

Dexmedetomidine Bolus to Treat Refractory Pain in the PACU Setting, Avoiding an Unplanned Admission in Ambulatory Surgery: A Case Report

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Abstract

Postoperative pain is one of the most common medical reasons for delayed Post Anesthesia Care Unit (PACU) discharges in ambulatory surgery and can lead to unplanned admissions. We present a case of a relatively healthy patient undergoing cystoscopy and ureteral stent placement who had a postoperative course complicated by pain refractory to traditional treatments with opioids and conventional adjuncts. The patient was given a dexmedetomidine bolus (0.7 µg/kg) as a last resort measure to avoid an unplanned hospital admission. The patient's pain decreased from an eight-out-of-ten to zero-out-of-ten within seven minutes leading to a successful discharge home.

Keywords: Dexmedetomidine; PACU unplanned; Hospital admission

Introduction

Acute pain is one of the most common medical causes of delayed discharge from the PACU in ambulatory surgery and is a common cause of unplanned admission [1]. A number of factors can be used to predict severity of postoperative pain, including type of surgery, use of intraoperative local anesthetic, and use of perioperative non-narcotic analgesics. However, there is subjective variability in patient's emotional and physiologic response to painful stimuli as well as patient's response to analgesics.

Dexmedetomidine is an alpha-2 adrenergic receptor agonist and was initially approved as a sedative for use in the Intensive Care Unit [2]. This drug is unique in its ability to provide sedation while keeping the patient in a state where they can be easily aroused when stimulated, while minimizing respiratory depression [3]. There is growing interest in the use of dexmedetomidine as a systemic analgesic [4,5] as well as an adjunct in regional [6] and spinal anesthesia [7], especially in obstetric anesthesia [8]. Furthermore, intranasal dexmedetomidine has been shown to be clinically effective, prompting interest in its use as a perioperative premedication [9]. Studies have shown that administration of an intraoperative dexmedetomidine bolus (0.5 µg/kg-1 µg/kg IV) reduces the need for additional analgesics in the intra- and postoperative periods [10]. Low dose dexmedetomidine infusions are gaining popularity, with the intent to minimize the use of other sedatives such as propofol or opioids. Dexmedetomidine is rarely used as a primary analgesic or as a rescue medication in treating refractory pain.

Low dose infusions of dexmedetomidine administered in animal models have shown a prominence for alpha-2 adrenergic receptor affinity; however larger doses or rapid infusions of lower doses have shown an increase in alpha-1 adrenergic receptor affinity [11]. A number of studies have speculated that the primary site of action responsible for the analgesic properties of dexmedetomidine is

neurochemical modulation at the level of the spinal cord [12], however this continues to be an area of ongoing research. Studies in mice models have found that alpha-2 adrenergic receptor agonists are more effective as analgesics when co-administered with an alpha-1 adrenergic receptor antagonist [13].

All information was de-identified in this case report.

Case Description

A 34-year-old man (83 kg and BMI of 25) with a history of recurrent nephrolithiasis presented to our institution with mild intermittent left renal colic. The patient had no significant past medical history other than nephrolithiasis and had passed approximately forty stones in the preceding four years before presentation. His only prescription medications were hydrocodone/acetaminophen 10/325 mg up to 3 times daily and tamsulosin during acute episodes of renal colic. A CT scan of the abdomen was performed one month prior to presentation and demonstrated three 5 mm renal stones in the left kidney.

The patient underwent cystoscopy, ureteroscopy and left ureteral stent placement. Preoperatively, the patient received oral celecoxib 200 mg, gabapentin 300 mg, and acetaminophen 1000 mg, in addition to intravenous midazolam 2 mg. General anesthesia was induced with 100-µg fentanyl, 50 mg lidocaine, 200 mg propofol, and 30 mg rocuronium intravenously. An endotracheal tube was placed *via* direct laryngoscopy and the operation proceeded without any complications. He received an additional 150 µg fentanyl during the procedure, which lasted one hour and fifteen minutes. At the conclusion of the surgery the patient emerged from general anesthesia, was extubated and transported to the PACU. Shortly after arriving in the PACU the patient was noted to have eight-out-of-ten pain at the left flank. He was given 25 µg fentanyl IV, which was repeated every five minutes until a total PACU dose of 200 µg IV was achieved. Hydromorphone 0.2 mg IV was also administered every five minutes until a total PACU dose of 3 mg was achieved. He continued to have unrelenting 8-out-of-ten left flank pain and was visibly restless and crying in pain. He was given

additional non-opioid analgesic therapies including 1000 mg IV acetaminophen and 30 mg IV ketorolac with no improvement in pain scores. He also received 1 mg midazolam IV at this time. After 120 min in the PACU and with a pain score of eight-out-of-ten the decision was made to administer a 0.7 µg/kg (60 µg) intravenous bolus of dexmedetomidine delivered in increments of 4 µg over approximately three to five minutes. His pain score quickly decreased to a three-out-of-ten and seven minutes after initiating the dexmedetomidine bolus, his pain score was zero-out-of-ten. He was discharged to home fifty one minutes after receiving the bolus in the PACU and remained at a pain score of zero-out-of-ten. His Richmond Agitation-Sedation Scale (RASS) score was positive one (+1) prior to administration of dexmedetomidine and decreased to negative two (-2) twenty minutes after receiving the bolus. The patients RASS score increased to zero by the time of discharge from the PACU however his pain score continued to be zero. Ultimately the patient spent three hours in the PACU with the dexmedetomidine bolus given at approximately two hours into his PACU stay. Before the decision was made that the patient could be safely discharged home they were observed in PACU for one hour after the last opioid dose was given and fifty-one minutes after the dexmedetomidine bolus was given.

Discussion

Refractory pain after a usual and customary cystoureteroscopy with ureteral stent placement is likely uncommon. In this situation stent-related pain or worsening renal colic may have contributed to postoperative pain.

In addition to hydrocodone/acetaminophen 10/325 mg, the patient's renal colic was managed with tamsulosin, an alpha-1 antagonist. There is potential that the alpha-1 antagonist effect of tamsulosin may have contributed to the analgesic effectiveness of dexmedetomidine given that in the mouse model it has been shown that alpha-2 adrenergic receptor agonists are more effective as analgesics when co-administered with an alpha-1 adrenergic receptor antagonist [13].

Dexmedetomidine is known to possess analgesic properties and has been used as an adjunct in the perioperative setting to minimize the use of opioids. However, it is rarely used as a rescue medication when treating refractory postoperative pain. In this case report, a dexmedetomidine bolus proved to be successful in controlling severe postoperative pain when high doses of opioids and typical analgesic adjuncts had failed. Although dexmedetomidine possesses sedative and anxiolytic qualities that contribute to the analgesic-sparing effect seen with its use, there appears to also be an intrinsic property of providing analgesia that is distinct from the level of sedation. The patient in this case report experienced a decrease in his RASS score after receiving the dexmedetomidine bolus and became sedated, however even as he became more alert his pain did not return, allowing him to be discharged home and avoid an unplanned hospital admission due to uncontrolled pain.

Because dexmedetomidine does not compromise respiratory function even at high doses it has a unique advantage over high doses of opioids and may be a valuable medication for anesthesia providers

managing significant postoperative pain in the PACU setting where there is a high degree of concern for respiratory depression. Of course, caution must be exercised to avoid potential adverse effects, including hypotension, nausea, bradycardia as well as first or second-degree heart block.

Significant postoperative pain is one of the most common medical causes of delaying PACU discharges in ambulatory surgery. When anticipating significant postoperative pain, anesthesia providers commonly utilize multimodal analgesic therapies in the perioperative setting. In addition to reducing narcotic use in the intraoperative and postoperative setting, dexmedetomidine may also have a role in treating unanticipated refractory postoperative pain when high dose opioids and conventional adjuncts have failed.

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