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Safety/QA/QI Projects

Quality Improvement Project on the Success Rate of Thoracic Epidurals in a Major Academic Hospital

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Introduction

Continuous thoracic epidural analgesia (TEA) is considered the gold standard in the management of perioperative pain for a diverse array of major open surgeries, such as thoracotomies and laparotomies. When installed and managed appropriately, epidurals have been associated with improved postoperative analgesia, increased patient satisfaction and decreased rates of readmission1. Although, appropriate placement is not always straightforward, a partially working TEA or failed TEA is a cause of significant failure in patient postoperative pain management and satisfaction. Many technical aspects of TEA placement may influence the likelihood of success. Patient factors such body mass index (BMI), history of spinal deformities and age-related spinal changes present significant challenges to successful placement. Reliance on traditional landmark-based and loss of resistance (LOR) techniques lack specificity and may also hamper success2. Furthermore, the decreased popularity of TEA in light of alternative novel fascial plane blocks and trend towards minimally invasive surgeries has led to reduced learning opportunities for trainees, another potential contributor to higher failure rates3. Given these multiple factors, studies examining TEA failures have reported failure rates ranging from as low as 2.1% to as high as 50%2,4. Examining failure rates is the first step in identifying issues that have the potential to be corrected or identifying risk factors for TEA failure. As a first step in quality improvement, we undertook a retrospective analysis of our electronic medical record (EMR) to determine the rate of thoracic epidural failures at our institution over a 6-month period. We also aimed to identify any common causes of TEA failure in this institute to improve the practice of TEA placement.

Materials and Methods

IRB approval was obtained for this retrospective case review (IRB# 2023P003125).

Thoracic epidural procedure data were collected from the EMR of patients who received TEA intended for postoperative analgesia between 1/1/2023 – 6/29/2023 in a major academic medical center with more than 45,000 surgeries per year.

In this setting, the epidural solutions for TEA included a mixture of local anesthetic and narcotics that was started immediately after surgery. In case of inadequate TEA, the common practice is to remove the narcotic component from the epidural solution and add systemic narcotics (Splitting). In order to globally capture all possible TEA failures, we

defined failure as the splitting of opioid and local anesthetic mixture that was previously administered through an epidural catheter alone.
The epidural procedure note was reviewed to obtain the documented level of epidural placement, approach to placement, patient position, number of attempts, loss of resistance depth, depth of catheter placement and any noted complications at the time of placement. The patient record was further reviewed to determine if systemic opioids were added while the epidural was in place (i.e. if the epidural was split), and to determine the epidural removal date. Acute pain service notes related to the epidural were also reviewed.

Complications associated with epidural placement were also noted, along with documented rational for epidural removal or addition of systemic opioids. The rational for addition of systemic opioids was then stratified according to if it was secondary to hypotension, inadequate sensory coverage, pruritis or concern for motor weakness.

Results/Case Report

From January 2023 to June 2023, there were 324 thoracic epidurals placed, 82 of which had systemic opioids added while they were in place. Of these 82 thoracic epidurals, 19 had systemic opioids added due to concerns over the epidural causing hypotension, while 2 had systemic opioids added due to refractory pruritis which was attributed to the neuraxial opioid. One epidural had systemic opioid added due to lower extremity motor weakness attributed to the epidural level (T9-T10). Figure 1.

The remaining 60 (18%) epidurals had systemic opioids added due to patchy or inadequate epidural pain coverage. Within these 60 thoracic epidurals, 8 had documentation suggesting that the epidural had migrated as a cause for inadequate epidural analgesia, and one had documentation of a kink in the epidural tubing. The remaining 51 did not attribute the failure of epidural analgesia to a specific cause. Figure 1.

Discussion

This internal audit examining the rate of thoracic epidural failures over a 6-month period represents an initial action to improve the quality of thoracic epidural analgesia at our institution. The epidural failure rate due to inadequate analgesia reported here of 18% is consistent with the range of failure rates reported in previous studies2. Of these failed epidurals, migration of the catheter is documented in 8 cases (probable secondary failure), while in 51 cases, the cause for failure is unclear. Given the lack of specificity of the LOR technique in identifying the thoracic epidural space2, it may be reasonable to assume that a proportion of these are due to primary failure. This highlights a limitation of this retrospective review in the inability to distinguish between primary and secondary failure. Additionally, our definition of failure involving the addition of systemic opioids following epidural placement is limited in that it may be underreporting failure in some instances (non-functioning epidural managed with non-opioids) or overreporting failure (epidural functioning, but pain is located outside of covered area necessitating systemic opioids).

While the collective failure rate presented is consistent with that reported with other training centers, it underscores an opportunity for quality improvement. There are several patient safety concerns that arise with failure of thoracic epidurals. Along with heightened patient discomfort, anxiety, and distress, failure of thoracic epidurals hinders postoperative recovery1. Our next step to improve our TEA success rate is to present these findings as part of a faculty workshop aimed at improving the technical skills of our anesthesia providers, focusing on use of neuraxial ultrasound to guide correct placement. This modality offers advantages over traditional landmark techniques in identification of key anatomical structures and may help confirm correct placement in real time5. Though requiring specialized training, the use of fluoroscopy has been shown to significantly increase the incidence of correctly positioned

thoracic epidural catheters and is an additional avenue that will be explored4.

References

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Disclosures

No

Tables / Images

Figure 1: Pie-in-Pie chart displaying proportion of thoracic epidurals which had systemic opioids added while in place, and the documented rational for addition of systemic opioid (n, %).