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# Conscious Sedation in Paediatric Dentistry- A Review.

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**Abstract:**

Conscious sedation is a combination of medicines to help to relax and block pain during medical or dental procedure.Although behavioural management may need to be augmented with conscious sedation for some anxious children, pharmacological agents are not substitutes for effective communication and the persuasive ability of the operator. It is important that a wide margin of safety between conscious sedation and the unconscious state provided by general anaesthesia is maintained. In conscious sedation, verbal contact and protective reflexes are maintained, whereas in general anaesthesia these are lost. Recording of blood pressure is a part of assessment process of all patients having intravenous,oral, transmucosal sedation. The drugs used for conscious sedation are Midazolam (oral sedative), laughing gas (nitrous oxide sedative),fentanyl (intravenous), sublimaze (injection).

**Keywords:** anaesthesia, midazolam, nitrous oxide, verbal contact.

## INTRODUCTION:

All children expect painless, high quality dental care. Conscious sedation is defined as a technique in which the use of a drug or drugs produces a state of depression of the central nervous system enabling treatment to be carried out, but during which verbal contact with the patient is maintained throughout the period of sedation(1). Reduction of pain and anxiety in child dental patients has been an issue for a long time. Although the majority of paediatric dental patients could be managed by conventional behaviour management methods, a fair number of them require pharmacological intervention. For these children, conscious sedation or general anaesthesia are the primary treatment options that allow comprehensive restorative dental care. Because of the risks and costs involved with general anaesthesia, conscious sedation is often the option of first choice. Although most paediatric dentists prefer using oral sedation, parenteral sedation techniques are also popular (2). Behavioural management and prevention, coupled with local anaesthesia when required, form the foundation of the delivery of pain-free dentistry to children. There is certainly no option for invasive and high-risk sedative techniques such as deep sedation or polypharmacy in the dental management of anxious children within paediatric dental care in the UK. Indeed, even in parts of the world where deep sedation techniques are more common, their use is often limited to hospitals. Nitrous oxide inhalation sedation remains the preferred technique for the pharmacological management of anxious paediatric dental patients (1).

## GOALS OF CONSCIOUS SEDATION:

- Promote patient welfare and safety.
- Facilitate the provision of quality care.
- Minimize the extremes of disruptive behaviour.
- Promote a positive psychological response to treatment.
- Return the child to a physiological state in which safe discharge is possible.

Informed consent for a course of dental treatment under conscious sedation must be obtained from each parent/guardian, and the child, where appropriate, prior to the conscious sedation appointment.

- An explanation of the sedation technique proposed and of appropriate alternative methods of pain and anxiety control must be given.
- In advance of the procedure, the child and their parent or guardian must be given clear and comprehensive pre- and postoperative instructions in writing (3).

## CHOICE OF SEDATIVE AGENT FOR CHILDREN UNDERGOING DENTAL TREATMENT:

The drug groups used for paediatric dental sedation include inhalational agents, benzodiazepines, Midazolam (oral sedative), laughing gas (nitrous oxide sedative)

## NITROUS OXIDE:

Nitrous oxide (N2O) is a non-irritating respiratory tract gas, which presents fast action on induction as well as during recovery (these effects occur within a few minutes). It presents low solubility in the tissues, as well as a minimal alveolar concentration (MAC) which is so high that its anesthetic effect is poor under normal atmospheric pressure.(4)

Machines intentionally designed for the administration of inhalation sedation in dentistry should be used and be capable of administrating N2O to a maximum limit of 70% with not less than 30% of oxygen in volume, even though in the majority of cases, adequate analgesia is achieved with concentrations of N2O that do not exceed 50% in volume. These machines must be in conformity with the European (or otherwise applicable) legislation and be maintained and serviced according to the producers' orientations. It is also important that regular maintenance be documented, where all safety rules must be respected, such as for instance, the presence of a device that cannot fail in an emergency (if the oxygen pressure drops, N2O supply must automatically stop) (5).

Nitrous oxide causes minor depression in cardiac output while peripheral resistance is slightly increased, thereby maintaining the blood pressure.This is of particular advantage in treating patients with cerebrovascular system disorders.

Nitrous oxide is absorbed rapidly, allowing for both rapid onset and recovery (two to three minutes). It causes minimal impairment of any reflexes, thus protecting the cough reflex (6). Studies have reported negative outcomes associated with use of nitrous oxide greater than 50 percent and as an anesthetic during major surgery (7,8).

Nitrous oxide has been associated with bioenvironmental concerns because of its contribution to the greenhouse effect. Nitrous oxide is emitted naturally by bacteria in soils and oceans; it is produced by humans through the burning of fossil fuels and forests and the agricultural practices of soil cultivation and nitrogen fertilization. Altogether, nitrous oxide contributes about five percent to the greenhouse effect (9) Only a small fraction of this five percent (0.35 to two percent), however, is actually the result of combined medical and dental applications of nitrous oxide gas (10).

**Adverse effects of nitrous oxide:**

Nitrous oxide has an excellent safety record. When administered by trained personnel on carefully selected patients with appropriate equipment and technique, nitrous oxide is a safe and effective agent for providing pharmacological guidance of behaviour in children. Acute and chronic adverse effects of nitrous oxide on the patient are rare.(11) Nausea and vomiting are the most common adverse effects, occurring in 0.5 percent of patients (12) A higher incidence is noted with longer administration of nitrous oxide/ oxygen, fluctuations in nitrous oxide levels, and increased concentrations of nitrous oxide (6). The practitioner, however, may recommend that only a light meal be consumed in the two hours prior to the administration of nitrous oxide (13).

The long-term exposure to nitrous oxide used as a general anesthetic has been linked to bone marrow suppression and reproductive system disturbances (14).

## MIDAZOLAM (ORAL SEDATIVE):

Midazolam, one of the commonly used oral sedation agent in children has several characteristics such as safety of use, rapid onset and some degree of amnesia that makes it a desirable sedation agent in children. Therefore, oral midazolam sedation is recommended for short dental procedures in children. A variety of sedative drugs has been used for oral sedation in young children including benzodiazepines. Midazolam is a newer-generation benzodiazepine with wide toxic/therapeutic ratio and safety margin, and does not produce prolonged sedation associated with other benzodiazepine such as diazepam (15) When taken orally, midazolam is rapidly absorbed in the gastrointestinal tract, produces its peak effect in relatively shorter time of about 30 minutes, and has a short half-life of about 1.75 hours. When given in doses between 0.5 to 0.75 mg/kg of body weight, oral midazolam has been found to be a useful sedative agent for pediatric dental outpatients (16) Midazolam has also been shown to enhance anterograde amnesia when used preoperatively in pediatric patients.(17) Midazolam is a short acting anxiolytic agent, (18) with short duration of action,(19,20) that makes its use limited to short dental procedures only.

The clinical use of midazolam is primarily reserved as premedication/sedation drug, though it also has anticonvulsant and muscle relaxant proper- ties. One of the limiting factors in the use of midazolam for sedation is the short length of action (21) So, midazolam can be used effectively in pediatric patients for short, mildly painful and minimally invasive procedures (22).

**Paediatric dosage of midazolam:**

Midazolam has been used orally at doses between 0.2-1.0 mg/kg with onset of action between 20-30 minutes (23,24,25) Several studies have been conducted to determine an optimal dose of oral midazolam for sedation by comparing various doses of oral midazolam. oral midazolam in a dose of 0.5 mg/kg is suitable premedication for child patients (ASA Category I) during short dental procedures. Another study compared two dosages of oral midazolam (0.3 mg/kg or 0.5 mg/kg) in 31 physically and neurologically compromised pediatric (3-18 years) dental patients; both dosages proved successful, without intraoperative or postoperative complications (26).

## ORAL MIDAZOLAM WITH NITROUS OXIDE:

Oral midazolam is often used in combination with nitrous oxide for dental sedation in children. A study compared the effectiveness of oral diazepam and midazolam alone and in combination with nitrous oxide for sedating autistic patients during dental treatment(27); the midazolam/nitrous oxide combination was found significantly more effective than diazepam/nitrous oxide combination. A study reported that combination of oral midazolam (0.6mg/kg) and nitrous oxide (30-50%) is effective and safe in young dental patients who need minimal restorative treatment(28). Some study have also recently reported similar results with combination of 0.5 mg/kg oral midazolam and nitrous oxide (50%) in 4-6 year old children(29). The use of nitrous oxide may prolong the working time to some extent and simultaneously incorporates its own desirable effects (such as analgesia) in the clinical situation.

## CONCLUSION:

The application of conscious sedation should be carried out effectively and precisely so that it maintains a healthy gap from general anesthesia and unconsciousness. More concern should be taken when this process is applied on pediatric patients.The provision of adequate anxiety control is an integral part of the practice of dentistry. All patients deserve appropriate anxiety control for any dental procedure.

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