

Conscious Sedation: A Bridge between the Real and Ethereal



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ABSTRACT: The most frequently encountered and unavoidable phenomenon in a dental practice is pain, often accompanied by fear and anxiety. Local anesthetic, which forms the foundation for pain-free dental treatment, does not serve the purpose in anxious patients and needs augmentation with “Conscious Sedation” techniques. Nitrous oxide is a frequently used inhalation anaesthetic in dentistry as it is known to provide anxiolysis, mild analgesia, and amnesia. It has proved to be safe in delivering conscious sedation for apprehensive dental patients. This review discusses the role of Nitrous oxide inhalation sedation (NOIS) in the field of endodontics highlighting its objectives, advantages and indications. It also brings to light the multidisciplinary applications of NOIS in dentistry.

KEYWORDS: Conscious sedation, Nitrous oxide, Nitrous oxide inhalation sedation, Anxiolysis, Analgesia.

INTRODUCTION

Anxiety and fear of pain are acknowledged to be the major deterrents to oral health which leads to negligence of dental treatment. Dental treatment has been ranked fifth among the most commonly feared situations [1]. One of the dental procedures that are feared by many people is endodontic treatment [2]. In addition, a higher level of anxiety may manifest as increased pain intensity. Local anaesthetic, which forms the foundation for pain-free endodontic treatment, does not serve the purpose in anxious patients and needs augmentation with “Conscious Sedation” techniques.

Conscious sedation is a drug-induced depression of consciousness during which the patient responds purposefully to verbal commands, either alone or accompanied by light tactile stimulation. No interventions are required to maintain a patent airway, and spontaneous ventilation is adequate as well as maintaining cardiovascular function [3]. Conscious sedation can be administered by oral, intramuscular, intravenous and inhalation routes [Table 1].

Table 1./ Conscious Sedation (Routes And Agents)

ROUTES of ADMINISTRATION	PHARMACOLOGICAL AGENTS
I. Oral	Hydroxyzine Promethazine Chloral hydrate Meperidine Diazepam Triazolam
II. Intramuscular	Ketamine Midazolam
III. Intravenous	• Midazolam
IV. Inhalation	• Nitrous oxide

The operator has a choice of maintaining the correct depth of sedation specifically for each patient. This is contrary to the clinical effects of intramuscular, intravenous and orally administered sedative medications, the outcomes of which are dependent on the pharmacokinetics of the agent, which means that the effects cannot be reversed by the operator. Nitrous oxide is an inhalation

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agent, and its clinical effects, if in excess of those desired, can be easily reduced by lowering its concentration, due to its pharmacological properties. Hence, nitrous oxide is the most commonly used and the safest form of conscious sedation.

For more than 150 years, Nitrous oxide (N₂O) has been utilized in clinical dentistry due to its analgesic and anxiolytic properties. This small and simple inorganic chemical molecule has indisputable effects of analgesia, anxiolysis, and anesthesia that are of great clinical interest, especially in apprehensive dental patients [4]. The most common estimate of analgesic efficacy suggests 30% nitrous oxide is equivalent to 10–15 mg of morphine [5]. From its earlier role of being a solo gas technique resulting in many complications, the present standard of care demands dilution with oxygen (O₂) to achieve the desired level of titration. The range of nitrous oxide concentration is 30% to 50%, which, according to Malamed [6], is the concentration typically required for analgesia. Some studies in the literature have reported that 70% nitrous oxide showed a statistically significant improvement in pain scores [7]. However, 70% nitrous oxide also resulted in significantly increased side effects (nausea and vomiting), negating the advantages of improved analgesia.

In endodontics, the most commonly used method for obtaining pulpal anaesthesia in mandible is Inferior Alveolar Nerve Block (IANB), however, its efficacy is debatable. In these situations, complete removal of the dental pulp without pain is not always feasible [8]. According to clinical studies, IANB failure rate is documented to be between 44% and 81% [9]. In 91% of cases, achieving pulpal anaesthesia in lower molar teeth is difficult [6]. Due to the high failure rates of inferior alveolar nerve block in emergency treatment, sedation may be beneficial. A significant increase (50%) in success of Inferior alveolar nerve block in combination with 30-50% Nitrous Oxide was reported, in cases of symptomatic irreversible pulpitis in mandibular teeth [7]. Gupta, P.D et al reported a significant reduction in pain perceived during endodontic access cavity preparation under nitrous oxide sedation [10].

MECHANISM OF ACTION

Although the exact mechanism of action of nitrous oxide is not known, it is known that nitrous oxide does not work through a single mechanism. Research indicates that nitrous oxide activates its analgesic effect by causing the release of endogenous opiate peptides with subsequent activation of opioid receptors [4] and by the inhibition of N methyl-D-aspartate (NMDA) glutamate receptors [4]. NMDA typically induces an excitatory response in the nervous system; therefore, by blocking this effect, nitrous oxide creates the desired analgesic effect [4]. Nitrous oxide targets both opiate receptors and NMDA receptors to provide analgesia. The anxiolytic effect involves the activation of the gamma-aminobutyric acid A receptor through the binding site for benzodiazepines [4]. The anxiolytic effect of nitrous oxide involves 3 key enzymes: nitric oxide synthase, soluble guanylyl cyclase, and cyclic guanosine monophosphate–dependent protein kinase [4]. The inhibition of any of these enzymes blocks the anxiolytic effect of nitrous oxide.

OBJECTIVES/ ADVANTAGES OF NOIS

- Quick onset of action.
- Flexible duration of action.
- Reduction or eradication of anxiety.
- Decrease of inappropriate movement and response to dental therapy.
- Improve patient cooperation and communication.
- Increase the pain reaction threshold.
- Improved ability to tolerate longer appointments.
- Aid in treatment of medically compromised patients and individuals with special healthcare needs.
- Lessen gag reflex.
- Enhance the potency of other sedatives.
- Especially beneficial for the first-time patient.
- Permits longer working hours.
- Complete and rapid recovery.

DISADVANTAGES OF NOIS-

- Deficit of potency.
- Predominantly dependent on psychological reinforcement.
- Obstruction of the nasal hood with injection to the maxillary anterior region.
- Failure in patients with nasal blockage.
- Potential environmental pollution and occupational exposure hazard.

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- Space occupied by equipment within the dental surgery suite.

INDICATIONS OF NOIS-

- In patients where effective local anaesthesia cannot be achieved.
- Patients who are anxious or fearful.
- Patients with gag reflex that obstructs dental care.
- Patients with special healthcare needs.

CONTRAINDICTION OF NOIS

- Few chronic obstructive pulmonary diseases.
- Ongoing infections of upper respiratory tract.
- If the patient recently underwent middle ear discomfort/surgery.
- Drug addictions.
- During first trimester of pregnancy.
- Methylenetetrahydrofolate reductase and cobalamin (vitamin 12) deficiency.
- Adult patients who exhibit obsessive behaviour.
- Claustrophobic patients.
- Patients with severe personality problems who are receiving psychiatric treatment.
- If the patient is taking bleomycin sulfate, receiving psychotropic drugs or mood elevating antidepressants.

PROCEDURES POSSIBLE UNDER NOIS

The NOIS approach has also been well accepted in adult dentistry, in addition to paediatric dentistry, where it is employed in a number of settings. It is being used for restorative clinical work, cementation and removal of provisional crowns and bridges, cementation of prosthesis, and occlusal adjustment in restorative dentistry. It is utilized in periodontics during the probing/initial examination, scaling, root planning, and curettage. The use of NOIS in oral and maxillofacial surgery has many advantages. Longer surgical procedures, the treatment of abscesses, and postoperative problems, all benefit tremendously from sedation. An important advantage in oral radiological procedures is that Nitrous oxide inhalation sedation eliminates or significantly reduces the gag reflex and helps lower the discomfort associated with the placement of intraoral films/sensors.

CONCLUSION

Nitrous oxide–oxygen inhalation sedation has been the primary technique in the management of dental fears and anxiety for more than 170 years and remains so today. It is a highly safe, effective, and convenient way to provide painless endodontic therapy to the patients.

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