Dexmedetomidine Supported Office Based Genioplasty: A Pilot Study

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Abstract

Introduction Despite the availability of wide variety of pharmacological agents for dental procedural sedation, there has always been a continuous search for newer sedative agents. Dexmedetomidine is a newer sedative agent for provision of short-term sedation (<24 h) in adult patients in the intensive care unit setting. It is a selective α_2 adrenergic receptor agonist. The reports on off-label use of this drug in a variety of settings for invasive and non invasive procedural sedation have provided encouraging results.

Material and methods The present paper reports a pilot study observing clinical efficacy of the newer drug dexmedetomidine in patients undergoing office based sliding genioplasty for correction of facial asymmetry. Subjects were sedated with dexmedetomidine with a loading dose of 0.5 mcg/kg over 10 min followed by a continuous infusion dose of 0.1 mcg/kg/h, the recovery process was observed for 60 min after the dexmedetomidine infusion was stopped. The patients were observed pre operatively, intra operatively (every 10 min) and postoperatively for the

following parameters—oxygen saturation (SpO_2), mean arterial pressure (MAP), heart rate (HR), and Ramsay sedation score (RSS), respiratory rate, pain scale.

Keywords Dexmedetomidine · Sedation · Genioplasty · Office based · Local anaesthesia

Introduction

Advancements in dental technology have made dentistry virtually pain-free, but fear and anxiety still keep millions of patients away from the dental office every year. Anxiety can lead to various psychosocial consequences for a patient. Patients who have high degree of anxiety for dental treatment are associated with higher propensity to depression and anti-social behaviors [1]. Treatment is often delayed [2], particularly when the disease can be treated conservatively until more aggressive measures become their only option [2]. For these patients, local anaesthesia is not enough and a sedative is often needed to put them at ease during dental treatment.

An increasing number of surgical procedures involving the head and neck are now performed under local anaesthesia augmented by intravenous sedation [3–6]. Balanced use of sedative–hypnotic and analgesic agents is a key in providing patient comfort and safety in office based procedures.

Techniques such as genioplasty, blepharoplasty, open reduction of undisplaced mandibular fractures as well as a number of a temporomandibular joint (TMJ) procedures like placement and removal of intra-oral distractors require varying degree of sedation to get accomplished under local anaesthesia. A number of agents have been tried as sedatives for dental procedural sedation such as chloral hydrate

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[7–9], meperidine [7, 8], hydroxyzine [7, 10], promethazine [7], ketamine [11, 12] propofol [13, 14] and benzodiazepines [10, 11, 15, 16] etc., each having its own advantages and limitations. Dexmedetomidine is a newer sedative agent currently approved by Food and Drug Administration (FDA) for provision of short-term sedation (<24 h) in adult patients. Surgeries performed under local anaesthesia supplemented with short acting sedatives have advantages of reduced hospitalization thereby leading to the concept of “outpatient orthognathic surgery.” [17–20]. In addition, monitoring of patients is very important in terms of assessing hemodynamic changes, however, at a minimum, the facilities including reliable source of oxygen, suction, resuscitation equipment, emergency drugs and monitoring equipment should be available [21]. Here we are presenting a pilot study of five patients with facial asymmetry planned to undergo sliding genioplasty under local anaesthesia with intravenous (iv) dexmedetomidine.

Study Design

Five patients of facial asymmetry presented to the department of oral and maxillofacial surgery, PGIDS, Rohtak, during the year 2013 were planned for surgical management. All the patients were apparently healthy, belonging to ASA class I, between 20 and 30 years of age (Table 1). Among them two patients had retrognathic chin and three patients had prognathic chin. Two patients were previously operated for TMJ ankylosis under general anaesthesia. All these patients were planned for genioplasty under local anaesthesia with iv dexmedetomidine. An informed written consent was taken from all the patients for study.

An iv access was secured with (20-gauge) catheter and an infusion of 0.9 % normal saline solution was started at 2 ml/kg/h. Subjects were sedated with dexmedetomidine with a loading dose of 0.5 mcg/kg over 10 min followed by a continuous infusion dose of 0.1 mcg/kg/h, the recovery process was observed for 60 min after the dexmedetomidine infusion was stopped.

2–3 ml of 2 % lignocaine was infiltrated in the lower labial vestibule for local anaesthesia. After achieving satisfactory anaesthesia, mucosal incision was given 6–8 mm away from the depth of the vestibule or halfway between depth of the vestibule and wet dry line. Then the incision was extended horizontally to the alveolar process. Reflection of the periosteum was carried out ensuring that 5 mm of periosteal attachment was maintained at the lower anterior border. Orientation grooves were placed. Osteotomy cuts were given 5 mm below the canine root tip. Extension, proximally 4–5 mm, below mental foramen was carried out. Spreader was used to free the lower segment. Using heavy artery forceps the lower segment was pulled out. The miniplates adapted to the desired shape were fixed depending on the amount of advancement or reduction. Two layer closure of incision line was done. The patients were observed pre operatively, intra operatively (every 10 min) and postoperatively for the following parameters—oxygen saturation (SpO₂), mean arterial pressure (MAP), heart rate (HR), and Ramsay sedation score (RSS), respiratory rate, pain scale (VAS 1–10, explained to the patients in pre operative period).

Before discharge, patients were assessed for stable vital signs and weaning off the effect of dexmedetomidine. None of the patients experienced any pain, discomfort throughout the procedure, also there was no adverse recall. The vital signs throughout the surgical procedure and post operatively were within the normal range (Table 2) with no complications of hypotension and bradycardia.

Discussion

Surgical procedures like genioplasty under local anaesthesia have advantages of good pain relief, shorter hospital stay, decreased postoperative opioid use, and decreases the incidence of postoperative nausea and vomiting (PONV), time spent in recovery room, and improved patient satisfaction [22]. When local anaesthesia is augmented with an iv sedative agent, the surgical burden decreases for both the

Table 1 Demographic characteristics, duration of surgery

Variables	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5
Age (years)	22	20	24	30	22
Gender (M/F)	F	M	M	M	M
Weight (kg)	48	56	60	65	65
ASA (I/II)	I	I	I	I	I
Procedure done	Reduction genioplasty	Reduction genioplasty	Advancement genioplasty	Reduction genioplasty	Reduction genioplasty
Duration of surgery (min)	38	42	65	58	45

Table 2 Evaluation of patients's parameters mean values, pre, intra, post operatively

Duration	HR	RR	SpO ₂	BP	RSS	VAS	Rescue therapy
0 min (pre op)	72	16	96	124/84	4	3	Not needed
10 min	62	15	98	112/72	4	2	Not needed
20 min	64	16	97	124/70	5	2	Not needed
30 min	60	18	96	124/72	5	2	Not needed
40 min	68	16	96	112/72	5	3	Not needed
50 min	62	16	96	118/76	5	2	Not needed
60 min	64	16	97	112/72	5	2	Not needed
Immediate post op	64	16	97	110/70	4	2	Not needed
10 min post op	62	16	96	114/74	3	2	Not needed
20 min post op	64	16	97	110/68	3	3	Not needed
30 min post op	68	16	98	120/78	3	3	Not needed

patient as well as surgeon with similar operating conditions comparable to general anesthesia. A large number of sedative agents for use with local anaesthesia are reported in the literature.

The continued quest for a novel sedating agent and need for drugs to blunt the stress response to the surgical stimulus has led to the increasing use of α_2 adrenergic agonists in these clinical settings. These drugs have a favourable pharmacological profile owing to their sympatholytic, sedative, analgesic, anxiolytic effects. Its sedative actions resemble physiologic sleep [23], and respiratory depression is less marked; this differs from the features of benzodiazepines and propofol, which have been proposed in the dental field for psychosedation.

Dexmedetomidine hydrochloride has been reported to decrease blood pressure and cause bradycardia via inhibition of the sympathetic nervous system and activation of the parasympathetic nervous system in the presence of α_{2a} receptor stimulation [24, 25].

Contrary to study of Taniyama et al. [26], there was no significant reduction in hemodynamic variables in our cases. Hemodynamic changes were marked during initial loading, needing close monitoring. The dose of dexmedetomidine used in our study was much less; however, it was sufficient to augment the analgesia and sedation required. In the present cases, the administration of dexmedetomidine hydrochloride did not influence the respiratory rate and SpO₂. The change in respiratory rate was consistent with findings reported by Yamashita et al. but changes in SpO₂ are contrary to his findings. SpO₂ in our cases was 95 % or greater in the absence of oxygen inhalation.

A number of clinical trials have reported a dose dependent sedative response with dexmedetomidine [27, 28]. An interesting finding regarding this drug's sedative effect is its resemblance with natural sleep [27]. A decrease in cerebral perfusion pressure with no effect on intracranial pressure has been reported [29, 30]. Dexmedetomidine has

also been reported to have advantage of less anterograde amnesia, which can be a good factor in considering it for office based dental procedures [21].

In cases of office based sedation, importance of monitoring can not be ignored. At a minimum, the facilities including reliable source of oxygen, suction, resuscitation equipment, emergency drugs and monitoring equipment should be available [31].

Future Prospective and Conclusion

Preliminary experience with low dose of dexmedetomidine for augmentation of local anaesthesia and reports on usage of this agent in dental office based procedures requiring sedation are encouraging because of stable respiratory profile and antisialagogue properties. However, adequate monitoring during the procedure should be taken care of, also its usage in paediatric and geriatric population for dental procedure may be warranted because of absolute lack of data in this age group. Moreover, anterograde amnesia was not evaluated in this study; this is the limitation of this study. Hence, there is definite need of research in this untouched area and we suggest that randomised control studies should be conducted.

References

1. Locker D (2003) Psychological consequences of dental fear and anxiety. *Community Dent Oral Epidemiol* 31(2):144–151
2. Chanpong B, Haas DA, Locker D (2005) Need and demand for sedation or general anesthesia in dentistry: a national survey of the Canadian population. *Anesth Prog* 52(1):3–11
3. Spear SL, Mansuer ME, Kawamoto HK (1987) Sliding genioplasty as a local anesthesia outpatient procedure: a prospective two center trial. *Plast Reconstr Surg* 80:55–63
4. Van Sickels JE, Tiner BD (1992) Cost of genioplasty under deep intravenous sedation in a private office versus general anesthesia

- in an outpatient surgical center. *J Oral Maxillofac Surg* 50:687–690
5. Konovitch JW (1997) Intravenous sedation for aesthetic surgery. In: Aston SJ, Beasley RW, Thorne CHM (eds) *Grabb and Smith's plastic surgery*, 5th edn. Lippincott-Raven, Philadelphia
 6. Raffaini M, Hernandez AF, Ghilardi R, Garcia LA (2002) The sagittal mandibular osteotomy under local anesthesia and intravenous sedation: four years of multicenter experience. *Int J Adult Orthodon Orthognath Surg* 17(4):267–271
 7. Nathan JE, West MS (1987) Comparison of chloral hydrate-hydroxyzine with and without meperidine for management of difficult pediatric patients. *J Dent Child* 54:437–443
 8. Sams DR, Thorton JB, Wright JM (1992) The assessment of two oral sedation drug regimens in pediatric dental patients. *J Dent Child* 59:306–312
 9. Littman RS, Kotra JA, Verga RA, Berkowitz RJ, Ward DS (1998) Chloral hydrate sedation. The additive sedative and respiratory depressant effect of nitrous oxide. *Anesth Analg* 86:724–728
 10. Shapira J, Holan G, Botzer E, Kupletzky A, Tal E, Fuks A (1996) The effectiveness of midazolam and hydroxyzine as sedative agents for young pediatric dental patients. *J Dent Child* 63:421–425
 11. Roelofse AJ, Joubert VD, Roelofse RGP (1996) A double-blind randomized comparison of midazolam alone and midazolam combined with ketamine for sedation of pediatric dental patients. *J Oral Maxillofac Surg* 54:238–844
 12. Roelofse AJ, Shipton AE, de la Harpe JC, Blignaut JR (2004) Intranasal sufentanil/midazolam versus ketamine/midazolam for analgesia/sedation in the pediatric population prior to undergoing multiple dental extractions under general anesthesia: a prospective, double-blind, randomized comparison. *Anesth Prog* 51:114–121
 13. Arya VS, Damle SG (2002) Comparative evaluation of midazolam and propofol as intravenous sedative agents in the management of unco-operative children. *J Indian Soc Pedod Prev Dent* 20:6–8
 14. Mittal N, Goyal A, Gauba K, Kapur A, Jain K (2013) A double blind randomized trial of ketofol versus propofol for endodontic treatment of anxious pediatric patients. *J Clin Pediatr Dent* 37(4):415–420
 15. Kapur A, Chawla SH, Goyal A, Gauba K, Bhardwaj N (2004) Efficacy and acceptability of oral-transmucosal midazolam as a conscious sedation agent in pre-school children. *J Indian Soc Pedod Prev Dent* 22:109–113
 16. Damle SG, Gandhi M, Laheri V (2008) Comparison of oral ketamine and oral midazolam as premedication in pediatric dental patients. *J Indian Soc Pedod Prev Dent* 26:97e100
 17. Knoff SB, Van Sickels JE, Holmgren WC (1991) Outpatient orthognathic surgery: criteria and review of cases. *J Oral Maxillofac Surg* 49:117–121
 18. Lupori JP, Van Sickels JE, Holmgren WC (1997) Outpatient orthognathic surgery: review of 205 cases. *J Oral Maxillofac Surg* 55:558–563
 19. Dann JJ (1998) Outpatient oral and maxillofacial surgery: transition to a setting and outcome of the first 200 cases. *J Oral Maxillofac Surg* 56:572–577
 20. Blakey GH, White RP (1999) Bilateral sagittal split osteotomies in ambulatory care setting. *Semin Orthod* 5:241–243
 21. Fan TW, Ti LK, Islam I (2013) Comparison of dexmedetomidine and midazolam for conscious sedation in dental surgery monitored by bispectral index. *Br J Oral Maxillofac Surg* 51:428–433
 22. Ragab A, ElShamaa H, Ibrahim M (2013) Dexmedetomidine, morphine, propofol vs midazolam, morphine, propofol for conscious sedation in rhinoplasty under local anaesthesia. A prospective, randomized study. *Egypt J Anaesth* 29:181–187
 23. Nelson LE (2003) The alpha 2-adrenoceptor agonist dexmedetomidine converges on an endogenous sleep-promoting pathway to exert its sedative effects. *Anesthesiology* 98:428–436
 24. Doze VA, Chen BX, Tinklenberg JA, Segal IS, Maze M (1990) Pertussis toxin and 4-aminopyridine differentially affect the hypnotic-anaesthetic action of dexmedetomidine and pentobarbital. *Anesthesiology* 73:304–307
 25. Sullivan AF, Kalso EA, McQuay HJ, Dickenson AH (1992) The antinociceptive actions of dexmedetomidine on dorsal horn neuronal responses in the anaesthetized rat. *Eur J Pharmacol* 215:127–133
 26. Taniyama K, Oda H, Okawa K, Himeno K, Shikanai K, Shibutani T (2009) Psychosedation with dexmedetomidine hydrochloride during minor oral surgery. *Anesth Prog* 56:75–80
 27. Hall JE, Uhrich TD, Barney JA et al (2000) Sedative, amnestic, and analgesic properties of small-dose dexmedetomidine infusions. *Anesth Analg* 90:699–705
 28. Doze VA, Chen BX, Maze M (1998) Dexmedetomidine produces a hypnotic-anesthetic action in rats via activation of central alpha-2 adrenoceptors. *Anesthesiology* 71:75–79
 29. Karlsson BR, Forsman M, Roald OK et al (1990) Effect of dexmedetomidine, a selective and potent alpha 2-agonist, on cerebral blood flow and oxygen consumption during halothane anesthesia in dogs. *Anesth Analg* 71:125–129
 30. Prielipp RC, Wall MH, Tobin JR et al (2002) Dexmedetomidine induced sedation in volunteers decreases regional and global cerebral blood flow. *Anesth Analg* 95:1052–1059
 31. Guidelines for office based anaesthesia by committee of ambulatory surgical care. Approved by ASA, House of Delegates, October 13, 1999. www.asahq.org. Accessed on 10 Oct 2014