A Comparison Between General and Neuraxial Anesthesia on the Incidence of Surgical Site Infection Rates Following Joint Surgeries: A Retrospective Study of cases at DMC from 2011-2015

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INTRODUCTION:

Prosthetic joint infection occurs following roughly 2% of total knee arthroplasties [1]. It is anticipated that by 2030, total knee arthroplasty procedures performed annually will increase by 673% and total hip arthroplasty procedures will increase by 174% [2]. It is imperative to reduce the burden of SSIs. The first few hours of surgery is a critical period in which surgical wounds are contaminated and surgical site infections can develop [3]. It is vital to establish the optimum surgical and anesthesia techniques during this period to reduce the risk of SSIs. Previous studies have shown that the sympathetic blocking effect of neuraxial anesthesia improves tissue perfusion and oxygenation, which may reduce the risk of SSI [4,5]. More recent literature has confirmed that total joint arthroplasty under general anesthesia is associated with a higher risk of SSI compared with epidural or spinal anesthesia, finding a rate of SSI of 2.8% with general anesthesia and 1.2% with neuraxial anesthesia [6,7]. The Primary study aim is to compare the rate of surgical site infection with neuraxial anesthesia versus general anesthesia in patients undergoing joint (hip and knee) surgery. Secondary aims of the study will be to observe if there were any identifiable factors in demographic, preoperative health or perioperative interventions that increase the risk of rate of SSI in order to identify potential prevention interventions and reported SSI risk factors.

METHODS:

After institutional review board approval, data for 5 years (2011-2015) was collected via patient chart records. The following information was collected and analyzed: Patient demographics, comorbidities, surgery, surgical site infection (SSI defined as an infection that occurs within 90 days of surgery in the part of the body where the surgery took place, including superficial infections involving only the skin), type of anesthesia, operator, anemia, perioperative normothermia, hyperglycemia, recent infections (within 90 days prior to surgery), perioperative transfusion amounts (cc) and recurring surgery within 90 days of initial surgery. Statistical Chi Squared and ANOVA tests were used were appropriate. Continuous data expressed as mean ± SD, Categorical data expressed as percentages.

RESULTS:

Thus far a total of 1960 patient procedures were reviewed. Of these, 47 patients developed SSI (2.4%). Demographic characteristics (Age, Sex and Race) of patients are displayed in Table 1.

Table 1 Demographic factor comparison of SSI vs No SSI occurrence.

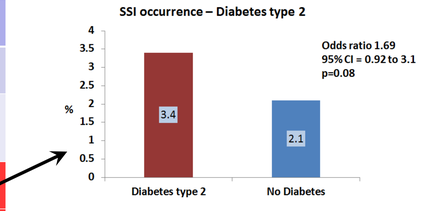
Demographic Factor	SSI occurrence	No SSI occurrence	P-value
Age (Years)	58 ± 11.1	59.2 ± 11.3	0.56
Sex-Female (64%)	2.1%	97.9%	0.21
Sex –Male (36%)	3.0%	97%	
Race- African American (59%)	2.3%	97.7%	0.40
Race- Caucasian (35%)	3.0%	97.0%	

RESULTS

Pre-operative Health and Co-morbidity factors (Smoking status, Body Mass index (BMI), presence of diabetes type 2 status, peripheral vascular disease, chronic obstructive pulmonary disease (COPD), Hypertension and recent infection occurrence were compared between SSI and Non SSI patients are outlined in table 2. Perioperative factors (anesthesia provider, anesthesia type, patient surgical temeprerature and occurrence of perioperative transfusion are outline in table 3

Table 2. Pre-operative Health and Co-morbidity Factor comparison of SSI vs No SSI occurrence.

Pre-operative Health and Co-morbidity Factors	SSI occurrence	No SSI Occurrence	P-value
Smoker (41%) Non Smoker (59%)	2.2% 2.5%	97.8% 97.5%	0.70
BMI <30 (37%) BMI 30-40 (39%) BMI >40 (24%)	2.4% 2.5% 2.1%	97.6% 97.5% 97.9%	0.91
Diabetes Type 2 (25.3%) No Diabetes (74.7%)	3.4% 2.1%	96.6% 97.9%	0.08*
Peripheral Vascular disease (2.8%) No Peripheral Vascular disease (97.2%)	7.1% 2.3%	92.9% 97.7%	p <0.05
COPD (18.5%) No COPD (81.5%)	1.6% 2.6%	98.4% 97.4%	0.30
Hypertension (24%) No Hypertension (76%)	2.3% 2.7%	97.7% 97.3%	0.57
Recent Infection (< 2 weeks; 6.8%) No Recent Infection (93.2%)	3.7% 2.3%	96.3% 97.7%	0.30



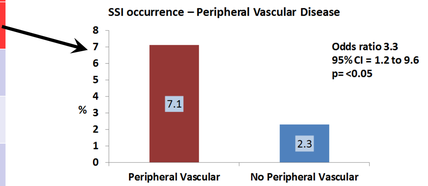
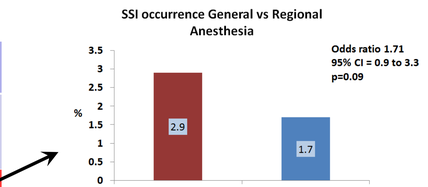
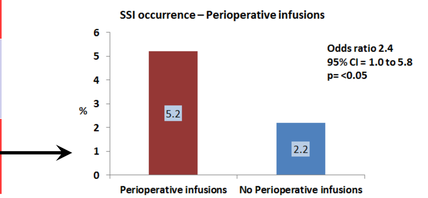


Table 3. Perioperative factor comparison of SSI vs No SSI occurrence.

Perioperative Factors	SSI occurrence	No SSI Occurrence	P-value
Anesthesia Provider Attending MDA (90%) Resident (10%)	 2.5% 1.6%	 97.5% 98.5%	0.42
Anesthetic Type General Anesthesia (60.5%) Regional Anesthesia (39.5%)	 2.9% 1.7%	 97.1% 98.3%	0.09*
Patient Surgical Temperature < 36 ° C (Hypothermic; 6%) 36° C- 38° C (Normothermic; 94%)	 3.6% 2.3%	 96.4% 97.7%	0.39
Peri-Operative Transfusions >1 Unit Transfusion (4%) No Transfusions (96%)	 5.2% 2.2%	 94.8% 97.8%	p< 0.05*





DISCUSSION

Surgical Site Infection (SSI) is a common and often serious complication of surgery [8]. It is the third most common nosocomial infection and it accounts for 14-17% of all hospital-acquired infections [9]. The treatment of SSIs places an immense economic burden on health-care costs. The Surgical Care Improvement Project (SCIP) has made the prevention of SSIs a national priority and the Centers for Disease Control and Prevention has issued guidelines for the prevention of SSIs [10]. Previous studies examining outcomes and complications of arthoroplasty surgery under different anesthesia techniques have noticed greater risk of SSI when administering general anesthesia compared to neuraxial anesthesia. A retrospective study of hip arthroplasty procedures found compared with general anesthesia, regional anesthesia was associated with reduction in SSI rates, hospital length of stay, and rates of postoperative cardiovascular and pulmonary complications[11]. In addition a Meta analysis showed existing evidence supports the overall beneficial effects of neuraxial anesthesia in decreasing the development of SSI after joint arthroplasty[12]. As opposed to only analyzing data for type of anesthetic used, our study additionally analyzed other potential risk factors for SSI. In our investigation general anesthesia was associated with a higher odds ratio of developing SSI when compared with regional anesthesia; which is supported by data found in previous studies. We also found increased odds ratio of SSI in diabetes type 2, pvd, patients with infection within 2 weeks of surgery, hypothermic post op patients, and patients who received 1 Unit pRBC transfusion compared to 0 Units pRBC. PVD and patients receiving a unit of blood showed the greatest odds ratio for SSI, possibly due to decreased blood flow and oxygen to the surgical site; further analysis would have to be done to confirm this hypothesis.

Conclusion

The observed two fold difference between SSI rates in neuraxial vs general anesthesia with lower SSIs rates associated with neuraxial anesthesia indicates anesthesia type is a potential factor in reducing SSI, which is supported by previous studies. Risk factors such as diabetes type 2, pvd, recent infection, hypothermia, and perioperative tranfusion also showed a trend towards increased risk of SSI from our data analysis. These trends will be further analyzed through additional chart analyses (n=1960) to increase the power of the study and limit the probability of type 2 errors due to small sample size. We will conduct further analysis to investigate if there are correlating factors with the already significant trending factors for risk of SSI.

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