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Perioperative corneal abrasion: An investigation into preventive practices and educational interventions that limit corneal abrasions in the perioperative setting

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Executive Summary

Title

Perioperative corneal abrasion: An investigation into preventive practices and educational interventions that limit corneal abrasions in the perioperative setting.

Author

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Introduction to the Problem

Corneal abrasions are the most common ophthalmic injuries that occur in the perioperative period (Griti, Sadri, & Watts, 2013). Corneal abrasions that occur while the patient is under anesthesia are the result of physical trauma, exposure, or reduced tear production (Grixiti et al., 2013). Many risk factors, both physiologic and mechanical, contribute to corneal abrasions. Common practices, along with various strategies, are employed by anesthesia providers, but no definitive strategy exists. A large academic university hospital in southeastern Pennsylvania noted an increase in corneal abrasions experienced by patients in the perioperative setting. There was a desire to create a guideline and continuing education program highlighting the best practice for corneal abrasion prevention and an education seminar for faculty and staff CRNAs. The goal of this educational program was to educate the providers regarding the safest techniques to limit the occurrence of corneal abrasions.

IRB Information

The Institutional Review Board (IRB) at Southern Illinois University Edwardsville reviewed and approved this project on September 6, 2022. The Institutional Review Board (IRB) Quality Initiative at the University of Pennsylvania reviewed and determined that this project

does not meet the definition of human subjects research and therefore, further IRB review was not required.

Literature Review

Evidence throughout the literature suggests that the rate of corneal abrasions that occur during general anesthesia and monitored anesthesia care varies greatly. While the rate of corneal abrasions is low ranging around 0.11 – 0.17% of all anesthetics, corneal abrasions cause significant discomfort for patients and can possibly lead to permanent damage (Roth, Thisted, Erickson, Black, & Schreider, 1996; Segal, Fleischut, Kim, Levine, Faggiani, et al., 2014; Yu, Chou, Yang, & Chang, 2010). Many risk factors exist that increase the likelihood of developing a corneal abrasion while under anesthesia, and preventative practices among anesthesia personnel remain the most effective means of limiting the incidence of corneal abrasions. Despite receiving didactic and continuing education pertaining to corneal abrasion risk factors and prevention techniques, a knowledge gap exists in CRNAs based on pre-test evaluation results. Pertaining to risk factors, every CRNA who participated in the pre-test and post-test evaluation were unable to correctly identify all risk factors associated with corneal abrasions. Furthermore, only 8.2% were able to identify the most evidenced-based preventative measure to prevent corneal abrasions.

Several factors that increase the risk of corneal abrasions exist and have been clearly identified in the literature. In addition to patient conditions such as dry eye and lagophthalmos, other conditions related to the patient's position (prone and lateral), oxygen use during transport, and timing and placement of occlusive device all contribute to increased risk of corneal abrasion. Furthermore, advanced age, patients with prominent globe position, and

patients with Grave's disease are at increased risk (Malafa et al., 2015, Martin et al., 2009; Lichter, Marr, Schilling, Hudson, Boretsky, et al., 2015). Because a corneal abrasion can happen during any anesthetic and post-anesthetic, employing a consistent and evidence-based approach is necessary.

Many practices exist to prevent corneal abrasions. Practices such as taping the eyes shut as soon as the loss of consciousness occurs following induction of anesthesia and before airway management is the most common practice among clinicians (Wan, Wang, & Jin, 2014; Grover, Kumar, Sharma, Sethi, & Grewal, 1998). Other practices include placing methylcellulose eye drops in each eye before taping (Ganidagli, Cengiz, Becerik, Oguz, & Kilic, 2004). While the other methods have been shown to limit corneal abrasions, tape only provides the safest method of limiting corneal abrasions.

Project Methods

The project was proposed to educate CRNA staff at a large academic medical center in Pennsylvania about the risk factors associated with increased corneal abrasions and the most appropriate ways to limit corneal abrasion occurrence in the perioperative period. The education was presented via a PowerPoint. The staff learned about both patient and procedural risk factors, prevention techniques, litigation costs associated with corneal abrasions, and long-term risks of untreated corneal abrasions. A pre/post-test was used to determine the effectiveness of the educational presentation and completed using RedCap software. The PowerPoint presentation lasted approximately 15 minutes in length consisting of key elements of corneal abrasion risk factors and preventative measures. Pre/post-test consisted of four demographic questions and ten questions that were used as a method of evaluation. During the

meeting, the first step for the CRNAs was to take the pre-test to develop a better understanding of their baseline knowledge surrounding corneal abrasions. The second step was to watch a PowerPoint presentation. The third and final step was to take the post-test. Both Southern Illinois University Edwardsville and the University of Pennsylvania's IRB determined this was a quality improvement project rather than a human research project. Analysis of the results was completed using Stata software for data science.

Evaluation

The objective of this project was to increase the knowledge-base of risk factors and preventative techniques of corneal abrasions among CRNAs at a large academic medical center in southeastern Pennsylvania. Although only 15 participants that participated completed the pre/post-test, a successful learning experience was identified following the evaluation of the results of the post-test.

Results

Demographic data revealed that all participants in attendance were CRNAs. A total of 28 providers participated. Eighteen females and 10 males participated. Participants had a wide variety of experience levels ranging from 1 year to over 15 years with most participants having five to ten years of experience. Seventeen of the 28 participants practiced 25-40 hours per week while 10 participants were employed for more than 40 hours per week. There was no physician anesthesiologist participation.

While questions 1-4 focused on demographics and years of experience as an anesthesia provider, questions 5-14 focused on knowledge-based questions relevant to corneal abrasion prevention practices and the overall impact of corneal abrasions on patients. These questions

were formatted in a multiple-choice format. These questions assessed current knowledge and knowledge gained regarding corneal abrasion prevention practices.

Participants were given a pre-test and then provided with an educational PowerPoint presentation that was followed by a post-test. There was an increased percentage of correct responses for all questions following the educational component of the test. Participants understood taping the eyes immediately after induction of anesthesia was the most appropriate method for preventing corneal abrasion as all participants correctly answered the question. However, less than fifty percent of participants correctly answered questions related to risk factors, most effective method for preventing corneal abrasions, litigation costs associated with corneal abrasions, and long-term risk factors associated with corneal abrasions. Only eight percent of CRNAs correctly answered that tape only was the most useful prevention method. Following the educational presentation, eighty percent of CRNAs correctly identified that tape only is the most effective preventative method. The CRNAs that participated in the pre-and post-test all correctly identified that tape only is the most effective method of preventing corneal abrasions. Furthermore, all CRNAs who participated correctly identified that tape should be applied following loss of consciousness and before airway management. Following the educational PowerPoint, the number of correct responses increased among all participants.

Limitations

The most significant limitation of this project was the sample size. While 28 people completed the pre-test, only 12 people completed the post-test. This was mainly attributed to the limited staff at the meeting this presentation took place and time constraints for the

meeting. The staff meeting concluded before some people finished the post-test. Future projects may benefit from allowing increased time for the pre-test, presentation, and post-test. Additionally, time for questions should be factored in. Lack of physician anesthesiologist participation is another limiting factor.

Impact on Practice

The results of the project revealed a knowledge gap surrounding corneal abrasions among the CRNAs at an academic medical center. When considering the improvement seen from the pre-test to the post-test, there was an improvement in the knowledge base surrounding corneal abrasion prevention. It is likely that the presentation and increasing awareness of corneal abrasions and corneal abrasion prevention practices will help limit the number of corneal abrasions that occur in the practice.

Conclusion

Corneal abrasions that occur in the perioperative setting are typically rare but do occur. At a large academic medical center in Southeastern Pennsylvania, there has been an increase in corneal abrasions patients experienced in the perioperative period. As a result, there was a desire to create an educational program to educate the staff and faculty on corneal abrasion prevention practices. The primary goal of this project was to create an educational PowerPoint to educate the anesthesia staff regarding corneal abrasion prevention practices. A post-test was used to assess participants' increase in knowledge regarding corneal abrasion prevention practices. Following statistical analysis, overall results were positive and demonstrated that the presentation was an effective tool that can be used to improve knowledge among the anesthesia staff and may lead to a decrease in corneal abrasion. The adoption and

incorporation of the corneal abrasion prevention methods discussed in this educational document have the potential to improve patient outcomes and limit corneal abrasions that might occur in the perioperative period.