

Practitioner's Corner

Relative Analgesia (Nitrous Oxide Sedation)

(A report submitted to the Annual General Meeting of the Dental Association of South Africa by Dr. P. Cleaton-Jones BDS. MB BCh (Wits.) acting upon requests from various Standing Committees).

DEFINITION

For the purpose of this report Relative Analgesia is synonymous with Nitrous Oxide-Oxygen Sedation, in which sub-anaesthetic concentrations of nitrous oxide are administered for the control of fear and anxiety; pain relief is provided by local anaesthesia. It does not include the use of any other inhalational agent, either given simultaneously with, or independent of, nitrous oxide and oxygen. Similarly, it does not include the simultaneous or independent use of any orally or parenterally administered drug.

PREAMBLE

Nitrous oxide oxygen sedation is in vogue in dentistry following the activities of men such as Langa (1968). Although it is not a new technique, having first been introduced about 90 years ago and used more widely over the last 30-40 years, it has enjoyed a revival over the past five years. This has been brought about by the development of nitrous oxide-oxygen sedation equipment specifically designed for the purpose. These are mainly accurate continuous flow machines with built-in fail safe devices that ensure a constant minimum supply of oxygen in the presence of nitrous oxide. There are also a number of demand flow machines available. All machines have a readily accessible oxygen flush button to deliver a flow of 100 per cent oxygen. The inhalational apparatus is designed to be readily transformed into a resuscitative device thereby fulfilling an additional important role in the dental surgery. These machines have been reviewed and approved for the Council on Dental Materials and Devices and the Council for Dental Therapeutics of the American Dental Association by Allen (1973). His report will shortly be published in the Journal of the American Dental Association.

These machines have been available in South Africa for some two to three years and are at present being used by practitioners. The minimum oxygen flow settings vary from 20 to 30 per cent depending on the make of the machine, but this is adjustable to any level according to the suppliers.

The gases are supplied to the patients via soft nasal masks that have an air inlet hole and an exhaust valve and adapt loosely to the face, thereby allowing further gas leaks. These serve to reduce the nitrous oxide concentration in the inspired gas even more. In brief, the technique involves an explanation to the patient of the idea of anxiety and fear control in reducing pain and what sensations the technique will produce, namely a slightly inebriated feeling of warmth and relaxation. The mask is applied and gas flow commenced. Within about two to three minutes most patients are sufficiently relaxed to allow the introduction of local anaesthesia with almost no discomfort. At the end of the procedure the nitrous oxide is switched off and 100 per cent oxygen is inhaled. Recovery is rapid and is completed within about five minutes. The technique is suitable for most adults and children although about 20 per cent of people reject it usually through a dislike of the sensations experienced or claustrophobia caused by the mask.

Nitrous oxide-oxygen sedation is not synonymous with the old nitrous oxide anaesthesia and is not designed as a technique to replace general anaesthesia in dentistry. Those patients previously requiring a general anaesthetic will still require one.

SAFETY ASPECTS

There are two considerations to be borne in mind:

1. Safety for the Patient.
2. Safety for the Dental Practitioner.

Safety for the Patient

The numerous advertisements from the commercial houses selling the various machines and statements from protagonists of the technique repeatedly state that:

- (i) there have been no deaths reported with the technique;
- (ii) the technique has a greater safety record than local anaesthesia.

A review of the literature cannot contradict either of these statements.

All factors that have been reported regarding the use of nitrous oxide in dentistry have been with nitrous oxide anaesthesia or with general factors in dental

anaesthesia. The two major applications to nitrous oxide-oxygen sedation are:

(a) *The Supine Position*

Bourne (1967) has clearly shown that hypoxia in dental anaesthesia is usually due to the use of the upright position and that only the supine position should be used. In personal communication Bourne (1974) states that the same applies to nitrous oxide-oxygen sedation.

(b) *The Anaesthetic Properties of Nitrous Oxide*

Nitrous oxide on its own can produce general anaesthesia and will do so in debilitated patients in concentrations as low as 50 per cent. Parbrook (1971) has described how, in healthy patients, light anaesthesia has been produced at a concentration of nitrous oxide of 66-80 per cent. This is described as a state of complete analgesia and amnesia in which it is impossible to communicate with the patient. Probably for this reason Hiatt (1971) recommends that only fail safe sedation systems delivering a maximum of 50-60 per cent of nitrous oxide should be manufactured.

No references could be found dealing with pre-medication or starvation although it does not seem to be general practice among those using the technique to do either.

Finally, while the protagonists state that all protective reflexes are present (Langa 1968). Pleasants (1971) says that these are slowed. Hence starvation would be an additional safety factor.

Apart from the risk of producing general anaesthesia in debilitated patients and never using the technique in patients with trismus or other airway obstruction, there appear to be no contra-indications to the technique.

Safety for the Dental Practitioner

There is a great deal of concern today about the contamination of operating theatres by anaesthetic gases. Whitcher, Cohen and Trudell (1971) have investigated long term halothane contamination in general operating theatres. More recently, Strunin, Strunin and Mallois (1973) studied contamination in an outpatient dental surgery in London and found that the level of halothane was 18,5 - 70 times greater than recommended, at the level of the dental surgeon's face. Reports on the effect of nitrous oxide room contamination could not be found, but Cleaton-Jones (1974) has drawn attention to some possible hazards. (I hope, in fact, during 1974 to begin a study on the effects of N₂O inhalation on the operating ability of dental practitioners.)

In summary then, one must state that it is obvious that a dental surgeon using nitrous oxide-oxygen sedation on a patient and operating at the same time, must inhale significant amounts of nitrous oxide. The long and the short term effects on his health and operating ability are not yet known.

OPINIONS OF OTHERS ON THE TECHNIQUE

The Executive Secretary of the Dental Association of South Africa approached the following people for their

opinions as to whether or not a second registered person should be present to administer nitrous oxide-oxygen sedation:

- (a) The Deans of the Faculties of Dentistry in South Africa.
- (b) The Heads of the Departments of Anaesthesia at all the Medical Schools in South Africa.
- (c) The South African Society of Anaesthetists.

In addition, the Dental Associations in Australia, Britain, Canada, New Zealand and the United States were approached for their opinions.

Findings

Replies were received from all those approached in South Africa and abroad with the exception of the University of the Orange Free State.

Table I summarises the South African replies. It was obvious from the replies received from the Universities of Cape Town, Natal and Stellenbosch that they were not aware of the technique although only one (Cape Town) admitted never having seen it. Their replies should probably not be considered therefore. On the other hand, I know that replies received from all the others were written in the full knowledge and understanding of the technique.

Considering then these replies, the opinions were three for and three against the necessity of a second registered medical and/or dental practitioner being present.

The various dental associations also do not agree in their approaches which are summarised in Table II. The most comprehensive reply was from the American Dental Association which, although it does not express a definite opinion regarding the necessity for a second registered person being present, approves the technique. To me the implication here is that the operator/sedationist is acceptable.

RECOMMENDATIONS

Having considered all the evidence, and bearing in mind the necessity for safety, I recommend the following points for consideration by the Dental Association of South Africa as a guide to its official policy.

1. Nitrous oxide-oxygen sedation is an established, effective and inherently safe technique for the control of fear and anxiety in dentistry, and is suitable for administration by a single operator/sedationist provided that:
 - (a) the administrator has an adequate training and experience in the technique itself, in the management of the airway and in cardio-pulmonary resuscitation.
 - (b) an adequately equipped emergency kit is readily available in the surgery.
 - (c) an emergency routine has been established and is regularly practised in the dental practice.
 - (d) adequate suction is available at hand.
 - (e) only approved nitrous oxide-oxygen sedation apparatus with built-in fail safe oxygen supply maintaining a minimum oxygen concentration of 40 per cent be used. This apparatus should

- be regularly tested and calibrated, and modified or improved apparatus is unsuitable.
 - (f) an adequate medical history be taken prior to use of the technique and that it not be used in debilitated patients or those with trismus or any other airway embarrassment.
 - (g) pain relief be obtained by the use of a local anaesthetic.
 - (h) only the supine position to be used.
 - (i) a patient be fasting for four hours prior to receiving the technique.
 - (j) the technique be used selectively when indicated by significant fear and anxiety.
 - (k) no inhalational, intravenous or other sedative or anaesthetic agent be combined with it other than a local anaesthetic.
2. The Dental Association of South Africa should consider ways and means of:
 - (a) defining what constitutes adequate training and experience for recommendation to the South African Medical and Dental Council.
 - (b) defining minimum standards for emergency kits and emergency routines in dental surgeons.
 - (c) that the necessary sub-committee consider training programmes along the lines of the Guidelines set out by the American Dental Association Council on Dental Education.
 3. That if the conditions set out under Recommendation 1 are not complied with, then a second registered person must be present to administer the nitrous oxide-oxygen sedation.
 4. That, in view of the simplicity of the technique, the brief time in its administration required and that it be used only when indicated by significant fear and anxiety, no separate fee be charged for its administration.
 5. That training in the technique of nitrous oxide-oxygen sedation be begun at an undergraduate level in the various faculties of dentistry in South Africa.
 6. That the term "Relative Analgesia" be eliminated due to the confusion that it creates and the term nitrous oxide-oxygen sedation be substituted.

TABLE I

Presence of second registered practitioner.

A. Faculties of Dentistry

1. University of Pretoria: Second person not required.
2. University of Stellenbosch: Second person necessary.
3. University of Witwatersrand: Second person not required.

B. Departments of Anaesthesia

1. University of Cape Town: *Second person necessary.
2. University of Pretoria: Second person not required.
3. University of Natal: *Unclear, but apparently second person necessary.
4. University of O.F.S.: No reply.

*See comments under FINDINGS - Par. 2.

5. University of Stellenbosch: *Second person necessary.
6. University of Witwatersrand: Second person necessary.

C. South African Society of Anaesthetists

Second person necessary.

TABLE II

Official Policies of Dental Associations

1. British Dental Association

Wherever possible, a second person should be present, but dentists in the U.K. reserve the right to act as operator/anaesthetists when they consider it is in the patient's interest to do so.

2. Canadian Dental Association

No official policy.

3. Australian Dental Association

No official policy.

4. New Zealand Dental Association

Association and their insurers are aware of safety of technique but the attitude of the New Zealand Anaesthetists body and the Courts in general compels that they warn that a second dentist or doctor be present.

5. American Dental Association

Appears to condone the use of nitrous oxide-oxygen sedation.

References

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NOTE: At the time of writing this report, legal opinion had not yet been received.