Surgical Site Infection in Foot and Ankle Surgery: A Comparison of Patients with and without Diabetes Mellitus

Presenting:

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Our retrospective chart review of 1000 surgical cases demonstrates that univariate logistic regression shows significant associations between the development of infection and age (p=.001), presence of Charcot neuroarthropathy (p=.000), the diagnosis of diabetes (p=.000), length of surgery (p=.008), peripheral arterial disease (p=.017), peripheral neuropathy (p=.000), history of previous ulcer (p=.000), diagnosis of rheumatoid arthritis and the use of external fixation (p=.000). Significant associations were not found in patients who used tobacco (p=.857) or had undergone transplantation (p=.139). The unadjusted relative risk of acquiring a severe infection for the diabetic population was nearly 5x that of the non-diabetic population.

Surgical site infection (SSI), defined as a wound infection occurring within 30 days of surgery, is an inherent risk for all surgical procedures. Foot and ankle surgery may have a higher infection rate than other surgical areas since surgical preparation cannot fully reduce the bacterial load prior to incision. Patients with diabetes, particularly if the disease is poorly controlled, may have associated comorbid conditions that may place them at-risk for post-operative infections. Among these comorbidities are peripheral neuropathy, peripheral vascular disease. This study aimed to determine if patients with a diagnosis of diabetes mellitus have an increased rate of infection following foot and ankle surgery when compared with a cohort of patients without diabetes. Furthermore, our study sought to define which comorbid conditions, if any, place the patient at greater risk of postoperative wound infection. Our hypotheses were that the infection rate for the general population will be lower than that for those patients with diabetes mellitus, and that diabetic patients with comorbid conditions would be at even higher risk for SSI.

Materials and Methods:
Prior to beginning this study, IRB approval was granted by our institution. A retrospective chart review of 1000 consecutive surgical cases performed by the senior author between January 1, 2006 and December 31, 2007 was undertaken. The charts were reviewed and the following data were extracted: patient age, gender, history of diabetes mellitus, development of post-operative infection, severity of infection, inpatient or outpatient surgery, use of internal or external fixation, tobacco use, history of organ transplantation, rheumatoid arthritis, length of surgery and follow-up time in weeks. Medical records were used to determine the presence of comorbid conditions of peripheral neuropathy, previous ulceration, Charcot neuroarthropathy and peripheral vascular disease.

Results:
Univariate analysis demonstrated significant associations between the development of postoperative infection and increasing age (p=.001), presence of Charcot neuroarthropathy (p=.000), the diagnosis of diabetes (p=.000), history of previous ulcer (p=.000), longer length of surgery (p=.008), peripheral arterial disease (p=.017), peripheral neuropathy (p=.000), rheumatoid arthritis (p=.032) and the use of external fixation (p=.000). Significant associations with postoperative infections were not found in patients who used tobacco (p=.857), had undergone previous transplantation (p=.139), gender (p=0.501) or had their surgery performed as an outpatient or inpatient (p=.242). Stepwise multivariate logistic regression included all those variables with significant associations found on univariate analysis. Multivariate logistic regression demonstrated that when controlling for age, Charcot neuroarthropathy, diabetes status, peripheral arterial disease, and rheumatoid arthritis, only peripheral neuropathy (OR=3.98, 95% CI 1.52-10.45, p=.005),
previous ulcer history (OR=2.42, 95% CI 1.14-5.16, p=.022) and the use of external fixation (OR=2.80, 95% CI 1.38-5.66, p=.004) were significantly associated with increased rates of infection. Diabetic patients were 5 times more likely to experience a severe infection requiring hospitalization (4.7%) as compared to 1% of those patients without diabetes (OR=4.97, 95% CI (1.89-13.0)

Discussion:
The most obvious weakness of our study is its retrospective design. Even well conducted retrospective case control studies are subject to large number of biases. The selection of a control group itself can introduce bias, and we attempted to minimize this by including all patients without diabetes as a control group rather than attempting to match them. Retrospective studies rely on the accuracy of the medical records, and the data obtained for analysis is only as good as the documentation in the medical record. We have attempted to minimize measurement bias between the study group and control group by remaining consistent in our treatment. All patients received the same antibiotic prophylaxis. Our postoperative follow up visits occurred at 1, 3, 6 and 12 weeks give or take a few days. We have attempted to minimize nonresponder bias as we have not lost any patient to follow. Nonetheless, this study is subject to this type of bias due to the fact that some patients were followed longer than others, and additional infections may have been detected with longer follow up. Our primary outcome measure, the presence or absence of surgical site infection, was assessed consistently in each patient by the same attending physician. Therefore, interviewer bias is potentially present since the primary investigator determined the primary outcome (infection). Confounding factors clearly play a role in postoperative infection (age, neuropathy, vascular disease) and we have attempted to address this through the proper statistical methods. Finally, another limitation of this study is that we have not evaluated our patient's blood sugar levels, hemoglobin A-1C levels or body mass index as a contributing factor for postoperative infection. When controlling for those factors that demonstrated significant associations on univariate analysis, only peripheral neuropathy, previous ulcer, and external fixation demonstrated significant association with infection. The strongest predictor of postoperative infection was peripheral neuropathy which carried 3.98 increased risk.