Conscious Sedation

A New Approach for Peritonsillar Abscess Drainage in the Pediatric Population

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Objective: To assess the safety and efficacy of conscious sedation (CS) in children undergoing emergency department incision and drainage (I&D) of peritonsillar abscesses (PTAs).

Design: A 33-month retrospective chart review of all children presenting to the emergency department with the diagnosis of a PTA or peritonsillar cellulitis. Children who underwent CS prior to I&D were compared with children without CS for complications and efficacy.

Setting: St Louis Children’s Hospital, an academic tertiary care pediatric hospital.

Patients: Fifty-two children were enrolled; 30 PTAs were drained with CS in 27 children (3 underwent I&D twice), and 25 PTAs were drained in 25 children without CS.

Interventions: The CS team included an otolaryngologist, a pediatric emergency department physician, and a registered nurse. A standardized CS protocol assessing vital signs and level of consciousness was employed during each procedure. A combination of midazolam, ketamine hydrochloride, and glycopyrrolate was used in appropriately weighted calculated doses. Patients were assessed for major and minor airway complications.

Main Outcome Measures: Airway complications related to CS were reviewed. Patients who underwent I&D with and without CS were compared with regard to purulent drainage.

Results: There were no major airway complications in patients undergoing I&D with CS. There was 1 minor complication in this group, oxygen desaturation to 88%, which resolved with stimulation. Of the 55 procedures, 45 (82%) yielded purulence: 29 (97%) of 30 in the CS group and 16 (64%) of 25 in the non-CS group ($\chi^2 = 9.8; P = .002$). Of those children undergoing CS, 3 (10%) of 30 were admitted to the hospital from the emergency department as compared with 6 (24%) of 25 without CS ($\chi^2 = 1.95; P = .16$). In the CS group, PTAs had a low recurrence rate of 1 (3.3%) of 30 compared with 2 (8%) of 25 in the non-CS group ($\chi^2 = 0.57; P = .45$). No one in the CS group required a secondary procedure under general anesthesia.

Conclusions: This preliminary study demonstrates CS to be a potentially safe and efficacious approach to drainage of PTAs in children. Given its efficacy and associated lower levels of anxiety and pain for the patient, CS seems to be a promising new approach to caring for children with PTAs.


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METHODS

The medical records of all patients presenting to the ED of the St Louis Children’s Hospital, in St Louis, MO, from April 1995 until February 1998 with the discharge diagnosis of PTA or peritonsillar cellulitis (International Classification of Diseases, Ninth Revision, code 475) were reviewed. A start date of April 1995 was chosen because this coincided with CS availability for use with PTAs. There were 56 patients who fulfilled the entry criteria. Three patients were excluded because an I&D was not performed and an otolaryngology consultation was not obtained.

A standard protocol for the implementation of CS was employed in each I&D procedure. The “nil by mouth” status ranged from 2 to 4 hours. Present during each procedure were at least 3 health care providers: the otolaryngologist who performed the I&D, a pediatric ED physician trained in the administration of CS, and a registered nurse who both monitored and documented vital signs and sedation level. The data discussed below were collected on the standard CS forms.

Continuous monitoring of the child’s heart rate and rhythm, oxygenation, airway patency, blood pressure, and level of consciousness was performed and documented at least every 5 minutes. This formal evaluation of level of consciousness and sedation included whether the child was awake, following commands, responding to painful stimuli, or unresponsive to pain. In addition, any complication and subsequent interventions were documented. Each child had an intravenous access. The procedure room had both airway stabilization and advanced cardiac life support equipment available.

The sedation provided by the ED physician was titrated to a level where the child appeared slightly dazed and comfortable while still able to follow commands and protect his or her airway. The medication was documented on the CS protocol sheet and most often included midazolam and ketamine for sedation and glycopyrrolate to decrease oral secretions. For midazolam, a dose of 0.1 mg/kg (maximum, 2.5 mg per dose) was given every 3 minutes to effect glassy or half-mast eyes or slurred speech. For ketamine, a dose of 0.5 mg/kg was given every 3 minutes until unfixed gaze, nystagmus, or decreased withdrawal response was noted. Glycopyrrolate was given at a dose of 5 µg/kg (maximum dose, 250 µg).

The CS regimen administered was most commonly a combination of ketamine and midazolam. Morphine sulfate was given in 6 patients in combination with midazolam. Sixteen patients received glycopyrrolate to decrease secretions. The average weight-adjusted total doses were as follows: ketamine, 0.8 mg/kg (range, 0.37-1.43 mg/kg); midazolam, 0.12 mg/kg (range, 0.03-0.75 mg/kg); morphine sulfate, 0.12 mg/kg (range, 0.09-0.22 mg/kg); and glycopyrrolate, 3.6 µg/kg (range, 0.47-5.3 µg/kg). The I&D was performed by the otolaryngology resident or fellow. The patient was placed in an upright, slightly forward position. The technique used varied depending on the surgeon’s preference.

The patient was closely observed after the completion of the procedure. The criteria for discharge after CS included being awake, verbalizing and walking with minimal help, and a demonstrated ability to tolerate oral fluids. The time required for postprocedural observation ranged from 30 minutes to 2 hours.

Conscious sedation complications were defined as major and minor, based on the descriptions by Graff et al. Major complications included the need for assisted ventilation, tracheal intubation, naloxone hydrochloride treatment for reversal of sedation, significant bleeding, and aspiration. Minor complications included oxygen saturation below 90% that corrected either spontaneously or with noninvasive measures such as verbal reminders, jaw thrusts, or supplemental oxygen.

During the study period, CS was not randomly employed since its use was based on the ED physician’s availability or the presiding otolaryngology resident’s familiarity with the procedure. A comparison of the children who underwent I&D with and without CS during this period looked at procedural efficacy, time until discharge, PTA recurrence within 1 month of the original procedure, a need for hospital admission, and procedural findings. Data were entered into a spreadsheet program (Excel 9, Microsoft Corporation, Redmond, Wash). Differences in demographic characteristics and clinical and outcome measures between the CS and non-CS groups were assessed with the x² statistic. A probability level of P<.05 or lower (2-tailed) was considered significant.

RESULTS

DEMOGRAPHIC CHARACTERISTICS

There were 52 children (18 male, 34 female), ranging in age from 4 to 17 years (average age, 11.2 years). The mean symptom duration prior to presentation was 5 days. Fifty-five I&D procedures were performed, 30 with CS and 25 without. Three patients in the CS group experienced recurrence 6 to 12 months after the procedure (Table).

PTAs are frequently anxious and in pain secondary to both their abscess and our therapeutic interventions. Otolaryngologists may perform either incision and drainage (I&D) or immediate tonsillectomy in the operating room under general anesthesia. Incision and drainage under local anesthesia is also a safe and cost-effective treatment in such cases. Many of the disease processes in pediatric patient, none has specifically addressed otolaryngologic procedures. A combination of ketamine and midazolam. Morphine sulfate was given in 6 patients in combination with midazolam. Sixteen patients received glycopyrrolate to decrease secretions. The average weight-adjusted total doses were as follows: ketamine, 0.8 mg/kg (range, 0.37-1.43 mg/kg); midazolam, 0.12 mg/kg (range, 0.03-0.75 mg/kg); morphine sulfate, 0.12 mg/kg (range, 0.09-0.22 mg/kg); and glycopyrrolate, 3.6 µg/kg (range, 0.47-5.3 µg/kg). The I&D was performed by the otolaryngology resident or fellow. The patient was placed in an upright, slightly forward position. The technique used varied depending on the surgeon’s preference.

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The CS group was more likely than the non-CS group to maintain their airways and kept oxygen saturation between 93% and 100%.

There were no major complications and only 1 minor complication in the non-CS group. A complication in the CS group was a brief episode of oxygen desaturation to 88% and only 1 minor complication. The minor complication was a stimulation in a 4-year-old who had a temporary oxygen desaturation to 88% that immediately resolved with stimulation.

The results of this study indicate that the use of CS is a potentially safe and effective approach to the drainage of pediatric PTAs. There were no major complications and only 1 minor complication. The minor complication was a brief episode of oxygen desaturation to 88% in a 4-year-old, which immediately resolved with verbal and external stimulation. The CS group was significantly more likely to demonstrate purulence on I&D (P = .002), suggesting a more accurate diagnosis and successful treatment. Our results suggest that a diagnosis of cellulitis (rather than an abscess) would more likely be assigned to an “uncooperative” patient, while the child resting comfortably receives the more thorough and accurate diagnosis. The CS group was less likely to be admitted to the hospital, perhaps secondary to the complete drainage of the abscess. No patient in the CS group required a secondary procedure under general anesthesia compared with 3 children in the non-CS group.

Interestingly, most of the patients in both PTA groups were discharged from the ED after I&D. There was a trend, although not statistically significant, for the CS children to be discharged home more often than those in the non-CS group. Children treated for PTAs are routinely given a dose of intravenous antibiotics and a bolus of intravenous isotonic sodium chloride solution prior to discharge. They are sent home with oral antibiotics, Tylenol, and strict instructions to return immediately if there is any difficulty with oral intake; they are followed up in 1 week. In addition, the recurrence rates of 3% to 7% are similar to those of other reports, further supporting that a single incidence of PTA is not an absolute indication for tonsillectomy. Although not the primary objective of our study, the substantial improvement in patient comfort with CS became rapidly apparent to both ED physicians and otolaryngologists, helping to establish it as the primary method since July 1997 at our institution.
airway patency and respiratory drive.14 In the last 10 years there has been a substantial increase in the use of CS in physician offices, dental offices, ambulatory surgical centers, and EDs. The pediatric ED physicians at St Louis Children’s Hospital are formally trained in the administration of CS and are active in its use in other pediatric procedures. The strict guidelines for CS presented by the American Academy of Pediatrics in 1985 was subsequently updated in 1992.13,14 The stated goals in these guidelines were to (1) guard the patient’s safety and welfare; (2) minimize physical discomfort or pain; (3) minimize negative psychological response to treatment by providing analgesia and amnesia and maximize the potential for amnesia; (4) control behavior; and (5) return the patient to a state that allows for safe discharge, as determined by recognized criteria.14

The primary drugs used include ketamine, midazolam, and morphine for sedation and pain control and glycopyrrolate for secretion control. There is no consensus as to the best combination. There is a very fine line between conscious and deep sedation that correlates with the intactness of airway reflexes. Great care must be taken, especially during an upper airway procedure, to prevent aspiration. Ketamine is a dissociative anesthetic that induces analgesia and profound sedation while maintaining spontaneous respiration and laryngeal reflexes. One of the potential adverse effects is a hallucinatory emergence reaction, usually occurring in adults, a problem that may be decreased by a benzodiazepine. Ketamine stimulates salivary and tracheobronchial secretions, and an anticholinergic agent should be concurrently administered. We have used glycopyrrolate for this purpose. Midazolam is a benzodiazepine that produces anxiolytic, sedative, and amnestic effects. However, it may also depress respiration. The therapeutic titrations for this study were determined by the ED physicians according to the CS protocol.

Although CS has been shown in this study to be potentially safe and efficacious in a common otolaryngologic procedure such as PTA treatment, CS remains a highly specialized undertaking. The narrow therapeutic window between adequate pain and/or anxiety control and adverse effects must be kept in mind. The vigilant monitoring and specialized training required limits the safe and effective use of this procedure to tertiary care facilities where ED physicians and nurses are trained in and comfortable with the use of CS. It should be restricted to generally healthy patients without comorbid disease who meet the criteria for the American Society of Anesthesiologists class I or class II patient. There should be no evidence of airway compromise or contraindication to CS medications. This study is limited by the number of patients involved and its retrospective nature. A larger cohort is necessary to confirm the safety of CS in the treatment of PTAs. Although there was a protocol established for CS reporting, there may have been some minor events such as nausea or vomiting that were not documented.

A child’s pain, anxiety, and difficulty understanding directions often result in attempts to escape. These make procedures more difficult for the clinician and more painful for the patient. As physicians, we often view the therapeutic procedure as the exclusive medical goal for a patient, and any discomfort or anxiety this produces as an unfortunate but acceptable collateral effect. Fortunately, this is changing. There is an increasing recognition of the relative undertreatment of pain in children and an increased focus on pain assessment and treatment.15 This sensitivity has produced a substantial increase in ED analgesia use.13 However, physicians are unfortunately also less likely to prescribe analgesics to children than to adults in identical clinical situations.16,17 This is in spite of a documented lower pain threshold and tolerance in children than in adults. The advent of CS may provide the necessary pain control for patients while providing reluctant physicians with a sedating technique that they can use comfortably.

CONCLUSION

Our study of CS at the St Louis Children’s Hospital presents the first data demonstrating the potential for safety and efficacy of CS in pediatric otolaryngologic procedures. It indicates that CS in the proper setting is safe. The advantages of CS include patient comfort, the potential for more easily accomplished procedures, reduced numbers of hospital admissions, and more successful surgical outcomes. We advocate CS as a potentially safe and effective alternative to either a general anesthetic or physical restraint. Further investigation of CS is necessary to document completely its role in pediatric otolaryngology.

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REFERENCES


