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Original Article

Most Common Causative Organism in Hand Abscess, Secondary to Puncture Wounds

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ABSTRACT

Hand infections are frequently encountered problem by primary care doctors and orthopedic surgeons. **Objective:** To evaluate the frequency of common causative organisms in hand abscess, secondary to puncture wounds in patients. **Methods:** Descriptive cross-sectional study in the Emergency Services of plastics and hand reconstructive surgery at a Civil Hospital in Karachi, Pakistan from January to June 2022. A sample size of 156 was estimated. The Inclusion criteria of our study were Patients of age >18 years, and patients presenting with hand abscess secondary to puncture wounds. A Non-probability consecutive sampling technique was utilized to collect the data. Data were analyzed using SPSS version- 23. Frequency and percentage will be computed for gender, diabetes mellitus, hypertension, location zone, and causative microorganism. **Results:** 156 patients were enrolled in our study out of which, 94 (60.3%) were male and 62 (39.7%) were females. The mean age of the patients was 59.7 years and the mean BMI was 32.3 kg/m 2.83(53.2%) patients had diabetes and 95 (60.9%) patients were hypertensive. The most common location zone of the abscess is Thumb & 1st web space (22.4%). The most common organism identified was *Staphylococcus aureus* (30.8%) followed by *Streptococcus* β-hemolytic group A (19.9%) and *Staphylococcus* coagulase-negative (14.1%). The least common organism was *Klebsiella oxytoca* (0.6%). **Conclusions:** The most common cause of hand abscess is staphylococcus aureus and puncture wounds result in hand abscess. Therefore, we conclude that in the cases of puncture wounds, physicians should timely assess the patients for the bacterial cause and treat accordingly to avoid the worst prognosis.

INTRODUCTION

Hand infections are frequently encountered problem by primary care doctors and orthopedic surgeons in the emergency department [1]. Hand infections face a great challenge in diagnosis, owing to the particular differential diagnosis, which involves complex anatomy and microbiology. By correctly defining the etiology of the infection and undertaking timely and effective treatment, severe morbidity can be avoided by health practitioners [2-4]. The pattern of infections of hand varies significantly from finger infections to deep-space infections, and from viral to fungal and bacterial [3, 5]. Often, hand infections are occurred by common flora of the mouth and skin such as *Streptococcus species and Staphylococcus species [6]. Literature showed that almost 60% of the infections in hands are caused by Staphylococcus aureus*, with only a single organism growing in 86% of cultures. Recent findings have shown that 60% to 90% of all cultures contain both streptococci and staphylococci in almost equal numbers

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[2, 7]. Methicillin-resistant *Staphylococcus aureus*, Gram-negative microbes, and viruses are other infections associated with a hand infection [3]. In patients with an open fracture, tendon injury, punctured wound, immunosuppressive illness, malignancy, diabetes mellitus, intravenous drug use, and injuries due to animal or human bites, crush injury and joint violation, mixed and polymicrobial infection must be suspected, including anaerobes and/or gram-negative bacteria [6]. Hand abscesses typically arise from a puncture wound in the plantar portion of the foot or other distal extremities caused by pointing or sharp points. These have a central area of fluctuation surrounded by cellulitis [8]. *Staphylococcus aureus* is a common microorganism found in punctured wounds. Management needs incision and drainage with culture before administration of empiric antibiotic therapy. When reports become available, these therapies are adapted according to culture-specific microbes [1]. Even after the surgical advancements and new treatments, infections of the upper extremities remain a major concern, with high morbidity and serious deterioration of hand function, and long-term disability. Most hand abscesses arise from punctured wounds that are neglected by the individuals. Hence, the information regarding the causative organisms is thus critical, enabling healthcare providers to respond promptly with the required antimicrobial therapy. Therefore, the study aims to evaluate the frequency of common causative organisms in hand abscess, secondary to puncture wounds in patients presenting at emergency services of plastics and hand reconstructive surgery at a tertiary care center. We aim to evaluate the frequency of common causative organisms in hand abscess, secondary to puncture wounds in patients presenting at emergency services of plastics and hand reconstructive surgery at a tertiary care center.

METHODS

We conducted this descriptive cross-sectional study in the emergency services of plastics and hand reconstructive surgery at a Civil Hospital in Karachi, Pakistan from January to June 2022. The sample size of 156 was estimated using an Open epi sample size calculator, by taking statistics of *streptococcus pyogenes* as 9% [9], the margin of error as 4.5%, and a 95% confidence level. The Inclusion criteria of our study were Patients of age >18 years, and patients presenting with hand abscess secondary to puncture wounds. The Exclusion criteria included Patients with arthritis, patients with immunosuppression, patients on antibiotic therapy before presentation at the hospital, or those patients who refused to give consent for the study. A Non-probability consecutive sampling technique was utilized to collect the data.Ethical approval from the ethical review committee was obtained for this study. Written informed consent was taken from all the eligible patients presenting with hand abscess secondary to puncture wounds of age 18-65 years of either gender. Abscess was diagnosed based on swelling, pain, pus discharge, and redness. Data regarding demographics, medical history (diabetes and hypertension), and location zone were collected. The infected tissue was taken for causative microorganism examination from the area where the abscess was present. The specimen was then sent for culture. The presence of causative organisms was done by a consultant pathologist with five years of experience. All data were kept confidential and bias was controlled by strictly following selection criteria. Data were analyzed using SPSS version 23.0. Mean and SD was calculated for age, weight, height, and BMI. Frequency and percentage will be computed for gender, diabetes mellitus, hypertension, location zone, and causative microorganism.

RESULTS

156 patients were enrolled in our study out of which, 94 (60.3%) were male and 62 (39.7%) were females. The mean age of the patients was 59.7 years and the mean BMI was 32.3 kg/m2. 83(53.2%) patients had diabetes and 95(60.9%) patients were hypertensive. The most common location zone of the abscess is Thumb & 1st web space (22.4%)(table 1).

Table 1: Demographics related to the patients presenting with hand abscess secondary to puncture wounds

Variables	Result, n (%)
Mean of Age (years)	59.7 ± 4.5
Gender	
Male	94 (60.3%)
Female	62 (39.7%)
Mean of BMI (kg/m2)	32.3 ± 3.1
Diabetes	83 (53.2%)
Hypertension	95 (60.9%)
Location zone	
Thumb & 1st web space	35 (22.4%)
Index finger & 2nd web space	23 (14.7)
Middle finger & 3rd web space	17 (10.9%)
Ring finger & 4th web space	18 (11.5%)
Small finger	9 (5.8%)
Palm & dorsal side of the hand	32 (20.5%)
Wrist & forearm	24 (15.4%)
Elbow	12 (7.7%)
Multiple zones	21 (13.4%)

As stated in table 2, the most common organism identified was *Staphylococcus aureus* (30.8%) followed by *Streptococcus* β-hemolytic group A (19.9%) and Staphylococcus coagulase-negative (14.1%). The least

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common organism was *Klebsiella oxytoca* (0.6%)

Table 2: The list of organisms causing the abscess

Organisms	Results n (%)
Staphylococcus aureus	48 (30.8%)
Streptococcus β-hemolytic group A	31 (19.9%)
Staphylococcus coagulase-negative	22 (14.1%)
Streptococcus viridans	11 (7%)
Haemophilus influenza	15 (9.6%)
Streptococcus milleri	4 (2.6%)
Streptococcus β -hemolytic group B	18 (11.5%)
Klebsiella oxytoca	1 (0.6%)
Anaerobes	3 (1.9%)
Others	3 (1.9%)

DISCUSSION

Hand infections leading to abscesses can be debilitating and mostly can result in permanent disability specifically if they are diagnosed late and timely treatment and management are not given. The anatomy of the hand is unique as it has various enclosed spaces and compartments that require proper consideration. It is important to take thorough history and examination of the patients which provides a lead in further investigating and managing the patient as several conditions mimic hand abscesses like pseudogout, gout, and algodystrophy. Injection injuries and other disorders related to rheumatology [10, 11]. That is why we conducted this study to evaluate the basic demographics of the patients who get diagnosed with the hand abscess particularly due to puncture wounds. Most commonly hand infections occur in the subcutaneous tissues and trauma has been classified as the most common reason [12, 13]. Our study also evaluated the relationship between trauma with the hand abscess. In a study by Türker *et al.*, 21% of the patients with hand abscesses were due to puncture wounds. In the same study, the most common location zone of the abscess was the Palm & dorsal side of the hand (21%) followed by the Middle finger & 3rd web space(17%)[14]. In another study, the most common location zone was the Middle finger & 3rd web space (23%) and Index finger & 2nd web space (23%) [15]. In one of the studies, 36% of cases reported the location zone of the Palm & dorsal side of the hand for the hand abscess [16]. In our study, the most common zone was the Thumb & 1st web space (22.4%) followed by the Palm & dorsal side of the hand (20.5%). For the person who has been infected, his health status also matters in assessing the comorbidity as the conditions like diabetes mellitus, and other immunosuppressive states along with some metabolic abnormality do have an impact on the severity of the clinical features [11, 17, 18]. Similar was found in our study as well as 53.2% of patients had diabetes and 60.9% had hypertension. In severe infections, immunosuppressed patients like the one with diabetes mellitus present with systemic symptoms like high-grade fever, pain, tachycardia and raised white cell counts [19, 20]. In our study, *Staphylococcus aureus* (30.8%) was found to be the most common cause of hand abscess followed by *Streptococcus* β-hemolytic group A (19.9%). Similar findings were quoted in other studies as well [12, 13]. The increasing number of cases of community-acquired methicillin-resistant Staphylococcus aureus (MRSA) causing hand infections are being reported [14, 17, 21]. Currently, 65% of *Staphylococcus aureus* infections are reported to be MRSA.

CONCLUSIONS

We conclude that the most common cause of hand abscess is *staphylococcus aureus* and puncture wounds result in hand abscess. Therefore, in the cases of puncture wounds, physicians should timely assess the patients for the bacterial cause and do keep in consideration the *staphylococcus* organism.

Authors Contribution

Conceptualization: SG, FAAK
Methodology: SG, SI, SR, SAC
Formal Analysis: MH, ST
Writing-review and editing: MH, ST

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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