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Paravertebral Catheters for Rib Pain in a Parturient with Cystic Fibrosis: A Case Report

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Abstract

A 32-year-old woman with cystic fibrosis pregnant with twins presented at 28 weeks with an acute rib injury sustained during a vigorous coughing episode. Two paravertebral catheters were placed to manage the severe pain associated with her four times daily vest treatments. She received a continuous ropivacaine infusion with twice daily boluses which resulted in a significant decrease in daily opioid use. The catheters remained in place for 32 days until she spontaneously went into labor, upon which they were removed and she had an uneventful cesarean section.

Keywords: Case report • Acute pain • Regional catheter • Local anesthetics

Introduction

Cystic Fibrosis (CF) is a multi-system disease caused by a mutation of the cystic fibrosis transmembrane conductance regulator gene on chromosome 7 [1]. Advancements in healthcare and medical treatments have resulted in an increase in the number of parturients with CF [2]. However, pulmonary changes seen during pregnancy can be detrimental to a parturient with CF1. As such it remains important for parturients with CF to be able to tolerate high-frequency oscillation chest wall vest therapy to ensure adequate pulmonary function. We present a case report of a Prolonged Paravertebral Catheter (PVC) placement in a parturient with CF with multi-level rib pain.

Case Presentation

A 32-year-old 79.6 kg G2P0010 at 28 weeks and three days gestation by frozen embryo transfer with di twin gestation and CF presented to the University of Minnesota emergency department after experiencing a vigorous coughing episode in her home and feeling a "pop" on her left side. Radiographic imaging showed no evidence of fracture; however, the patient was admitted due to intractable rib pain. She was initially treated with non-opioid (muscle relaxants, lidocaine patches) pain medications and opioid medications. Due to uncontrolled pain with high-frequency oscillation chest wall vest therapies, the Department of Anesthesiology Regional Anesthesia and Acute Pain Service was consulted on admission day two. A single shot left sided T9-T10 paravertebral block with 1% lidocaine was placed to evaluate responsiveness to regional analgesia. Her pain significantly improved for 2 hours following the single shot block. On admission day three, a left sided T9-T10 PVC was placed with ropivacaine 0.2% at 10 mL/hr. The patient experienced a significant reduction in her pain and was able to tolerate high-frequency oscillation chest wall vest therapy without IV pain medications for the first time since admission. Over the first 48 hours of her hospital admission, her average daily morphine equivalents usage was 64 mg. After catheter placement, for the next 48 hours, her average daily morphine equivalents were 12 mg and increased to a daily average of 46 mg for the remainder of catheter duration. On admission day seven, second PVC was placed at T6-7 to cover higher thoracic level pain that was not covered by the already present T9-10 PVC. The catheter infusion rates were adjusted to 7 mL/hour each to maintain ropivacaine 0.2% dosing at 14 mL per hour total.

On admission day 15, the T9-10 PVC was replaced due to continued leaking from the insertion site. On admission day 23, her On Q pump (On-Q®, Avanos Medical, Alpharetta, Georgia) was converted to a CADD Solis pump (CADD®-Solis Ambulatory Infusion Pump, Smiths Medical ASD Inc, Keene, NH) to allow for scheduled boluses around her morning and night vest treatments. She remained hospitalized throughout her pregnancy because of an inability to tolerate vest treatments without PVC boluses. Attempts were made to wean from the PVCs, but the patient's pain control was inadequate. She had PVCs in place for a total of 32 days. Throughout this time frame, she received twice daily boluses to help decrease opioid usage during four-times-daily vest therapies. Also, during this time, her catheters were assessed twice daily by the Department of Anesthesiology for signs of site infection. At no point in time did she display signs of infection or local anesthetic systemic toxicity (LAST). On admission day 35, she spontaneously went into labor. A lumbar epidural catheter was placed at L4-5 for labor analgesia in preparation for a suspected long cesarean section as well as a thoracic epidural at T11-12 for rib pain coverage following the delivery. Her PVCs were removed prior to placement of her thoracic epidural. She underwent a non-eventful primary cesarean section at 33 weeks and three days and delivered a viable female and male weighing 1640 grams and 1720 grams, respectively. The patient reported high satisfaction with her treatment and pain control.

Discussion

This case illustrates two significant points. First, it illustrates the benefit of PVCs for rib pain in the parturient with CF. Second; it illustrates the possibility for long-term catheter usage in a parturient. Patients with CF have shown increased life expectancy, leading to increased potential for traumatic injuries [2]. Along with this, patients with CF have shown increased potential for fertility with advancements in fertilization techniques. Lastly, as the population of patients with CF ages, there is a higher likelihood for rib fractures or chest wall injuries. Pulmonary changes seen during pregnancy include increased minute ventilation, upward displacement of the diaphragm, decreased functional residual capacity and decreased residual volume [1]. These changes can be detrimental to the parturient with CF and highlight the importance of this population of patients to have the ability to tolerate vest therapy. Analgesic

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techniques to minimize pain in patients with CF receiving vest therapy include opioids, non-opioid pain medications, paravertebral blocks, Erector Spinae Plane (ESP) blocks, intercostal single-shot blocks and thoracic epidural catheters. Each technique has its advantages and disadvantages. While the thoracic epidural catheter historically has been considered the “gold standard” for management of rib fracture pain, recent literature has shown that the use of thoracic epidurals for management of rib fracture pain to provide no additional benefit over alternative therapies in terms of mortality, pain, pneumonia and duration of mechanical ventilation [3]. Single-shot blocks of any type are traditionally less technically challenging; however, they offer only short periods of relief and would require frequent repeat procedures leading to potential for introduction of bacteria and trauma. PVCs and ESPs have low rates of complications, allow medication to be infused over many days to weeks, allow for single-sided infusions and also allow the physician to adjust the rate of infusion [4-6]. As such, either paravertebrals or ESPs may become the gold standard for pain control in patients with rib fractures. However, prospective randomized controlled trials are necessary to provide a definitive answer.

The use of PVCs for long periods is often avoided especially in patients with immunocompromised states like CF due to risk of infection. Previous studies have shown that the longer duration a peripheral nerve catheter remains in place the higher the risk of infection with the probability of peripheral infection-free catheter use being 57% at 15 days [7]. Additionally, there are case reports of femoral catheters [8] and infraclavicular catheter [9] remaining in place for as long as or longer than our paravertebral catheter without infection or adverse events. However, no case reports of prolonged paravertebral catheters were available in the literature. We had previously published a case report of a paravertebral catheter infusion for acute pain in a parturient with CF. However, that catheter was only kept in place for seven days prior to removal and the patient discharging home [10]. In this patient, we elected to keep the catheters in place for a longer period of time (32 days total) because her pain was unable to be controlled without the PVCs and we were able to monitor for signs of infection and toxicity daily. If the patient would have been discharged, it is unlikely we would have kept the catheters in place beyond a few additional days due to the difficulty of managing outpatient catheters for an extended duration of time.

Conclusion

In conclusion, our findings suggest that continuous paravertebral catheters can be used in parturients with CF and remain in place for an extended period of time. This manuscript adheres to the applicable CARE guidelines. Many analgesic techniques have been established to manage acute pain in cystic fibrosis patients receiving vest treatments. We examine the possibility of using paravertebral catheters over an extended period of time to manage pain in a parturient with cystic fibrosis receiving vest treatments, over traditional analgesic techniques. The patient’s satisfaction with her pain management, the ability to monitor her daily for infection and toxicity during her hospital stay and her uneventful cesarean section support further research regarding the extended use of paravertebral catheters to manage pain in cystic fibrosis patients.

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