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Best Practice in the Perioperative Anesthetic Management of Infants with Gastroschisis

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Executive Summary

Introduction of Problem

Gastroschisis is a severe congenital abdominal wall defect, affecting as many as 1 in 2,000 fetuses (Bhatt et al., 2018; Wright & Geraghty, 2017). An abnormal folding of the fetus's abdominal wall subsequently results in a ventral wall defect causing protrusion of the abdominal contents into the amniotic fluid (Bhatt et al., 2018; Wright & Geraghty, 2017). Despite care advancements, controversy remains regarding best practice management techniques for gastroschisis in a variety of areas. Moreover, gastroschisis continues to be associated with significant morbidity and mortality (Bhatt et al., 2018).

At a tertiary care facility in central Illinois, a practice change in the care and management of infants with gastroschisis resulted in uncertainty regarding best-practice management. As a result, the anesthesia group requested an integrative review of the available literature and development of a comprehensive guideline discussing best-practice perioperative recommendations pertinent to the care of infants with gastroschisis. Thus, this project aimed to facilitate the delivery of standardized, evidence-based care to infants with gastroschisis in the perioperative setting.

Literature Review

Care of the infant with gastroschisis is multidisciplinary and involves prenatal care, delivery planning, presurgical stabilization and evaluation, surgical repair, anesthetic care, and postsurgical care. Though the exact etiology of gastroschisis remains debated, several potential environmental and lifestyle factors have been suggested including young maternal age, nulliparity, illicit substance use, maternal tobacco use, low BMI, diets low in essential fruits and vegetables, low socioeconomic status, and exposure to pesticides (Haddock & Skarsgard, 2018;

Wright & Geraghty, 2017). Optimal delivery time appears to be between 36- and 40-weeks' gestation, as preterm delivery may be associated with worse outcomes (Copel & Campbell, 2017; Haddock & Skarsgard, 2018). While delivery timing is debatable, vaginal delivery is recommended unless other obstetric indications exist for a scheduled cesarean section (Fraga et al., 2018; Haddock & Skarsgard, 2018). Following delivery, the primary focus becomes stabilization and preparation for the infant to undergo anesthesia for surgical repair. Therapeutic goals following delivery include physiologic homeostasis in addition to providing the infant with intravenous hydration, respiratory support, temperature regulation, and bowel protection (Haddock & Skarsgard, 2018).

Literature suggests a primary surgical repair be performed shortly after birth in cases of uncomplicated gastroschisis, if intraabdominal pressures are acceptable (Haddock & Skarsgard, 2018; Williams et al., 2003). Complex gastroschisis or failed primary closure may require a staged closure using a silo (Biswas et al., 2006; Dogra et al., 2019). To facilitate successful surgical closure, many anesthetic delivery options are available. Many providers prefer a combined anesthetic technique utilizing a general anesthetic (GA) plus a regional block, such as a spinal or caudal block (Dogra et al., 2019). A combined anesthetic provides a protected and controlled airway, reduced opioids and muscle relaxants, less inhalation agent, and reduces the need for postoperative ventilation. In contrast, scarce research has shown that bedside closure utilizing sedation has produced similar outcomes (Cauchi et al., 2006).

Regardless of the anesthetic technique chosen, many intraoperative considerations must be made. Adequate anesthetic depth and analgesia is crucial to avoid severe bradycardia during surgical stimulation. Aggressive fluid management must continue throughout the procedure ensuring blood loss, urine output, and third space losses are replaced, with third space losses

frequently requiring replacement as high as 10ml/kg/hr. In addition, thermoregulation is crucial (Brusseau & McCann, 2010). During closure, airway pressures must be monitored closely. High intrabdominal pressures can cause high airway pressures and may indicate the need for a staged closure (Biswas et al., 2006; Dogra et al., 2019).

In the postoperative period, ventilatory support should be provided as necessary. Fluid administration should be judicious & enteral nutrition should be slowly advanced. Monitoring for signs of abdominal compartment syndrome is crucial and may include ventilatory compromise, decreased cardiac output, renal and intestinal ischemia, and lower limb vascular compromise. If abdominal compartment syndrome develops, the abdomen should be opened promptly to avoid further complications (Haddock & Skarsgard, 2018). While similarities exist among infants with gastroschisis, the defects can vary in complexity and individualized care must remain a priority.

Project Methods

Purpose and Goals

The aim of this project was to develop a comprehensive guideline discussing current best-practice recommendations for anesthetic management of infants with gastroschisis. This guideline was developed based on an all-inclusive literature review analyzing pathophysiology, diagnosis, prenatal care, delivery management, post-delivery care, historical and current surgical management techniques, and anesthetic care. The purpose of the guideline was to increase participant knowledge regarding perioperative considerations and anesthetic techniques for infants undergoing gastroschisis repair.

Project Design

This project was implemented on July 29, 2021, to pediatric anesthesia providers in the operating room at the host facility. A non-experimental single group design was utilized. The study population consisted of a convenience sample of pediatric Certified Registered Nurse Anesthetists (CRNAs) and Physician Anesthesiologists. An educational PowerPoint presentation was delivered to the providers in attendance. The comprehensive guideline was also presented, with each provider receiving a copy for personal use.

Institutional Review Board (IRB) Approval

This project is a quality improvement project and was submitted to the IRB at Southern Illinois University Edwardsville (SIUE) as such. This project was deemed a quality improvement non-research type project not requiring IRB approval by the SIUE IRB on June 10, 2021.

Evaluation

Tools

Following the educational presentation, all participants were asked to fill out an 11-question survey consisting of two demographic questions and nine project content evaluation questions. The surveys were collected via an electronic platform and then printed and secured into a folder for data analysis. All surveys were anonymous. A total of nine post-implementation surveys were collected.

Results

Demographic data showed that eight providers were CRNAs, and one was a Physician Anesthesiologist. Years of provider experience varied significantly, with 0–2 years of experience being the most frequently represented experience level.

Results from five knowledge assessment survey questions suggested that the educational presentation impacted the participants positively. Prior to the educational presentation, 7 out of 9

participants (77.8%) were unaware that vaginal delivery was the recommended route of delivery for infants with gastroschisis. Using a ten-point Likert scale, participants were asked to rate their proficiency in the anesthetic management of infants with gastroschisis before and after the educational presentation. Mean scores increased from 4.1 to 6.3 following the educational presentation, representing a potential increase in proficiency. Participants were also asked to rate the degree to which the presentation increased their knowledge of the anesthetic management of infants with gastroschisis. Scores of 4–10 were reported (mean of 7.4), indicating that the educational presentation increased all participants' knowledge. Lastly, participants rated their confidence in providing current best-practice anesthetic care to infants undergoing gastroschisis repair. Scores of 5–10 were reported with a mean of 7 indicating that all participants were at least moderately confident in their ability to provide best-practice care.

Participants were then asked to rate the applicability of the guideline for the operating room, and how likely they were to incorporate the guideline into everyday practice. Mean scores ranged from 8.3/10 to 9.3/10, indicating a positive appreciation for the user friendliness, appropriateness, and applicability of the guideline. The high mean scores indicate an apparent overall acceptance of the presented guideline by those in attendance.

Limitations

Limitations of this project include sampling size and sampling bias. A convenience sample was used related to staff availability. Due to the limited sample size, the ability to generalize the results to a larger population may be somewhat limited. Future projects should consider implementation at a mandatory staff meeting or implementation over multiple days. Correcting these limitations may result in more generalizable and meaningful results.

Impact on Practice

Overall, the results of this project were positive. Survey responses demonstrated that the educational presentation was informative and that the participants gained knowledge. Moreover, participants indicated that the guideline was user friendly, applicable to the intended setting, and incorporation of the guideline into practice was likely. Ultimately, providers being educated in and following best-practice recommendations in the care of infants with gastroschisis has the potential to reduce morbidity and mortality among these infants. Research validates that standardizing the care of infants with gastroschisis through the development and use of clinical pathways and protocols may improve outcomes (Bhatt et al., 2018).

While this project only aimed to develop and implement a guideline based on best-practice literature review findings, future extensions of this project are possible. Future projects should focus on monitoring and collecting outcome data from patients who received care based on the guideline recommendations. Continuation of the project in this direction would connect best-practice recommendations to infant outcomes at the project host site and beyond.

Conclusion

Gastroschisis is a major abdominal defect that continues to be associated with significant morbidity and mortality. As requested by the project host site, a comprehensive best-practice guideline was created. An educational PowerPoint and the guideline were presented to the pediatric anesthesia staff, followed by a post-implementation survey assessing knowledge gained, applicability of the guideline to the intended setting, and potential for guideline incorporation into practice. Results were positive and revealed an increase in provider knowledge and overall approval and acceptance of the guideline. With the continued use of the knowledge and comprehensive guideline presented in this project, the potential to improve patient outcomes exists.

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