

## A Comparative Study: Dexmedetomidine/Ketamine versus Propofol/Ketamine Combination for Sedation in Patients Undergoing Dacryocystorhinostomy (DCR) Surgery under Local Anesthesia

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**Abstract: Objective:** The purpose of this study was to compare the effects of dexmedetomidine-ketamine and propofol-ketamine combinations on hemodynamics, respiration, sedation level, and the recovery period in patients undergoing DCR under local anesthesia. **Methods:** Fifty patients undergoing dacryocystorhinostomy surgery under regional anesthesia were divided into two groups. The first group received Dexmedetomidine plus ketamine (group DK, n = 25). The patients received an infusion of 0.5 ug/kg/h of Dexmedetomidine and 0.5 mg/kg/h of ketamine. The second group received Propofol plus ketamine (group PK, n = 25), the patients received 0.5mg/kg/min of Propofol and 0.5mg/kg/h of ketamine by infusion. Hemodynamic data, respiratory rate, and sedation scores were recorded. Sedation level was titrated to a Ramsay sedation scale (RSS) every 5 minutes. Postoperative Aldrete score recovery time were assessed. **Results:** Both groups provided a similar significant reduction in heart rate and mean arterial pressure compared with baseline. The oxygen saturation values of Dexmedetomidine/Ketamine (DK) group were higher than those of Propofol/ Ketamine (PK) group. The respiratory rate values of the Dexmedetomidine/Ketamine (DK) group were higher than those in the Propofol/Ketamine (PK) group. The time required to achieve targeted levels of sedation was significantly longer in the Dexmedetomidine/ ketamine (DK) group. Postoperatively the time to achieve an Aldrete score of 10 was higher in Propofol/Ketamine (PK) group. **Conclusion:** Dexmedetomidine combination with small-dose of Ketamine may prove to be a valuable adjuvant for sedation in patients undergoing DCR surgery, and it may be a valuable alternative to Propofol/Ketamine combination.

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### 1. Introduction

Monitored anesthesia care (MAC) is useful for various clinical fields such as minimally invasive surgery, ocular surgery, gastrointestinal endoscopy, and interventional or radiological procedures<sup>(1,2)</sup>. It provides suitable intraoperative conditions as well as comfort for patients. The commonly used drugs are Midazolam, Propofol, ketamine and Opioids such as Fentanyl, Alfentanil or Remifentanil. Occasionally, the administration of sedatives or hypnotics in conjunction with analgesics can cause significant respiratory depression and/or transient upper airway obstruction<sup>(3)</sup>.

Dexmedetomidine is a highly selective  $\alpha_2$ -adrenoceptor agonist with eight times higher specificity for the receptor compared to Clonidine. It provides excellent sedation and analgesia with minimal respiratory depression<sup>(4)</sup>.

External dacryocystorhinostomy (DCR) remains the gold standard for the treatment of epiphora caused by nasolacrimal duct (NLD) obstruction which is traditionally performed under general anesthesia (GA). In recent years, there has been a progressive move by surgeons toward DCR performance under

local anesthesia (LA), and intravenous sedation as an outpatient procedure<sup>(5,6,7)</sup>.

### 2. Materials and Methods:

Fifty ASA I-II-III adult patients scheduled for elective DCR surgery under regional anesthesia were enrolled in this prospective, single-blind, randomized study. Expected time of surgery was less than 2 hours. On arrival at the operating room, routine monitors were applied for recording heart rate (HR), systolic and diastolic blood pressure, mean arterial blood pressure (MAP) and peripheral oxygen saturation (SpO<sub>2</sub>). After obtaining baseline values, patients were randomly allocated to receive one of two study protocols.

Patients were randomized to receive either Dexmedetomidine plus ketamine, group DK, (group1, n = 25). The patients received an infusion of 0.5 ug/kg/h of Dexmedetomidine and 0.5 mg/kg/h of ketamine. The Propofol plus ketamine group (group2, n= 25). The PK patients group received 50 ug/kg/min of Propofol and ketamine 0.5 mg/kg/h by infusion.

Heart rate (HR), systolic and diastolic blood pressure, mean arterial pressure (MAP), respiratory rate (RR), and oxygen saturation (SpO<sub>2</sub>) were recorded.

Topical anesthetic drop (tetracaine) was instilled in both conjunctival sacs of each patient. The local anesthetic solution consisted of 2% lidocaine, and 0.5% levobupicaine in ratio 1:1, without adding epinephrine. Injections included 2 cc in the infratrochlear region, 2 cc in the infraorbital region, 2 cc in 5 mm superior to the medial canthus at the depth of 15-20 mm, and 2 cc subcutaneously on the flat side of the nose beneath the incision site. In addition, a piece of gauze immersed in Lidocaine gel was packed through the nostril of the side of the operation and left in place for 20 minutes before the operation starts.

Patients in both groups underwent standard external DCR. After a straight 12-15 mm incision through the skin, blunt dissection between skin and orbicularis muscle was performed. The periosteum was incised and elevated. Bony rhinostomy was made in front of lacrimal sac. After opening the lacrimal sac, in patients who had canalicular obstruction, silicone tube was passed through the canaliculi, and finally the mucosa was incised and nasal flaps created in the usual manner. Anastomosis was also performed as the final step. Sedation level was titrated to a Ramsay sedation scale (RSS) every 5 minutes (table 1)<sup>(8)</sup>. Postoperative Aldrete score recovery time were assessed in both groups<sup>(9)</sup>.

**Table (1) Ramsay sedation score (RSS):**

Score	Observation
1	Anxious, agitated or restless
2	Cooperative, oriented and tranquil
3	Responsive to commands
4	Asleep, but with brisk response to light glabellar tap or loud auditory stimulus
5	Asleep, sluggish response to glabellar tap or auditory stimulus
6	Asleep no response

**Statistical Analysis**

The number of patients was determined on the basis of the results of a preliminary investigation during which the sample size was calculated to be 25 patients per group. The statistical analysis of our results was conducted using the computer program SPSS version 15.0 for Windows. We considered  $P < 0.05$  to be statistically significant.

**3. Results**

The two groups were comparable with respect to the following variables; age, sex, weight, ASA status, and duration of surgery ( $P > 0.05$ ). The time required from the start of the infusion of the study drugs to achieve targeted levels of sedation was significantly longer in the Dexmedetomidine /ketamine group (18.36±4.66 min) than in the Propofol /ketamine group (10.96±3.27min) ( $P = 0.001$ ) (Table 2).

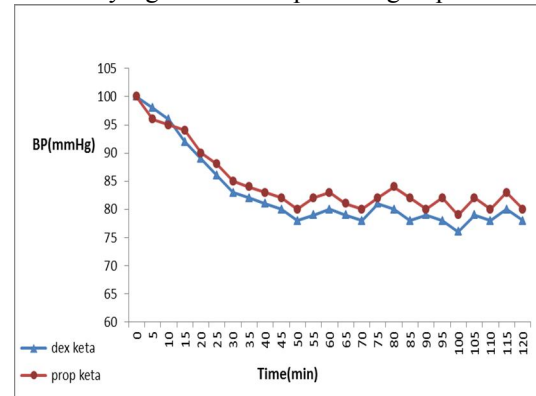
In both groups, there were a similar significant reduction in HR and MAP compared with baseline values ( $P > 0.05$ ) (Fig. 1). However, there was no significant difference in the Ramsay Sedation Score (RSS) levels throughout the sedation period (Fig. 2).

Furthermore, there was significant reduction in the respiratory rate (RR) in the Propofol/Ketamine group ( $P < 0.05$ ) compared with baseline values. RR values in the Dexmedetomidine/Ketamine group were significantly higher than those in the Propofol/Ketamine group during the sedation period ( $P < 0.05$ ). The  $SpaO_2$  values in the Dexmedetomidine/Ketamine group did not change from baseline, while there was significant reduction in the  $SpaO_2$  in the Propofol/Ketamine group ( $P < 0.05$ ) compared with the baseline values (Fig. 3).  $SpaO_2$  values in the Dexmedetomidine/Ketamine group were significantly higher than those in the Propofol/Ketamine group during the sedation period ( $P < 0.05$ ). Aldrete score of 10 was similar in both groups ( $P = 0.084$ ), yet Dexmedetomidine/Ketamine group had significantly lower levels than Propofol/Ketamine in the first 30 minutes postoperatively (Fig. 4).

**Table (2) Demographic and selected clinical data of the study groups**

	Group DK (n=25)	Group PK (n=25)	P value
Age (yr)	50.16±9.47	51.11±8.02	0.337
Weight (kg)	72.50±3.74	73.36±4.89	0.062
Sex (M/F)	13/12	14/11	0.792
ASA class I/II/III (n)	10/9/ 6	11/8/ 6	0.1
Duration of surgery (min)	109.03±7.62	110. 73±6.29	0.208
Time to achieve adequate sedation level	18.36±4.66	10.96±3.27*	0.001
Time to achieve an Aldrete score of 10 (min)	45.53 ±6.51	35.60±6.42*	0.084

Data are displayed as means ± standard deviations. \*Statistically significant compared to group DK.



**Fig (1): Blood pressure changes in both groups**

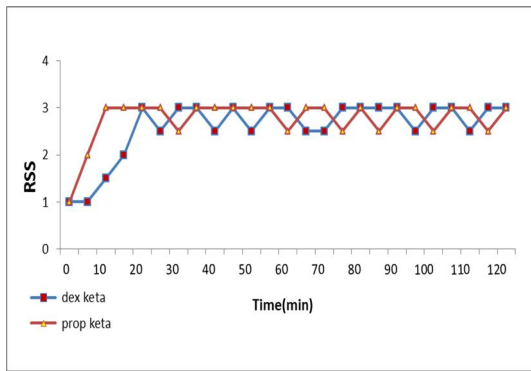


Fig (2): Ramsay Sedation Score (RSS) in both groups

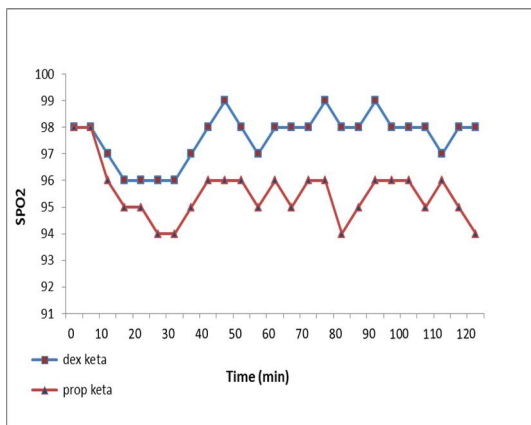


Fig (3): Spo2 changes in both groups

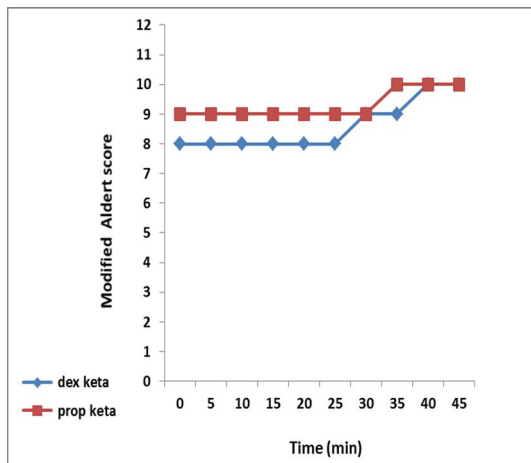


Fig (4): Modified Aldrete Score in both groups

#### 4. Discussion

Many studies have shown the usefulness of LA in the elderly patients, who frequently have coexisting cardiovascular disease. Kratky *et al.* reported 25 consecutive DCRs under LA in the elderly patients, that none had to convert to GA, and none suffered any adverse effects<sup>(10,11)</sup>. McNab and Simmie established the effectiveness, complications, and patients acceptance of LA with intravenous sedation for external DCR<sup>(12)</sup>.

Dexmedetomidine is an  $\alpha_2$ -adrenergic agonist which initially received FDA approval in the United States in 1999 for the sedation of adults during mechanical ventilation and subsequently in 2009 for monitored anesthesia care (MAC) of adults. While FDA-approved only for use in adults, Dexmedetomidine has been used safely and successfully in several different clinical scenarios in infants and children including sedation during mechanical ventilation, procedural sedation, supplementation of postoperative analgesia, prevention of emergence delirium, control of post-anesthesia shivering, and the treatment of withdrawal<sup>(13)</sup>. Although generally effective for sedation during non-invasive procedures, Dexmedetomidine as the sole agent has not been uniformly successful for invasive ocular procedures<sup>(14)</sup>. Given these issues, the combination of ketamine and Dexmedetomidine may be preferred for invasive procedures.

At equipotent sedative dose Propofol/Ketamine and Dexmedetomidine/Ketamine resulted in an equivalent mild reduction in MAPs. However, this decrease in MAP did not require treatment in either group. Higher surgeon satisfaction was observed in group (PK) compared with that in group (DK) which may have been related to patient cooperation during the operation. Recovery times were longer in group (DK) than those in the other group. This finding could be attributed to sustained therapeutic plasma concentrations of Dexmedetomidine, which has a longer context-sensitive half-time compared with that of Propofol. In contrast, the elimination half life of Dexmedetomidine is 2-3 hours, with a context-sensitive half-time ranging from 4 minutes after a 10 minute infusion to 250 minutes after an 8 hour infusion.

Although limited when compared to reports using only Dexmedetomidine, there have been reports in the literature regarding the use of a Dexmedetomidine/ketamine combination for procedural sedation in the pediatric population<sup>(15)</sup>.

The addition of ketamine to Propofol is thought to counteract the cardiorespiratory depression that occurs when Propofol is used alone, whereas Propofol blunts the psychometric and nauseant effects of ketamine.

Ketamine provides an analgesic effect that is absent when Propofol is used alone, which, for some clinicians, may represent a further advantage. Using ketamine and propofol in combination allows to benefit from the advantages of each, and minimizing their drawbacks.

Propofol is widely used for sedation during eye surgery because of its short duration of action, no cumulative effect, unique recovery profile as well as

its rapid emergence. In contrast, Dexmedetomidine is a highly selective alpha-2-adrenoreceptor agonist with both sedative and analgesic properties and is devoid of respiratory depressant effect. Dexmedetomidine has been studied for sedation and analgesia sparing properties in various surgical procedures<sup>(16,17)</sup>.

At equipotent sedative doses Propofol/Ketamine and Dexmedetomidine/Ketamine resulted in an equivalent mild reduction in MAPs. However, this decrease in MAP did not require treatment in either group. This study demonstrated that both groups were effective in providing adequate intraoperative sedation, the Dexmedetomidine/Ketamine group (group Dk) patients were more satisfied with their sedation than those of the Propofol/Ketamine group (group Pk). This could be explained, at least in part, by the additional analgesic property of Dexmedetomidine that could have contributed to improved patients' perception of this form of sedation, and in part, by potential differences in the quality of sedation of the two drugs .

### Conclusion

Although infusion of Dexmedetomidine /Ketamine and Propofol/Ketamine provided safe and adequate sedation and patient comfort in the DCR procedure, analgesic and respiratory variables were better with Dexmedetomidine/Ketamine than Propofol/Ketamine. Therefore, Dexmedetomidine in combination with small-dose Ketamine can be useful during DCR and it may be a valuable alternative to Propofol/Ketamine.

### References

1. Sedation in gastrointestinal endoscopy: Current issues. John K Triantafillidis, Emmanuel Merikas, Dimitrios Nikolakis, Apostolos E Papalois. *World J Gastroenterol*. 2013 January 28; 19(4): 463–481
2. A Pilot Study of Ketamine versus Midazolam/Fentanyl Sedation in Children Undergoing GI Endoscopy. Jenifer R. Lightdale, Paul D. Mitchell, Meghan E. Fredette, Lisa B. Mahoney, Steven E. SRT Zgleszewski, Lisa Scharff, Victor L. Fox. *Int J Pediatr*. 2011; 2011: 623710
3. Intravenous infusion of ketamine-Propofol can be an alternative to intravenous infusion of Fentanyl-Propofol for deep sedation and analgesia in pediatric patients undergoing emergency short surgical procedures. Samit Kumar Khutia, Mohan C Mandal, Sabyasachi Das, SR Basu. *Indian J Anaesth*. 2012 Mar-Apr; 56(2): 145–150.
4. Update on Dexmedetomidine: use in nonintubated patients requiring sedation for surgical procedures. Mohanad Shukry, Jeffrey A Miller. *Ther Clin Risk Manag*. 2010; 6: 111–121.
5. Maheshwari R. Single-prick infiltration anesthesia for external dacryocystorhinostomy. *Orbit* 2008; 27(2):79-82
6. Ciftci F, Pocan S, Karadayi K, Gulecek O. Local versus general anesthesia for external dacryocystorhinostomy in young patients. *Ophthal Plast Reconstr Surg* 2005; 21(3):201-6
7. Caesar RH, McNab AA. External dacryocystorhinostomy and local anesthesia: technique to measure minimized blood loss. *Ophthal Plast Reconstr Surg* 2004; 20(1):57-9.
8. R Riessen, R Pech, P Tränkle, G Blumenstock, M Haap. Comparison of the Ramsay Sedation Score and the Richmond Agitation Sedation Score for the measurement of sedation depth. *Crit Care*. 2012; 16(Suppl 1): P326.
9. Aldrete JA. The post-anesthesia recovery score revisited. *Journal of Clinical Anesthesiology*. 1995;7:89–91
10. Kratky V, Hurwitz JJ, Ananthanarayan C, Avram DR. Dacryocystorhinostomy in elderly patients: regional anesthesia without cocaine. *Can J Ophthalmol* 1994;29(1):13-6.
11. Hurwitz JJ, Merkur S, DeAngelis D. Outcome of lacrimal surgery in older patients. *Can J Ophthalmol* 2000; 35(1):18-22.
12. McNab AA, Simmie RJ. Effectiveness of local anaesthesia for external dacryocystorhinostomy. *Clin Experiment Ophthalmol* 2002;30(4):270-2.
13. Tobias JD. Dexmedetomidine: Applications in pediatric critical care and pediatric anesthesiology. *Pediatr Crit Care Med*. 2007;8:115–31.
14. Jalowiecki P, Rudner R, Gonciarz M, Kawecki P, Petelenz M, Dziurdzik P. Sole use of Dexmedetomidine has limited utility for conscious sedation during outpatient colonoscopy. *Anesthesiology*. 2005;103:269–73
15. Tosun Z, Akin A, Guler G, Esmaglu A, Boyaci A. Dexmedetomidine-ketamine and Propofol-ketamine combinations for anesthesia in spontaneously breathing pediatric patients undergoing cardiac catheterization *J Cardiothorac Vasc Anesth*. 2006 Aug;20(4):515-9. Epub 2006 Jan 23.
16. Ghali A, Mahfouz AK, Ihanamäki T, El Btarny AM. Dexmedetomidine versus Propofol for sedation in patients undergoing vitreoretinal surgery under sub-Tenon's anesthesia. *Saudi J Anaesth*. 2011 Jan; 5(1):36-41
17. Arain SR, Ebert TJ. The efficacy, side effects, and recovery characteristics of Dexmedetomidine versus Propofol when used for intraoperative sedation. *Anesth Analg* 2002; 95: 461–6.

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