Trauma-Related Hand Infections at Siriraj Hospital

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Background: *Hand infections are the common causes of working hours loss and morbidity for workers and housewives. Most of hand infections are caused by trauma. To identify the causes of infection, types, organisms and to initiate prompt appropriate medical or surgical treatment can prevent substantial morbidity. There are some literatures about trauma related hand infections around the world but not from Thailand. The author tried to study the prevalence of trauma related hand infections in Thai people.*

Objective: *To study types of hand infections, age, sex, occupation, mechanisms of injury, bacterial organisms and residual complications in trauma patients.*

Material and Method: *This retrospective study was carried out at Division of Trauma Surgery, Department of Surgery, Faculty of Medicine Siriraj Hospital from January 2006 to December 2010. The patients, who could not be identified regarding the cause or history of their injury, were excluded from this study. The results were analyzed by calculating percentages and compared by Chi-square.*

Results: *There were 209 patients in the study. 121 patients (57.9%) were female and 88 patients (42.1%) were male. Difference types of hand infections included Cellulitis (35.9%), Paronychiae (34.4%), Abscess (23.9%), Felon (3.3%), bacterial tenosynovitis (1.0%), web space infection (0.5%), thenar space infection (0.5%) and mid palmar space infection (0.5%). Incidence of hand infections in adolescents, young, middle aged and elderly patients were 7.18%, 30.62%, 37.8% and 24.4%, respectively. The most common cause of hand infection was puncture (43.2%). Staphylococcus aureus was detected as a single offending organism in 72 out of 115 patients (62.59%). 114 out of 209 cases were manual workers (54.5%). Stiffness was the most common cause of complications (3.82%) and there was no statistical difference in complications between male and female.*

Conclusion: *Trauma was the most common cause of hand infection. Young and middle aged manual workers and houswives were significantly prone to hand infection. Most common injury was puncture or minute laceration. Staphylococcus aureus was the most common single offending organism. Stiffness was the leading complication which could be avoided by prompt appropriate medical and surgical treatment along with vigorous rehabilitation.*

Keywords: *Hand infection, Trauma, Puncture*

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As human, we use our hands for many purposes in our day life. Our hands touch and contact many things, put it at risk of injury and secondary infection. Paronychiae and felon are usually common hand infections. Etiology of hand infection due to trauma varies from 35 to 67 percentages in previous studies. Generally, the principle management of hand infection is systemic antibiotics, hand elevation, immobilization in the "Safe" position and surgical drainage with wound care. In the absence of early detection and prompt appropriate management, it could result in serious and permanent hand disability.

In Thailand, the author could not find any study about trauma-related hand infections. The author's purpose is to study the prevalence of trauma related hand infections in Thai people.

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Material and Method

Two hundred and nine patients with trauma-related hand infections were studied from January 2006 to December 2010. This retrospective study was carried out at Division of Trauma Surgery, Siriraj Hospital which is an excellent trauma center. Patients without history of injury were excluded from this study. Variables in this study were age, sex, occupation, causes of injury. The age groups were adolescent (<19 years), young (19 to 39 years), middle (40 to 59 years) and elderly (>59 years). Types of hand infection and isolated

organisms were recorded. The groups of "Manual worker" and "Others" were made on the basis of occupation.

The results were analyzed by calculating percentages. Student t-test and Chi-square test were applied for statistical significance.

Results

Among our 209 patients, 121 patients were female (57.9%) and 88 patients were male (42.1%). The mean age was 46 years. Majority of hand infections were observed in middle-aged group followed by young-aged group, elderly and adolescent (Fig. 1). The highest frequency was that of cellulitis followed by paronichiae, abscess, felon, flexor tenosynovitis, web space infection, thenar space infection and mid palmar space infection (Table 1) 114 out of 209 cases were manual workers (54.5%).

The most common cause of injury was puncture (43.2%), followed by animal bite (18.7%), contusion (17.7%) and nail clipping (12%) (Fig. 2).

Pus culture was performed in 115 cases. Single organism was detected in 76 cases and, surprisingly, there was no mixed growth of organisms. Culture was negative in 39 cases (33.9%). *Staphylococcus aureus* was the most common offending organism.

The most commonly observed complication was stiffness followed by contracture, hypertrophic scar and pain. Most complications were noted in elderly patients. Residual complications occurred in 15 out of 209 cases (7.15%). 8 cases were female and 7 cases were male. There was no statistic difference between male and female.

Discussion

Most common cause of hand infection is trauma[1-7,13]. Hand infections include cellulitis, abscess, paronychiae, felon, tenosynovitis, deep space infections, septic arthritis, and osteomyelitis. Most patients came for medical treatment late due to their

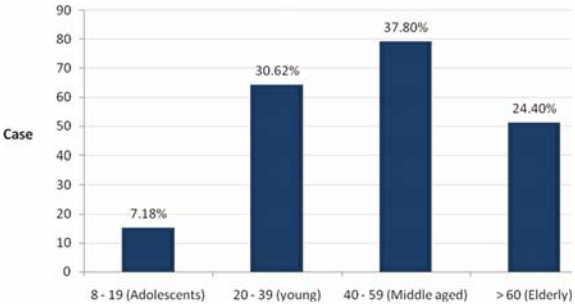

Fig. 1 Hand infection (age variation)

Table 1. Types of Hand infection

Type of infection	Number	Percentage (%)
Cellulitis	75	35.9
Paronychiae	72	34.4
Abscess	50	23.9
Felon	7	3.3
Flexor tenosynovitis	2	1.0
Thenar space infection	1	0.5
Mid palmar space infection	1	0.5
Web space infection	1	0.5
Total	209	100

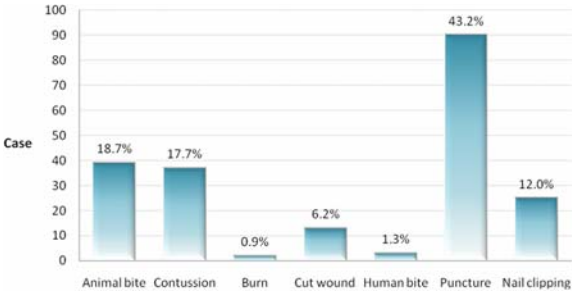

Fig. 2 Causes of injury

Table 2. Percentages of infecting microorganisms

Microorganism	Number of case	Percentage (%)
Staphylococcus aureus	72	62.59
Burkholderia pseudomallei	1	0.87
Streptococcus pyogenes	2	1.74
Aeromonas hydrophilia	1	0.87
No growth	39	33.93
Total	115	100

Table 3. Residual complications

Residual complicated	Number of case	Percentage (%)
Stiffness	8	3.82
Contracture	3	1.43
Hypertrophic scar	2	0.95
Pain	2	0.95
Total	15	7.15

injuries being minute lacerations or punctures[4,7]. Hand infections are more common in manual workers[13]. The author found that 114 cases (54.5%) were manual workers. Two-thirds of patients were young and middle-aged group corresponding to the age of manual workers and active daily life which put them on high risk of hand injury. Most common cause of injury was minute laceration or puncture[1,2,4-6]. The author's study revealed 90 cases (43.2%) got puncture wound as the cause of infection. Animal bite (18.7%), contusion (17.7%) and nail clipping (12%) were very common causes in the author's study. Ezeldeen K et al noted that hand infections were common among young male manual and industrial workers at male:female ratio of 2: 1 but the author's study got more female patients than male patients (121: 88), which maybe due to increasing female manual workers and nail clipping cases.

For the types of infections, Turker T et al, Houshian S et al and Osterman M et al found that most common site of hand infection was subcutaneous tissue but the author's study showed that most common infection was cellulitis (35.9%). The author also found paronychiae nearly as common as cellulitis (34.4%), which was the most common hand infection of Ezeldeen's study. The author initially treated cellulitis with intravenous antibiotics, rest and elevation, edema and pain control. The author performed nail extraction for all paronychiae cases and "Incision and Drainage" for felon, abscess and all deep space infections. The author sent pus for culture in 115 cases. *Staphylococcus aureus* was the most common offending organism (62.6%) same as previous studies[2-4,6,10,13,14]. The report showed "no growth" in one-third of the author's study and no "mixed growth" at all. The author was very surprised with this result which was thought to be from inadequate specimens collection. Turker T et al revealed *Staphylococcus aureus* and *beta-hemolytic Streptococcus* were the most commonly cultured microorganisms. Houshian S et al reported 11.7% of mixed organisms. Stern PJ et al and Stromberg BV also reported mixed organisms from their studies. Kennedy SA et al revealed that hand was the most common site for bite injuries, which commonly lead to polymicrobial bacterial infections. They also found that *Pasteurella* species were commonly found in dog and cat bite wounds and *Eikenella corrodens* was characteristic of human bite wounds same as the studies from Goldstein EJ et al, Maier R and Arons MS et al. From these studies, the author usually start intravenous antibiotics to cover Staphylococcus aureus and mixed organisms before the availability of culture and sensitivity report. McDonald LS et al suggested a combination of proper antibiotics, immobilization, edema control and early adequate surgical treatment to prevent permanent disability. Reichert B et al and Bergmann PA et al found that the delayed onset of adequate treatment happened when hand infection was caused by minor trauma same as fingertip injury from minute laceration or puncture. They also noted that patients who came within 48 hours following injury required less surgical procedures and shorter hospitalization. Glass KD's study in 1982 noted that factors associated with the rate of resolution were adequacy of surgical drainage, efficacy of antibiotics and associated diabetes mellitus and that there was direct correlation between increasing treatment delay and slower resolution of deep infection. Muller CT et al claimed that the only presenting factor that was statistically predictive of an increased risk of needing a second debridement was the presence of subcutaneous abscess. Ince B et al found that diabetic hand infection patients, who had ESRD, peripheral neuropathy, HbA1c level greater than 10% had significantly higher amputation rates. Osterman M et al also found that an immunocompromised state, intravenous drug abuse, diabetes mellitus and steroid use all predisposed to infections.

The author noted residual complications in 15 patients (7.15%). Stiffness was the leading complication followed by contracture. There was no significant difference between male and female as far as complications were concerned. Complications were higher in elderly group and may be due to prolonged healing and rehabilitation period. Diligently mobilized and early rehabilitation were important factors to prevent complications.

Conclusion

Trauma was the most common cause of hand infection. Young and middle-aged manual workers were the most common group of patients. Cellulitis, paronichiae and abscess were among most common types of infections. *Staphylococcus aureus* was the most common single offending organism from pus culture. Mixed organisms were very common infections from many reports. Wound or injury ignorance, diabetes mellitus, immunocompromised state were reported as important predisposing factors to hand infection. Stiffness was the most common complication. Early detection, prompt appropriate medical and surgical treatment assured better outcome and early

rehabilitation could prevented substantial disability.

What is already known on this topic?

1) Most common cause of hand infection is trauma.

2) Most common pathogen is *Staphylococcus aureus*.

3) Paronychia is the most common hand infection.

4) Early antibiotics with or without operation is recommended.

What this study adds?

1) Most patients are manual workers and housewives.

2) Cellulitis is also very common for hand infection.

3) Stiffness is the most common complication of hand infection

4) Early aggressive rehabilitation prevents complications and improves outcomes.

Potential conflicts of interest

None.

References

1. Osterman M, Draeger R, Stern P. Acute hand infections. J Hand Surg Am 2014; 39: 1628-35.
2. Turker T, Capdarest-Arest N, Bertoch ST, Bakken EC, Hoover SE, Zou J. Hand infections: a retrospective analysis. PeerJ 2014; 2: e513.
3. McDonald LS, Bavaro MF, Hofmeister EP, Kroonen LT. Hand infections. J Hand Surg Am 2011; 36: 1403-12.
4. Tosti R, Ilyas AM. Empiric antibiotics for acute infections of the hand. J Hand Surg Am 2010; 35: 125-8.
5. Downs DJ, Wongworawat MD, Gregorius SF. Timeliness of appropriate antibiotics in hand infections. Clin Orthop Relat Res 2007; 461: 17-9.
6. Houshian S, Seyedipour S, Wedderkopp N. Epidemiology of bacterial hand infections. Int J Infect Dis 2006; 10: 315-9.
7. Reichert B, Oeynhausen-Petsch P, Mailander P. Hand infections resulting from underestimation of minimal injuries. Handchir Mikrochir Plast Chir 2007; 39: 124-7.
8. Kennedy SA, Stoll LE, Lauder AS. Human and other mammalian bite injuries of the hand: evaluation and management. J Am Acad Orthop Surg 2015; 23: 47-57.
9. Bergmann PA, Mauss KL, Liodaki ME, Mailander P, Siemers F, Stang F. Infection of the hand: evaluation of a two-stage therapy. Handchir Mikrochir Plast Chir 2014; 46: 49-55.
10. Fowler JR, Ilyas AM. Epidemiology of adult acute hand infections at an urban medical center. J Hand Surg Am 2013; 38: 1189-93.
11. Ince B, Dadaci M, Arslan A, Altuntas Z, Evrenos MK, Fatih KM. Factors determining poor prognostic outcomes following diabetic hand infections. Pak J Med Sci 2015; 31: 532-7.
12. Muller CT, Uckay I, Erba P, Lipsky BA, Hoffmeyer P, Beaulieu JY. Septic tenosynovitis of the hand: factors predicting need for subsequent debridement. Plast Reconstr Surg 2015; 136: 338e-43e.
13. Ezeldeen K, Fahal AH, Ahmed ME. Management of hand infection in Khartoum. East Afr Med J 1992; 69: 616-8.
14. Stromberg BV. Changing bacteriologic flora of hand infections. J Trauma 1985; 25: 530-3.
15. Stern PJ, Staneck JL, McDonough JJ, Neale HW, Tyler G. Established hand infections: a controlled, prospective study. J Hand Surg Am 1983; 8: 553-9.
16. Arons MS, Fernando L, Polayes IM. Pasteurella multocida—the major cause of hand infections following domestic animal bites. J Hand Surg Am 1982; 7: 47-52.
17. Glass KD. Factors related to the resolution of treated hand infections. J Hand Surg Am 1982; 7: 388-94.
18. Goldstein EJ, Citron DM, Wield B, Blachman U, Sutter VL, Miller TA, et al. Bacteriology of human and animal bite wounds. J Clin Microbiol 1978; 8: 667-72.
19. Maier RL. Human bite infections of the hand. Ann Surg 1937; 106: 423-7.

การติดเชื้อที่มือเนื่องจากอุบัติเหตุ ณ โรงพยาบาลศิริราช

เรวัต ชุณหสุวรรณกุล

ภูมิหลัง: ภาวะติดเชื้อที่มือเนื่องจากอุบัติเหตุพบมากในประชากรวัยทำงานโดยเฉพาะอาชีพที่ใช้มือในการทำงานหนัก และแม่บ้านซึ่งทำให้สูญเสียชั่วโมงการทำงานและเกิดความพิการ การระบุสาเหตุของการบาดเจ็บ ลักษณะการติดเชื้อ เชื้อโรคที่เป็นสาเหตุและการให้การรักษาที่รวดเร็วและทันท่วงทีจะสามารถป้องกันความพิการและภาวะแทรกซ้อนได้

วัตถุประสงค์: เพื่อศึกษาลักษณะประชากรของผู้ป่วยติดเชื้อที่มือซึ่งเกิดจากอุบัติเหตุ สาเหตุของการบาดเจ็บประเภทของการติดเชื้อ เชื้อโรค สาเหตุและภาวะแทรกซ้อนหลังการรักษา

วัสดุและวิธีการ: ศึกษาย้อนหลังจากประวัติการรักษาของผู้ป่วยที่เข้ารับการรักษาที่สาขาวิชาศัลยศาสตร์ อุบัติเหตุ คณะแพทยศาสตร์ ศิริราชพยาบาล ตั้งแต่เดือนมกราคม พ.ศ. 2549 ถึง เดือนธันวาคม พ.ศ. 2553 โดยไม่รวมถึงผู้ป่วยติดเชื้อที่มือที่ไม่สามารถระบุประวัติอุบัติเหตุก่อนเกิดการติดเชื้อที่มือได้อย่างชัดเจน โดยวิเคราะห์ด้วยค่าความถี่ร้อยละและ Chi-square

ผลการศึกษา: มีผู้ป่วยทั้งสิ้น 209 ราย ในการวิจัยนี้เป็นเพศหญิง 121 ราย (57.9%) และเพศชาย 88 ราย (42.1%) พบการติดเชื้อแบบ Cellulitis มากที่สุด (35.9%) รองลงมาได้แก่ Paronychiae (34.4%), Abscess (23.9%) อุบัติเหตุที่เป็นสาเหตุที่พบบ่อยที่สุดคือ puncture (43.2%) ช่วงอายุผู้ป่วยที่พบมากที่สุดคือ 40 ถึง 59 ปี (37.80%) และ 19 ถึง 39 ปี (30.62%) และเป็นอาชีพที่ต้องใช้มือในการทำงานหนัก 54.5% เชื้อโรคที่ตรวจพบจากการเพาะเชื้อมากที่สุดคือ Staphylococcus aureus ภาวะแทรกซ้อนที่พบบ่อยที่สุดคือ ภาวะข้อแข็งติด (3.82%) พบในเพศหญิงและชายเท่าๆ กัน

สรุป: อุบัติเหตุที่มือเป็นสาเหตุที่พบบ่อยที่สุด สำหรับการติดเชื้อที่มือ พบมากในช่วงหนุ่มสาวและวัยทำงานโดยเฉพาะอาชีพที่ใช้มือในการทำงานหนักโดยอุบัติเหตุที่พบบ่อยที่สุดจากบาดแผลทิ่มแทงขนาดเล็ก Staphylococcus aureus เป็นเชื้อที่พบบ่อยที่สุด Cellulitis, Paronychiae และ Abscess เป็นการติดเชื้อที่พบบ่อยที่สุด ภาวะข้อแข็งติดเป็นภาวะแทรกซ้อนที่พบบ่อยที่สุด การให้การวินิจฉัยที่รวดเร็ว การรักษาที่ถูกต้องเหมาะสมและเวชศาสตร์ฟื้นฟู จะสามารถลดภาวะแทรกซ้อนและความพิการลงได้