Patient Specific Factors and Medical Comorbidities Associated with Surgical Site Infection after Open Reduction Internal Fixation for Distal Radius Fracture

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INTRODUCTION:

Distal radius fractures (DRF) are one of the most common fractures in the United States with over 640,000 cases. One of the most common surgical treatments for distal radius fractures is an open reduction internal fixation (ORIF). Although rates of surgical site infection after ORIF for distal radius fracture remain low, it is important for surgeons to know if risk factors exist for certain patient populations. Knowledge of risk factors allows surgeons to make informed decisions about additional wound care and the need for prophylactic antibiotics post-operatively in relevant patient populations. The purpose of this study is to understand if risk factors exist for specific patient factors or certain comorbidities after ORIF for DRF, in order to enhance surgeon decision making post-operatively.

METHODS:

A retrospective chart review was performed at 3 large volume trauma centers (two level 1 and one level 2) from January 1, 2017 through December 31, 2023 looking at any patient undergoing an ORIF for a primary DRF. For each patient, variables collected included age, race, sex, BMI, smoking status, fracture type, fracture energy, OR time (incision open to incision close), tourniquet time, number of plates used, number of screws used, and if the patient developed a surgical site infection post-operatively. Comorbidities recorded were type 2 diabetes mellitus, hypertension, osteoporosis, hyperlipidemia, coronary artery disease, gastroesophageal reflux disease, congestive heart failure, hypothyroidism, COPD, sleep apnea, and auto-immune disease. For each patient with a post-operative infection, variables collected included if the infection was deep or superficial, infectious agent, past surgical site infection, and if the infection required a return to the operating room.

The collected variables were then analyzed using paired t-tests to assess for significant differences ($p < 0.05$) between deep vs. superficial infections, the infection group vs. non-infection group, and the deep infection group vs. non-infection group.

RESULTS:

Overall, 816 patients underwent ORIF for a distal radius fracture at 3 sites. Of these 816 patients, 30 developed post-operative surgical site infections. Ten of these infections were characterized as deep, with 9 requiring a return to the OR.

In comparing the deep to superficial infections, the comorbidities associated with deep infection were GERD ($p=0.04$) and COPD ($p=0.04$). The risk factor differences associated with deep infection were OR time (191 minutes vs. 104.6 minutes, $p=0.007$) and tourniquet time (169 minutes vs. 69.8 minutes, $p=0.002$).

There were 647 patients who underwent ORIF for DRF at the 2 sites with higher volumes of operations performed. In comparing those who developed a surgical site infection to those who did not, the significantly different patient associated factors and comorbidities included White race ($p=0.0001$), smoking status ($p=0.045$), open fracture ($p <0.0001$), type 2 diabetes mellitus ($p=<0.0001$), osteoporosis ($p <0.0001$), OR time (125.32 minutes vs. 82.2 minutes, $p=0.09$).

Finally, when comparing a subset of the control cases (N=25) to those with deep infections (N=10), there was a statistically significant difference between OR time (191 minutes vs. 82.2 minutes, $p<0.0001$) and tourniquet time (169 minutes vs. 76.92 minutes, $p=0.0002$).

DISCUSSION AND CONCLUSION:

This study aimed to determine what, if any, patient specific factors may predispose patients to develop a surgical site infection. Smoking status, type 2 diabetes mellitus, osteoporosis, and OR time are factors that were found to be statistically significant differences between those who developed infection and those who did not, but it is unclear how clinically significant these may be. Additionally, OR time and tourniquet time were factors that were found to be statistically significant between those who developed deep infections compared to superficial infections and between those who developed deep infections and those who did not develop a surgical site infection.

Table 1. Deep vs. Superficial Infection Comparison

	Deep infections (N=10)	Superficial Infections (N=20)	P-value
Mean Age	58.8	58.4	0.94
Race - White	7 (70.0%)	14 (70.0%)	1
Sex - Female	6 (60.0%)	11 (55.0%)	0.8
BMI > 30	1 (10.0%)	3 (15.0%)	0.72
Smoking Status (current + former)	4 (40.0%)	7 (35.0%)	0.8
Open Fracture	3 (30.0%)	3 (15.0%)	0.3
Low Energy Fracture	5 (50.0%)	14 (70.0%)	0.3
Return to OR	9 (90.0%)	0 (0%)	<0.0001
Diabetes Type II	2 (20.0%)	1 (5.0%)	0.21
Hypertension	6 (60.0%)	5 (25.0%)	0.064
Osteoporosis	1 (10.0%)	4 (20.0%)	0.51
Hyperlipidemia	3 (30.0%)	8 (40.0%)	0.61
CAD	1 (10.0%)	0 (0%)	0.16
GERD	2 (20.0%)	0 (0%)	0.04
CHF	1 (10.0%)	0 (0%)	0.16
Hypothyroidism	1 (10.0%)	3 (15.0%)	0.72
COPD	2 (20.0%)	0 (0%)	0.04
Sleep apnea	1 (10.0%)	0 (0%)	0.16
Autoimmune disease	0 (0%)	1 (5.0%)	0.49
Prednisone	0 (0%)	1 (5.0%)	0.49
OR Time	191 minutes	104.6 minutes	0.007
Tourniquet Time	169 minutes	69.8 minutes	0.002
Plates used	1	0.79	0.43
Screws used	7.5	9.15	0.61

Table 2. Infection vs. Non-infection Comparison

	Infection (N=27)	Non-infection (N=647)	P-value
Mean Age	57.9	52.5	0.09
Race - White	21 (77.8%)	255 (39.4)	0.0001
Sex - Female	16 (59.3%)	382 (59.0%)	0.98
BMI > 30	3 (11.1%)	162 (25%)	0.1
Smoking Status (current + former)	11 (40.7%)	154 (23.8%)	0.045
Open Fracture	6 (22.2%)	26 (4.0%)	<0.0001
Diabetes Type II	9 (33.3%)	57 (8.8%)	<0.0001
Hypertension	2 (7.4%)	209 (32.2%)	0.006
Osteoporosis	11 (40.7%)	70 (10.8%)	<0.0001
Hyperlipidemia	4 (14.8%)	167 (25.8%)	0.2
GERD	1 (3.7%)	71 (11.0%)	0.23
Hypothyroidism	1 (3.7%)	55 (8.5%)	0.4
Sleep apnea	2 (7.4%)	19 (2.9%)	0.19
Autoimmune disease	1 (3.7%)	10 (1.5%)	0.39
OR Time	125.32 minutes	82.2 minutes	0.009
Tourniquet Time	93.64 minutes	76.92 minutes	0.30

Table 3. Deep Infection vs. Non-infection Comparison

	Deep Infection (N=10)	Non-infection (N=25)	p-value
OR Time	191 minutes	82.2 minutes	<0.0001
Tourniquet Time	169 minutes	76.92 minutes	0.0002