https://doi.org/10.5455/pjps.249-1701965042

Research Article

Frequency of Patients Presenting with Hand Infection and Treatment modalities

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Abstract

Background: Infections of the hand are one of the most common infections reported by physicians and surgeons and include: bite wounds, felon, necrotizing fasciitis, paronychia, flexor tenosynovitis, cellulitis, osteomyelitis and septic arthritis.

Objective: The aim of this study was to identify the etiological factors, possible complications due to acute hand infection and treatment modalities performed in our patients.

Methodology: This was a prospective observational study conducted at King Abdullah Hospital, Bisha, Saudi Arabia, from May 2022 to April 2023. Patients of all age groups presenting with hand infections were included. Outcomes assessed were etiological factors, management and complications.

Results: 58 patients presented with hand infections during the study period. Male patients were 16 (27.5%) while females were 42 (72.4%). Majority of the patients were gardener/farmer by profession[n=15, (25.9%)]. Major mechanism of injury was penetrating trauma [n=41 (70.7%)]. Associated risk factors included diabetes mellitus in 13 (22.4%) , smoking in 13 (22.4%), and hypertension in 5 (8.6%). Surgical intervention included incision and drainage in 40 (68.9%) cases while amputation was performed in 3 (5.2%) cases. Most common organism causing infection was staphylococcus aureus 28 (48.30%) including methicillin resistant staphylococcus aureus (MRSA). Subcutaneous infection was the most common diagnosis on presentation (24., 41%).

Conclusion: Hand infections are a common presentation in the working age group. Identification of etiological patterns and risk factors is thus important for timely diagnosis and treatment of these potentially devastating infections.

Keywords | Diabetic hand, infection, amputation, smoking

Received | 10-12-2023: **Revised** | 20-02-2024 **Accepted** | 01-03-2024

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Introduction

Infections of the hand are one of the most common infections reported by the treating physicians and surgeons. Common types of hand infections include: subcutaneous infection, bite wounds, webspace/ mid-palmer infection, paronychia (felon), flexor tenosynovitis, cellulitis, osteomyelitis and septic arthritis.[1,2] Primary care physicians and orthopedic surgeons frequently encounter infections of the hands. Under such situation late diagnosis and inappropriate treatment may cause morbidity and mortality for the patients.[1] Infections when lead to underlying deep soft tissue and skeletal damage needs surgical intervention. The tissue damage due to infection is thought to be excessive host innate immunological reaction. While drainage and decompression is a traditional surgical method, now there is a focus on early diagnosis and medicinal treatment by conservativeprotocols. Thisknowledgeprovide practical implications.[3] Clerc, Olivier et al.[4] are of the opinion that systemic coverage of MRSA should be

done only under known carriers. Harrison, Bridget et al.[5] have mentioned that hand infection with MRSA has increased rapidly during the last two decades and areresponsibleformajorityofpurulenthandinfections.

Methodology

This was a prospective Observational Study carried out at King Abdullah Hospital, Bisha, Kingdom of Saudi Arabia, after obtaining approval from the Institutional reviewboard. Period of studywas 1 yearfrom May 2022 to April 2023. Patients of all age groups with hand infection were included. Non-compliant patients were excludedfromthestudy. Alldemographic data of thepatients was recorded. Outcomes assessed were etiological factors, type of infection, common microorganisms and type of treatment given. All complications were also noted, as well as their management

Results

Total number of patients that presented with hand infection during the sutdy period was 58. Male patients were 16 (27.5%) while females were 42 (72.4%). Majority of thepatientswereadults. Figure 1 showstheage distribution of the study population. Most of thepatientsweregardener/farmer by profession. [n= 15 (25.9%)]. 12 were children/ students (20.7%), and 9 were housewife/maid (15.5%). Major mechanism of injury was penetrating trauma in 41 (70.7%). Most common risk factors associated with hand infection were diabetes mellitus in 13 (22.4%) and smoking in 13 (22.4%). Occupation related risk factor were present in 27 (46.5%). Most of the patients were Saudi national (n=30, 51.7%), followed by Egyptian (n=12, 20.7%), Pakistaniand Sudanese(n=4, 6.9%) each.Table1 depicts thedemographicandclinicalfindingsoftheparticipants.

The most common organisms causing infection was Staphylococcus aureus 16 (27.6%) including MRSA 12 (20.7%). There was no growth in 5 (8.6%) patients and for 19 (32.8%) patients no drainage collection was available and therefore their samples were not sent for culture sensitivity (figure 2).

We categorized the diagnoses of hand infection in this study into sixgroups; Subcutaneousinfection 17 (41.5%), Acute paronychia 11 (16.9%), Web space infection 10 (15.4%), Pulpspaceinfection(Felon) 7(10.8%), Flexor

Table 1: *Demographicandclinical findings of study population*

MECHANISM OF INJURY		
	Frequency	**Percent**
Blunt - hammer	1	1.7
Burn	1	1.7
Cat-bite	1	1.7
Human bite	1	1.7
No history of penetrating or blunt trauma	13	22.4
Penetrating injury	41	70.7
Total	58	100.0
HAND DOMINANCE		
RHD	58	100
LHD	00	00
Total	**58**	**100.0**
NATIONALITY		
Saudi	30	51.7
Egypt	12	20.7
Sudan	4	6.9
Pakistani	4	6.9
India	3	5.2
Uganda	2	3.4
Indonesia	1	1.7
Morocco	1	1.7
Yemen	1	1.7
Total	**58**	**100.0**

DURATION		
	Frequency	**Percent**
Less than 10 days	27	46.6
10-19 days	7	12.1
20 days or more	24	41.4
Total	**58**	**100.0**
COMORBIDITY/RISK FACTORS		
Smoking	13	22.4
Dm	13	22.4
HTN	5	8.6
Occupation	27	46.5
Total	**58**	**100.0**
OCCUPATION		
Gardner/Farmer	15	25.8
Children/Student	12	20.9
Housewife/Maid	9	15.5
Construction worker	6	10.3
Driver	4	6.9
Shepherd	4	6.9
Policeman	4	6.9
Painter	1	1.7
sweeper	1	1.7
Cement factory worker	1	1.7
Doctor	1	1.7
Total	**58**	**100.0**

tenosynovitis 6(9.2%) and Midpalmar/Thenar 4(6.2%). Therewere15 (25.9%)patientstreatedwithconservative treatment protocol. Incision anddrainage was performed in 40 (68.96 %) cases while amputation was required in 3 cases (5.2%) (table 2).

Table 2: *Diagnosis and management of handinfections*

DIAGNOSIS		
	No	**%**
Subcutaneous	24	41.4
Acute paronychia	10	17.2
Web space infection	9	15.5
Pulp space (Felon)	6	10.3
Flexor Tenosynovitis	5	8.6
Midpalmer/Thenarabscess	4	6.9
Total	58	100
TREATMENT		
Conservative	15	25.9
Incision and drainage	40	60.9
Amputation	3	5.2
Total	58	100

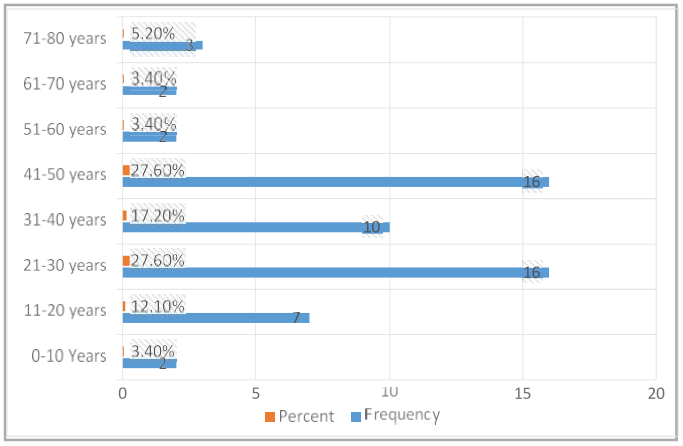

Figure 1: *Age distribution of the patients*

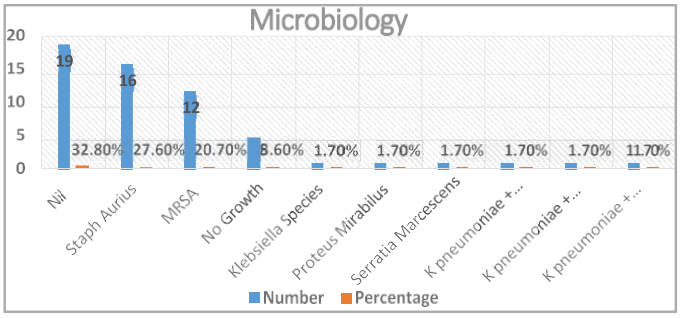

Figure 2: *Microbiology pattern of hand infections observed in this study*

Discussion

Hand infections vary significantly in terms of their etiology and site of infection. When misdiagnosed or left untreated result into significant morbidity or even mortality to some patients. While superficial infection may be treated by using conservative treatment, deep infection involving tendons and their sheaths, bone or joint or deep spaces of the hand require surgical management in addition to medical treatment.[7]

A complete history, physical examination and relevant investigations should be performed to confirm the diagnosis. Cultures should always be obtained to provide appropriate antimicrobial coverage. The most common organisms reported in the literature are: Staphalococcus aureus (80%), Streptococci, anaerobes, E corrodens and P multocida[3,5]. In our study too, staphylococcus aureus in the most common organism seen (48.3%). In a study on pulp space infection (felon), author found that mostly the types of microorganism involved were staphylococci and streptococci. In addition to antibiotic, warm or saline soak and elevation of the fingertips aid to the recovery. In case of abscess formation or if fluctuance or tension is present the wound should be drained with incision.[8]

Most commonly reported cause of hand infections is penetrating trauma[1,2], as was seen in our study too. Some authors found that human bite wounds are the second most common hand infection[6]. However in this study, second most common cause was insidious onset without an underlying history of trauma. This was most likely due to underlyingcomorbidities. It is acommon scenario to encounter patients with multiple comorbidities. Some of these patients may be taking certain medications, especially anticoagulants with the background history of hypertension. A trivial injury in these patients on anticoagulants leads to bleeding and hematoma formation at the site of either blunt or penetrating injury. The chances of having superadded infection with uncontrolled diabetes mellitus and smoking is quite high and lead to deep penetration of infection resulting in osteomyelitis and septic arthritis.

It is quite interesting to note that all 3 patients who required either partial or total hand amputation as a result of development of osteomyelitis/septic arthritis, were having long-standing uncontrolled diabetes mellitus. 2 of these patients underwent partial/total hand amputation (figures 3 and 4). The third patient with uncontrolled diabetes mellitus underwent partial amputation of the hand. Due to old age, immunosuppressed and on hemodialysis due to renal failure developed carpal bones infection and soft tissue infection around the wrist joints. She refused to have her diabetic hand amputation and developed regional axillary lymphadenopathy. Unfortunately, she passed away due to loco-regional infection, septicemia and multi organ failure.

A study was done on small septic joints of the hands in which all patients had incision, irrigation and debridement of the joints. Out of 110 patients, 83 were treated successfully, and 27 patients required either arthrodesis or amputation. Major influencing factors included time to diagnose and treatment, number of irrigation and debridement procedures, comorbidities and postoperative recurrent infection.[9] In hand infection, late diagnosis and inappropriate treatment are two important factors causing morbidity of the hand and mortality for the patients.[10,11] Acute infection of hands and upper extremities should be treated as surgical emergencies. This will avoid pain, stiffness, contracture and amputation. For established infection, antibiotic treatment should be considered a necessity[12,13].

Figure 3: *A,B: pre-op views, and C,D: post-op views of a 46 year old male with uncontrolled diabetes mellitus who underwent amputation of middle finger.*

Figure 4: *81 year old male with insulin dependent diabetes melliltus presented with recurrent infection of left ring and little finger (A). he underwent amputation of involved digits (B,C). he presented one month later with unresolved infection (D). he eventually required an above wrist amputation (E,F).*

Some less common and severe infections such as flexor tenosynovitis and necrotizing fasciitis needs urgent attention for identification and medical and surgical management. Adelay will result in permanent functional deficits and may require amputations.[14,15] A 10-year longitudinal study observed that MRSA was the most commonly cultured bacteria in hand infections.[17] Resistance of the pathogen to common antibiotics is steadily increasing, further highlighting the need for appropriate and effective antibiotic treatment.[18]

Conclusion

This study corroborates evidence that early clinical diagnosis based on occupational history and control of comorbid disease such as diabetes mellitus, smoking etc is effective in thetreatment andprevention of hand infection to avoid devastating surgical intervention of partial or total diabetic hand amputation.

Conflict of Interest: *None*

Source of funding: *None*

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