Introduction

Going to the dentist for the first time may often have a stressful impact on a child: dental anxiety and fear are the involved emotional components.

Fear is a sensitive answer associated to a visible impending danger for the subject: aggressive instruments, such as the drill and an injection, may lead the child to think he/she will be hurt [Berggren and Meynert, 1984]. Several studies highlight the role played by such tools in causing dental fear amongst children [Alvesalo et al., 1993; Klingberg et al., 1995; Foley, 2005a]. Anxiety is a discomfort condition which may occur even without a recognisable risk: forecasting an unpleasant event, such as a dental session connected to anticipated fear of pain, may produce this emotional state [Majstorovic and Veerkamp, 2005]. Anxiety and fear can both affect a child referring to a dentist for the very first time. Multiple aetiological factors are involved in conditioning the child’s dental behaviour and experience such as: child’s age and knowledge level, personality traits, parents’ own fear and life style, previous traumatic experiences and social environment [Townend et al., 2000; Klaassen et al., 2003]. Usually a child under 3 years of age is classified as pre-cooperating, showing limited understanding and poor cognitive mechanism [Marzo et al., 2003; Magnusson et al., 1985]. There is evidence that parental presence during Italian children’s first visit may affect their behaviour leading to a lower cooperation [Marzo et al., 2003] as well as maternal anxiety, which can be one of the most significant determinants of a child’s dental anxiety [Karjalainen et al., 2003; Balmer et al., 2004].

Pain experienced during past dental care is often associated to a higher anxiety level [Holst and Crossner, 1984; Raadal et al., 2002] which causes a disposition to experience every stimulus as painful. Painful dental care delivery has been reported to be important in the aetiology of dental fear: children who have been hurt while receiving dental treatment are more likely to avoid dental care as adults [Nakai et al., 2000]. Anxiety and pain can be modified by psychological techniques, although in many instances pharmacological approaches are required.

ABSTRACT. Aim The aim of the study was to assess 100 preschool children’s satisfaction grading of relative analgesia (RA) after completing dental treatment by collecting their opinion on this technique through a verbal questionnaire. Methods After completing dental care a simple verbal questionnaire (3 questions) was administered by the operator. The questionnaire investigated: 1) patient’s satisfaction about the sedation treatment; 2) patient’s agreement to re-experiment the technique and 3) patient’s emotions while sedated. Moreover, following treatment, each child was invited to make a drawing on the experience. Results Data obtained were classified in 3 groups: group 1 (87% of children) appreciated RA and would agree to repeat the experience; group 2 (4% of the sample) did not answer the verbal questionnaire and group 3 (9%) did not “enjoy” the sedation technique. Only 15 children completed a drawing; conducting a psychological analysis through C.R. Rogers’ theory of Person Centred Approach coupled with the handwriting analysis methodology defined by Girolamo Moretti, positive features were found in the majority of the drawings (13 out of 15). Conclusion The majority (87%) of the sample appreciated to experience nitrous oxide inhalation sedation and would undergo a further appointment under RA.

KEYWORDS: preschool children; Relative analgesia; Dental anxiety; Verbal questionnaire.
very young children who do not understand how to cope should be sedated [American Academy of Paediatric Dentistry, 2005]. Conscious sedation carried out through inhalation of nitrous oxide and oxygen flow is reported to be a successful technique for managing paediatric patients’ dental anxiety and fear [Shaw et al., 1996; Bryan et al., 2002]. Sedation for paediatric patients is an essential tool which may represent an adjunct to behaviour management during dental practise and is a potential alternative to General Anaesthesia (GA) [Paterson and Tahmassebi, 2003]. However, few investigations of the perceived acceptability amongst young children are found in international literature [Foley, 2005a].

The aim of the study is to assess preschool children’s satisfaction grading of relative analgesia (RA) when completing dental treatment by collecting their opinion on this technique through a verbal questionnaire.

Materials and methods

Data was collected over a 18 month period (November 2004-April 2006) on a sample of 100 preschool children aged 3 to 6, mean age 5 (SD=1) (56 females and 44 males; 96 Caucasians, 1 Asiatic, 2 Africans) attending the same dental surgery office. The children were referred to the office for different reasons:
- 24 were addressed by their paediatricians because of caries;
- 12 were sent by paediatricians who noticed the eruption of a permanent lower incisor without the loss of the corresponding deciduous;
- 19 reported previous negative dental experience and were referred to the office because of their dental fear;
- 29 were sent by other dentists who did not deal with children’s dental care;
- 16 were address by other patients’ parents for a fist dental visit.

Informed consent about nitrous oxide and oxygen administration was obtained from all children’s accompanying adults and documented in every patient’s record prior to a dental session under RA. Review of the patient’s medical history was always verified prior to decide upon the use of inhalation sedation. Conditions such as allergic reactions to medicines, asthma, chronic obstructive pulmonary disease, severe emotional disturbances were considered as contraindications for the use of nitrous oxide/oxygen inhalation.

At the first appointment parents were asked to fill in a questionnaire about their child’s medical history. Moreover an acknowledgement of the child’s anxiety and of previous negative dental experience was investigated with the following questions.

1) Do you think your child is anxious?
2) Has he/she had any past traumatic dental experience?

When at least one positive answer was found, the child could possibly be treated under RA, although the decision to select the child for this study depended upon 4 prerequisites:
1) preschool age;
2) a fearful attitude;
3) delivery of treatment requiring a local anaesthesia injection;
4) medical history review assessing a healthy general condition.

During the first appointment children were carefully observed by the dentist while they were showed dental tools and were invited to try the instruments on their fingers through the tell-show-do technique. The final decision to include a preschool child in the study was subject to child’s behaviour during the first visit; a child expressing one or more attitudes as:
- crying;
- reluctant to cooperate;
- frightened by noise;
- tightly holding the arms of the dental chair when seated,

was selected and was introduced to sedation equipment on the first visit as a “game” to be played on next appointment. He was showed the equipment focusing on the “balloon” which he was going to deflate by smelling through the “little scented Micky Mouse nose” (i.e. nasal hood). At this time the dentist was showing the patient how to deflate through the nasal hood before discharge. Prior to start the following session, RA equipment was set close to the dental chair and the dentist focused one more time on the machine as a game, showing the little patient how to deflate the “black balloon” by inhaling through the “little scented Micky Mouse nose”.

The same operator (licensed paediatric dentist) administered nitrous oxide-oxygen flow via the scented nasal mask connected to Quantiflex MDM Relative Analgesia machine. Dental personnel assisting the sedationist during RA treatment was the same trained nurse. Oxygen and nitrous oxide were provided in different percentages according to patient’s need, as to obtain individual optimal level of sedation: when reached, it was noted down. Starting titration was equal for all 100 children: 55% oxygen, 45% nitrous oxide. Further flow increases were provided to reach a limit percentage of 40% oxygen and 60% nitrous oxide. Duration of session ranged from 25 to 50 minutes, with a median sedation time of 31.8. Upon completion of dental procedures a 100% oxygen flow was provided for 2-3 minutes before nasal mask removal, as to obtain faster nitrous oxide
elimination. Table 1 shows treatments which were provided. During each session local analgesia was delivered by infiltration into the periodontal ligament space. A topical anaesthetic gel was applied on the same area for greater pain control [Anand et al., 2005]. A simple verbal questionnaire, due to the patients’ young age, was administered by the operator following treatment. The questionnaire investigated the following.

- Patient’s satisfaction about the sedation machine (“Did you like this new game that we just played with?”). We believe that all patients were aware of the question meaning as the machine was always pointed out.
- Whether patient agreed on being reappointed using the sedation machine (“Would you like to play this game again next time you come here?”).
- In case they answered “NO” to the previous questions, the reasons (“Why didn’t you like it?”) were asked.
- Patient’s emotions during session under RA (“how did you feel?”).

Upon completion of treatment, the child was sent back to the waiting room and invited to draw, as drawing can be considered a way for children to express their emotional life [Oliviero Ferraris, 1973; Crotti and Magni, 2006]. The drawings were evaluated by a psychologist and psychotherapist of the Carl R. Rogers Person Centred Approach, coupled with the handwriting analysis methodology defined by Girolamo Moretti. Rogers’ theory focuses on the established relationship between doctor and child [Rogers, 1951] on which the phenomenological meaning analysis of the drawings was based. Each drawing has been analysed considering the following variables, identified by Girolamo Moretti [Moretti, 1972].

- Description captured at the end of the drawing activity, where available.
- Contents: figures, shapes, composition.
- Space allocation on the sheet: total versus partial, upper/lower/central/right/left section.
- Choice of colours and shading quality.
- Stroke: regular versus irregular, marked versus light pressure.

Results
One hundred preschool children were included in this prospective study. Nitrous oxide and oxygen flow was administered by the sedationist during every dental treatment and an injection of local analgesia was always performed. Data were classified in 3 groups with no significant difference between sex distributions (Table 2).

- Group 1: 87% (47 females, 40 males) appreciated RA and would agree to repeat the experience.
- Group 2: 4% (3 females, 1 male) did not answer to the verbal questionnaire.
- Group 3: 9% (6 females, 3 males) did not “enjoy” the sedation technique and did not agree to undergo a future appointment using the same technique.

In Group 1, children’s enthusiasm regarding their conscious sedation experience was assessed to be related to:

- good scent (71; 41 females, 31 males) exhaled by the nasal hood (tutti-frutti or vanilla scent);
- pleasant sensations during treatment (16; 6 females, 9 males).

In Group 2 children’s emotions could not be defined, as the median age was indeed very young: 3.3. However, in 2 cases children underwent a second sedation appointment and did not offer any resistance when reintroduced to the inhalation equipment.

Processing data obtained in Group 3, different attitudes were found amongst those 9 children who expressed aversion for the sedation technique:

- the adverse effects of nausea and vomiting, reported to be the most common ones when administrating nitrous oxide and oxygen [AAPD, 2005], occurred in 2 cases (1 female, 1 male), frightening the subjects;
- unpleasant taste was reported by one patient (male).

**Table 1 - Treatments delivered.**

<table>
<thead>
<tr>
<th>Treatment on both dentitions</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Pulpotomy of 1 or more deciduous teeth</td>
<td>71%</td>
</tr>
<tr>
<td>Extraction of 1 or more primary teeth</td>
<td>16%</td>
</tr>
<tr>
<td>Restorative work in primary teeth or first permanent molars</td>
<td>13%</td>
</tr>
</tbody>
</table>

**Table 2 - Satisfaction rate groups.**

| Children who appreciated and agreed to repeat the experience | 87% |
| Children who did not answer | 4% |
| Children who did not appreciate nor agreed to repeat the experience | 9% |
as a result of dental material employment although the child linked his sensation to the sedation equipment;
- gas flow interruption was repeatedly asked by one patient. A previous negative experience during surgery, when a mask had been forced on the patient, was reported by the child’s mother.
- numbness due to local analgesia was considered as particularly unpleasant by three children (females), who connected their discomfort related to local analgesia to the sedation machine;
- mourning and crying were found in two patients (females) who were noticed as reluctant to perform even simple commands during their first visit.

No desire in repeating the inhalation sedation experience was shown by the above mentioned 9 patients. The local anaesthetic injection did not create any discomfort in 78 cases, where an appropriate level of sedation was achieved.

Upon completion of dental treatment, children were invited to draw and 15 drawings were completed and evaluated. The following common features were pointed out conducting an analysis on the available drawings:
- Contents: moving shapes 13:15.
- Space allocation: complete distribution over the sheet 13:15.
- Colours: bright and multicoloured 12:15.
- Stroke: for the most regular (9) and partially regular (2), always marked (15:15).
- Size: for the most big (7) or medium (5) 12:15.
- Graphic quality: good (10) or reasonably good (3) 13:15.
- Direct reference to the dental experience: absent 13:15.

The assessment of the emotional impact of RA on the children subject of the study was conducted making a distinction between an emotional state linked to the dental session (state anxiety) and an emotional state not referred to the dental experience (trait anxiety). A further step was taken to isolate children’s anxious status from a depressive status which cannot be referred to the contingent experience as it represents more complex familiar dynamics. In order to understand the effectiveness of the RA approach, the analysis verified how the status of anxiety was managed by the children, whether in the form of an uncontrolled anxiety (potential negative impact) or a self-controlled anxiety (not-negative impact) through drawings.

The main findings of the analysis are the following.
- No evidence of traumatic emotions linked to the RA experience as no over exposure of teeth or mouths on the people or animals represented in the drawings, neither alterations in the characteristics of the dental environment (dentist and dentist’s instruments).
- Children expressing anxiety (10:15) in different levels of intensity (worry, agitation, deep anxiety) as to match the parents’ evaluation of anxious traits in their children. Thus in no case anxiety is out of control.
- Children expressing depressive feelings (isolation, lack of confidence, sadness) (4:15) cannot link this emotional state to the RA experience.
- Overall most of the drawings (13:15) presents feature which in the contents, colours, stroke, pressure, size, space allocation are linked to positive elements: energy, vitality, trust, confidence, variety and intensity of emotions.

**Discussion**

Although the sample size was relatively small, the study highlights the possibility of successfully completing dental care in very young patients. Appreciation of providing nitrous oxide and oxygen flow was showed by the majority of the involved patients (87%).

Titrated doses of nitrous oxide and oxygen were administrated by the seditionist (paediatric dentist), as to continue the downward trend of using general anaesthesia for very young children requiring dental treatment. The goal of procedural sedation is the safe and effective control of pain anxiety and motion, as to allow a necessary procedure to be performed and to provide an appropriate degree of memory loss and decreased awareness [Krauss and Green, 2000]. As a matter of fact, RA has been reported to represent a successful alternative form of pain and anxiety control to GA as patients show their ability to cope with the treatment [Shepard and Hill, 2000; Bryan, 2002]. At preschool age coping skills are still deficient: we found that patients’ poor cooperation during previous simple procedures, such as first visit requisites, improved under RA.

A recent study carried out in the UK investigated young children’s acceptability of this technique through a questionnaire: it resulted as well in a similar percentage (90%) of satisfied children [Foley, 2005a], although children’s age was higher. Two more studies stressed the importance of using RA instead of GA to control children’s fears, but the considered age was older, as the authors were focusing on adolescents [Sheperd and Hill, 2000; Show et al., 1996].

The American Academy of Paediatric Dentistry recognises nitrous oxide and oxygen inhalation as a safe and effective technique to reduce anxiety, produce analgesia and effective communication between patient and health care provider, as it may enable the paediatric patient to tolerate unpleasant procedures [AAPD, 2005].

A few children’s perception of RA can be described...
through post session drawing analysis (15), as positive elements are represented: kites, birds, airplanes, butterflies, angels, streamers and stars, as to show no traumatic evidence linked to the RA experience, though following invasive dental procedures (injection, drill) performed on anxious children (as referred to parents’ evaluation). As a matter of fact, the aim of using conscious sedation technique is to provide a more pain-free care and to motivate even younger children to achieve trust in the dentist and his procedures [Foley, 2005a]; hopefully their dental future will be positively affected and improved. However, reaching a positive patient-doctor relationship is linked to children’s satisfaction of their first request: psychological approach [Marzo et al., 2003]. The effects of nitrous oxide inhalation are dependent on psychological reassurance: it is important to continue traditional behaviour guidance technique during RA treatment [AAPD, 2005]. Therefore, when providing dental care to paediatric patients, a valid psychological approach is one of the most important goal to be achieved in order to obtain a positive outcome. The psychological complexity and the extreme vulnerability of young children require great efforts on the dentist’s side, who needs to complete his treatment without causing a negative experience for the child, as to avoid long-lasting consequences leading to dental fear as an adult [Vitale et al., 1999]. The present study underlines that RA may indeed represent a great help to both operator and young patient in crumbling fear barriers, but it would be a misunderstanding to look at this technique as a panacea: reluctant and non-cooperating children would still not wear the required nasal mask if the psychological approach is not considered. The operator’s ability to lead the child undergoing dental treatment involves a mixture of fantasy, patience, play game and explanation through a tell-show-do technique, which is still the ideal way of introducing young patients to dentistry [Cameron and Widmer, 2004]. We share Langa’s statement suggesting that “no medicine can substitute kindness, humour and good sense”.

Conclusion

Of 100 patients 87% were observed to appreciate the use of RA through a simple post-session verbal questionnaire: tolerance of provided dental care was noticed. Patients’ satisfaction regarding their conscious sedation experience was linked to a pleasant scent exhaled by the nasal hood in the majority of cases (71%). The emotional impact of RA was analyzed also through 15 drawings painted by the children upon completion of dental treatment: no evidence of traumatic emotions linked to dental experience under RA was assessed, as most of the drawings (13:15) present positive elements.

References


