

# The Effect of Perioperative Glucose Management and Post-Operative Complications in Elective Foot and Ankle Surgery

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## Statement of Purpose

The purpose of this study is to evaluate the relationship of perioperative glucose levels and post-operative complications following elective foot and ankle surgery.

## Methodology and Hypothesis

A prospective review of 7 patients undergoing elective foot and ankle surgery at Loyola University Health System was conducted. Perioperative capillary blood glucose was collected as three separate samples. Clinical information, such as gender, body mass index (BMI) and comorbidities were reviewed and compared. Perioperative glucose and other patient characteristics were compared to determine correlation on post-operative complications.

The inclusion criteria were: male and female patients at least 18 years of age undergoing elective foot and ankle surgery.

The exclusion criteria were: The presence of pedal ulcerations, the presence of peripheral arterial disease or end stage renal disease (ESRD), patients undergoing emergent surgery due to open fractures or infection, patients who are pregnant or breast feeding at the time of the procedure. Patients were excluded if they had a follow up period of less than 90 days.

We hypothesize that increased perioperative glucose levels will increase the incidence of post operative complications after elective foot and ankle surgery.

## Literature Review

Hyperglycemia is a well-documented predictor of adverse surgical outcomes [1-4] in both patients with and without a diagnosis of diabetes .

There is evidence to support that elevated blood glucose has a negative impact on wound and bone healing [5-10] . Hyperglycemia has been shown to be an independent risk factor for 30 day surgical site infections (SSI) in orthopedic trauma patients without a history of diabetes [2].

Chrastil found that post-operative hyperglycemia was associated with an increased incidence of peri-prosthetic joint infections, and was a better predictor than hemoglobin A1c [1].

## Literature Review Continued

Elevated blood glucose in the immediate post-operative period significantly increases the odds of surgical and systemic complications, higher rates of mortality and increased length of stay following total joint arthroplasty as well [10].

The research investigating the effect of perioperative blood glucose on surgical morbidity after elective foot and ankle surgery is limited. Having a single elevated glucose reading during the acute post-operative period is associated with increased rates of SSI [3]. An investigation of the predictors of complications after external fixation in Charcot reconstruction showed an elevated preoperative glucose was an independent predictor of pin tract infection, pin fracture and wound dehiscence [4].

There is limited research investigating the effects of perioperative glucose on post-operative complications in diabetic and non diabetic patients undergoing elective foot and ankle surgery. It is due to this lack of high quality, prospective literature that the subject needs to be investigated further.

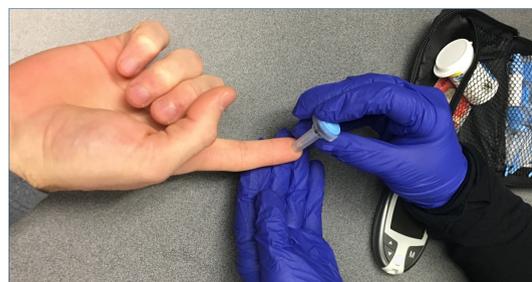
## Procedures

Patients undergoing elective foot and ankle surgery at our facility were prospectively enrolled.

Glucose levels during the perioperative period were collected and recorded in the medical record. This was completed by obtaining capillary blood glucose levels from the patient in the pre-operative holding area, intra-operatively, and in the post-operative recovery area. The patient underwent their planned procedure as previously discussed with surgeon.

Baseline demographic information, procedure information, clinical characteristics and comorbidities were obtained from the patients' medical records. Records were reviewed for any identifiable post operative complications in the 90 day post operative period.

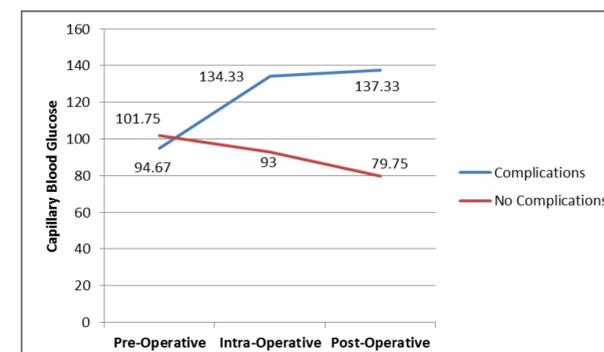
Figure 1: Acquisition of Capillary Blood Glucose



## Results

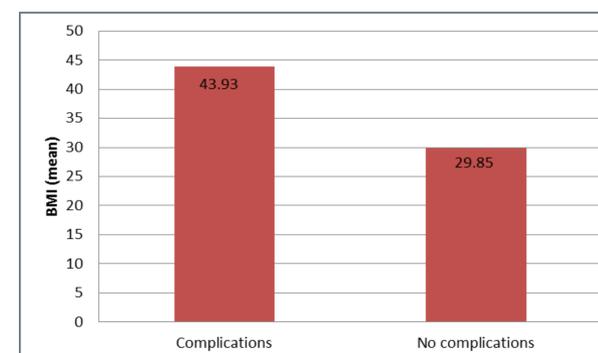
Of the 7 patients included in the study for data review, there was a correlation with increased blood glucose levels and adverse post-operative outcomes. The mean capillary glucose levels of patients who experienced a post-operative complication increased over the course of the three glucose samples taken. On the other hand, the glucose levels of the individuals who did not experience a complication decreased over the course of the three samples taken. A repeated measures ANOVA demonstrated an interaction of borderline statistical significance ( $p = 0.125$ ).

Figure 2: Line Graph Depicting Differences in Capillary Blood Glucose of Patients With and Without Post-Operative Complications



Of interest, during data review of patient clinical characteristics, we found a trend towards an increased BMI in those patients who experienced a post-operative complication when compared to those who did not. The average BMI for patients with a 90 day surgical complication was 43.93 and 29.85 for those without. Based upon a Wilcoxon rank sum test, we found that this also trends towards statistical significance ( $p=0.100$ ).

Figure 3: Bar Graph Depicting Mean BMI of Patients With and Without Post-Operative Complications



## Analysis and Discussion

Hyperglycemia is a well documented predictor of adverse surgical outcomes [1-4]. Research to date has been retrospective in nature with little research focusing on foot and ankle surgery. Perioperative hyperglycemia is a modifiable risk factor that can be managed to reduce postoperative morbidity, reduce health care costs , length of stay and improve patient outcomes [10].

Additionally, increased BMI and obesity have been linked to more frequent complications, more severe complications and worse functional outcomes in patients who undergo foot and ankle surgery [11,12].

The most significant limitation of this study is the small sample size; however, this study remains in progress and more data continues to be collected for further analysis.

Preliminary results from our study have demonstrated correlation of adverse outcomes with elevated blood glucose levels and; however, there is no identified statistical significance at a specific level of glucose in enrolled patients. Our pilot data also showed a borderline statistically significant trend for increased BMI in the cohort of patients who experienced a post-operative complication.

Further patient enrollment to adequately power the study will provide an identifiable optimal glucose range.

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