay between the diabetics and the non-diabetics was found to be not significant ($p < 0.05$). Even those who had sought treatment from modern medical establishments had a median delay of 7 days (Range 2-150 days). In two

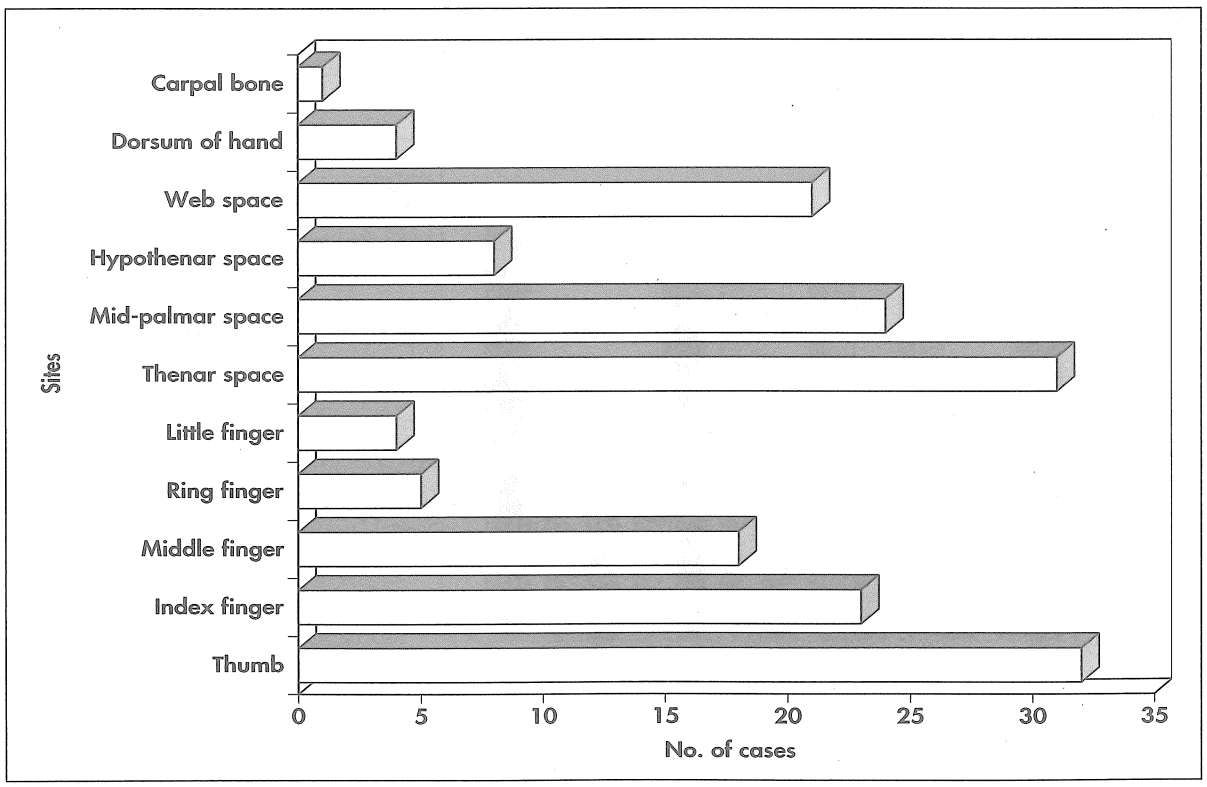

Fig. 2: Sites of infections

cases that took 150 days, one was found to be infected with *Mycobacterium* (after having undergone three operations in other hospitals) and the other had a foreign body embedded.

Overall the median period of hospitalisation was 4 days (Range 1-63 days) and this was true for 50.3% of the patients. For the diabetics the median period was 15 days (Range 3-63 days) compared to 4 days among the non-diabetics, and this difference was found to be significant statistically ($p<0.05$, $t=5.62$, $p=0.00$).

Sites of infection (Fig. 2)

The right hand was more often affected with a ratio of 1.4:1 over the left in both sexes (males; 1.4:1, females; 1.9:1). Nearly half of the infections occurred in the digits alone, with the thumb being the most often involved. There were six cases of osteomyelitis involving either the bones of the digits (5 cases) and the carpus (1 case), seven cases of tenosynovitis and three cases of cellulitis.

Associated medical or surgical conditions

These were scabies (3 cases), systemic lupus erythematosus (1 case), previous fractures at the sites (3 cases), foreign body granulomas (2 cases) and drug addiction (1 case).

Bacteriology

One hundred and twenty seven (74.3%) specimens yielded *Staphylococcus aureus* (including one case of MRSA) alone constituting 85.4% of all positive cultures. Five specimens had mixed growth. These were *Staphylococcus aureus* with *Enterobacter cloacae* (2), *Staphylococcus aureus* with colliform (1), *Klebsiella pneumoniae* with *Citrobacter* (1) and *Klebsiella pneumoniae* with *Enterococcus faecalis* (1). Fourteen cultures yielded single organisms and these were beta-haemolytic streptococcus (3), *Staphylococcus epidermidis* (2), *Klebsiella pneumoniae* (2) and one each for the *Aeromonas* species, *Acetobacter, Escherichia coli, Pseudomonas aeruginosa, Mycobacterium* species, *Streptococcus milleri* and the colliforms. Twenty-five (14.6%) cultures out of the total did not grow any organism or the results were lost and could not be traced.

Of the cultures from the thirteen diabetics, all grew *Staphylococcus aureus* except five which showed other growth. These were *Escherichia coli* (1), *Pseudomonas*

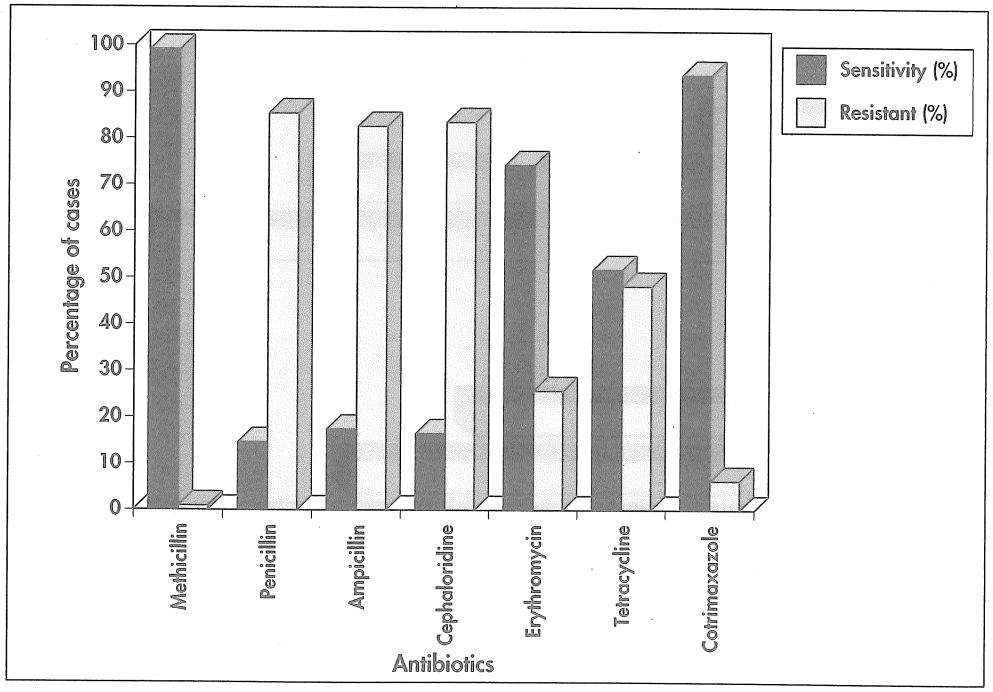

Fig. 3: Sensitivity and resistance of *Staphylococcus aureus* towards the antibiotics tested

aeruginosa (1), beta-haemolytic streptococcus (2) and the combination of *Klebsiella pneumoniae* with *Citrobacter* (1). Patients who underwent repeated surgery showed no change in bacteriology from the initial culture.

Sensitivity report

The antibiotic sensitivity patterns of *Staphylococcus aureus* isolates are shown in Figure 3. There was one case of methicillin-resistant *Staphylococcus aureus* but no repeat cultures was done to confirm it.

Follow-up and subsequent treatment

All patients turned up for follow-up at the clinic in the first week but the number dwindled to about fifty-three by the end of the sixth week. One case was on follow-up for a period of fourteen weeks for finger stiffness but this was resolved following occupational therapy. The patient affected with *Mycobacterium* infection was managed somewhere else following the confirmation of the diagnosis and did not return for subsequent visits. The other patients completed their follow-up within twelve weeks. All the wounds finally healed by granulation tissue.

Three cases of osteomyelitis had to undergo repeated surgery while being hospitalised and all of them recovered within the twelve-week period. Those patients who requested to be seen elsewhere did not return at all.

Discussion

University Hospital, Kuala Lumpur being a premier teaching hospital serves a suburban area of almost three-quarters of a million people apart from being a national referral centre. It is in close proximity to a wide range of industrial sites, both heavy and light, as well as being a residential area accommodating offices and schools.

These factors may cause a preponderence of male patients, manual workers and students[14,15]. They were mainly young, in the late teens or young adults, inexperienced and generally with a lackadaisal attitude towards safety[12]. Women tend to work in lighter industries and thus face less risk or less severe injuries. Another element may be lack of supervisison and inadequate protective gear in the workplace.

Brown[1] mentioned the 'three units of the hand' and postulated that the dexterity of certain parts may play a role. Constant blunt trauma probably plays a part and a slight discomfort may be regarded as trivial. Repetitive use in the course of the work and aggravated by trauma probably gives rise to spontaneity of infection[2,8,10]. The right hand was predominantly involved in both sexes. Left cerebral dominance resulting in greater usage of the right hand is present in ninety-three per cent of the population. Students frequently mishandle laboratory equipment or chemicals and are injured during games like hockey, volleyball and racket games. Diabetics have a lack of awareness as a result of sensory neuropathy of the extremities[11]. There was a slight delay in seeking treatment and a significantly longer period of hospitalisation due to slower wound healing. There was also a multiplicity of organisms involved and the administration of a broad-spectrum antibiotic should be considered as initial treatment[9].

The local general practitioner setting may be inadequate as most minor surgical procedures consisted of 'lancing' the abscess[16]. Those treated surgically by the general practitioners had to undergo surgery again. Even those treated in hospitals may be misdiagnosed as evidenced by the case of *Mycobacterium* infection and the case of a foreign body which was an oil palm thorn.

Staphylococcus aureus[5,10,17] was the commonest causative organism. Several studies elsewhere have shown the presence of anaerobic bacteria especially related to human bites[7] and the absence of this in the study was because anaerobic cultures were not done. The one case of *Mycobacterium* infection was only identified on histology.

There was only one serious complication, but if more education was given to the patients before discharge, a more reliable attendance at the follow-up clinic could be expected[17]. Poor record keeping hampered the study, contributing to an inadequate sample size. Poor documentation too frustrated our efforts to interpret various steps in the subsequent management.

Acknowledgement

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