Determining Predictability of Hemoglobin A1c and Glucose on Admission on Culture Results and Ultimate Antibiotic Choice for Hand Infections Among Diabetic Patients

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INTRODUCTION

- Hand infections can lead to significant morbidity including stiffness, chronic pain, amputation and sepsis without prompt and aggressive treatment.
- Diabetic patients are particularly at risk if improper antibiotic selection delays treatment. Hand infections among non-diabetic patients predominately grow gram positive organisms, yet pathogens found in diabetics' hand infections are frequently gram negative, polymicrobial, or fungal.
- Appropriate empiric selection and early aggressive debridement may improve outcomes and reduce cost and length of stay of diabetic patients with hand infections.

Study Goals

- The goal of this study is to determine whether **HbA1c** or **admitting glucose level** is **predictive** of culture and ultimate antibiotic or antifungal regimen.

METHODS

- Retrospective review of a prospectively collected, single-center database. Patients who presented from 2014-2016 with any hand infection were identified and then stratified into groups by presence or absence of comorbid systemic diseases.
- Patients with recent history of surgery, comorbid infection proximal to the distal wrist crease, history of osteomyelitis, or human or animal bite mechanisms were excluded.
- Independent t-tests and chi-square analysis were employed to compare hemoglobin A1c, lengths of stay, admitting blood glucose level, and infection parameters between diabetic and non-diabetic patient groups.

RESULTS

- Fifty-three patients met inclusion criteria (diabetics: n=24 [45.3%]; non-diabetics: n=24 [45.3%]; unknown status: n=5 [9.4%]).
- Mean overall patient age was 46 years (diabetics: 54.0 years; non-diabetics: 40.9 years). Both groups were 45% female.
- Mean hemoglobin A1C was significantly higher among diabetics compared to non-diabetics (12.16 vs. 6.07, p=0.003), as was glucose on admission (302.8 vs. 99.9, p<0.0001) and highest random glucose reported (316 vs. 116, p<0.0001).
- In both diabetic and non-diabetic groups, ***Staphylococcus aureus* was the most commonly identified pathogen** (diabetics: 12/22 [54.5%] cultures *S. aureus*-positive; non-diabetics: 14/23 [60.9%] cultures *S. aureus*-positive).
- *S. aureus* culture identification rates between these groups were similar (p=0.610). Rates of **methicillin-resistant *S. aureus*** (18% vs. 30%, p=0.340) and **gram-negative bacteria** (22.7% vs 14.3%, p=0.412) identification **did not vary significantly between diabetics and non-diabetics**.
- **ESR was significantly different between populations of diabetics and non-diabetics** (p=0.015), while WBC, CRP, and length of stays did not significantly differ between diabetic and non-diabetic patients (all p>0.05).

Organisms Cultured	No-DM	DM	Unknown DM status	Total
Beta-hemolytic Streptococci		1		1
Citrobacter		1		1
E. coli		1		1
E. coli, E. faecalis, Klebsiella			1	1
E. coli, Proteus	1			1
Gram-positive cocci	2	1		3
Gram-positive cocci and Gram-negative rods	1			1
Group B Streptococci		2		2
H. aprophilus, S. viridans	1			1
Klebsiella, Citrobacter, Serratia, Enterococcus		1		1
Latex-negative S. aureus		1		1
Latex-negative S. aureus, S. viridans		1		1
Latex-positive S. aureus	1			1
Morganella morgani	1			1
MRSA	6	3	1	10
MRSA, Proteus		1		1
MSSA	4	2		6
MSSA, Beta-Hemolytic Streptococci		1		1
MSSA, S. pneumoniae, S. viridans		1		1
MSSA, S. viridans, Candida tropicallis		1		1
No growth	2	1		3
Proteus, Group B Streptococci		1		1
S. aureus NOS	2	1	2	5
S. epidermidis			1	1
S. viridans group, cant C. albicans, E. gallinarum, Klebsiella, MRSA	1			1
S. viridans, Candida tropicallis, Gram-negative rods		1		1
Total	22	22	5	49

Table 1. Culture results, sorted by diabetic status (DM vs. No-DM).

CONCLUSIONS

- No association was identified between either culture outcome and diabetic status.
- **Hemoglobin A1c and admitting glucose level were not predictive of rates of positive MRSA, gram negative, or fungal cultures**.
- Based on our data, a ***known medical history of diabetes mellitus should not be a factor in selecting empiric antibiotic coverage for MRSA***.
- Diabetics with hand infections should be started on antibiotics with coverage for both gram-positive and gram-negative bacteria and empiric anti-fungal coverage should be considered at the provider's discretion.

REFERENCES

1. Osterman M, Draeger R, Stern P. Acute Hand Infections. J Hand Surg Am. 2014;39(8):1628-1635. doi:10.1016/j.jhsa.2014.03.031.
2. Bach HG, Steffin B, Chhadia AM, Kovachevich R, Gonzalez MH. Community-Associated Methicillin-Resistant Staphylococcus aureus Hand Infections in an Urban Setting. J Hand Surg Am. 2007;32(3):380-383. doi:10.1016/j.jhsa.2007.01.006.
3. Gonzalez MH, Bochar S, Novotny J, Brown A, Weinzweig N, Prieto J. Upper extremity infections in patients with diabetes mellitus. J Hand Surg Am. 1999;24(4):682-686. http://www.ncbi.nlm.nih.gov/pubmed/10447157.
4. Jalil A, Barlaan PI, Fung BKK, Ip JW-Y. HAND INFECTION IN DIABETIC PATIENTS. Hand Surg. 2011;16(3):307-312. doi:10.1142/S021881041100559X.
5. Fowler JR, Ilyas AM. Epidemiology of Adult Acute Hand Infections at an Urban Medical Center. J Hand Surg Am. 2013;38(6):1189-1193. doi:10.1016/j.jhsa.2013.03.013.
6. Connor RW, Kimbrough RC, Dabezies MJ. Hand infections in patients with diabetes mellitus. Orthopedics. 2001;24(11):1057-1060. http://www.ncbi.nlm.nih.gov/pubmed/11727802.
7. Ahmed ME, Mahmoud SM, Mahadi SI, Widatalla AH, Shawir MA, Ahmed ME. Hand sepsis in patients with diabetes mellitus. Saudi Med J. 2009;30(11):1454-1458. http://www.ncbi.nlm.nih.gov/pubmed/19882060.