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## Skin Wounds and Abscesses in Children: Conscious Sedation and Analgesia in Emergency

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### Abstract

#### Aim

Use of conscious sedation and analgesia in the treatment of the skin wounds or subcutaneous abscesses in children in order to minimize the “procedural” pain.

#### Methods

We performed 37 consecutive procedures of conscious sedation and analgesia in urgency and in selected paediatric patients, mostly for the suture of superficial wounds and grazes and/or cutting and for the drainage of subcutaneous abscesses. The extemporaneous sedoanalgesia was performed with a mixture of 50% nitrous oxide and 50% oxygen inhaled through a face mask and with the patient breathing spontaneously. The following dedicated treatment was performed at least three minutes after the administration of the medicinal gas.

#### Results

All patients completed the treatment, the analgesic and anxiolytic effects were effective. No major complications occurred and the discharges were early in all cases, except one case of sudden pronounced postprocedural sedative effect regressed after five minutes of observation and oxygen at 100%.

#### Considerations

The pain is often influenced by both subjective threshold of the patient to the sensation of pain, but also from emotional responses based on individual experiences. The conscious sedoanalgesia is indicated for the treatment of short duration pain, when is requesting a rapid analgesic and anxiolytic action or limited in duration to perform minor paediatric procedures. The medicament has a short on- and offset-time and a fast recovery after a slight alteration of the perception of space and time, with modest side effects.

#### Conclusions

The inhalative analgesia is easy to apply and is effective in ‘short-term’ operations in urgency, for the treatment of skin wounds or subcutaneous abscesses. The advantages of this method affect a high level of enjoyment and satisfaction for the patient, for the parents and for the health workers.

**Key words:** Inhalative analgesia, wound, abscess.

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## Introduction

In the paediatric age, at events such as skin wounds (lacerated and contused wounds or cuts) or subcutaneous abscesses, it is necessary to use a specific analgesic protocol in order to allow an adequate medical and surgical treatment (suture / incision and drainage), and in order to limit the intense pain and anxiety during invasive procedures of short duration. For this reason the conscious sedation and analgesia represents an alternative technique to traditional methods (intravenous procedures, local anesthetic infiltrations), possessing a high efficiency to minimize the 'procedural' pain [1]. Its frequent application is linked to the rapid onset, to the short duration of the analgesic and anxiolytic effect, and to maintain the state of consciousness, with a low incidence of complications [2]. According to international guidelines, the inhalative sedation in children is now well established also for other types of treatment, such as burns' medications, articular and lumbar punctures, medullar aspirates, biopsies, applications of catheters, peripheral blood samples, endoscopic diagnostic and dental care [3-5].

## Methods

In the second half of 2013 at our Complex Operative Unit of Emergency, we performed in emergency 37 consecutive procedures of conscious sedation and analgesia in selected patients between the ages of 1 and 16 years. In 32 cases the method was used for the suture of superficial skin wounds (23 patients) and for the drainage of subcutaneous abscesses (7 patients), while in 5 cases the inhalative analgesia was used both for manage a bloodless reduction (2 luxations of the shoulder and 1 wrist fracture), both for a nasal exploration for the removal of a small foreign body, both for an onyctomy. Skin sutures, for the most part of the head-face and extremities, have been traditionally performed in layers in separate stitches (not absorbable and/or absorbable

**Table 1: Benefits of inhalative analgesia**

<b>Ease of administration</b>
<b>Easy handling</b>
<b>Pleasantness</b>
<b>Short application</b>
<b>Rapid action</b>
<b>Rapid cessation of the effect</b>
<b>Rapid recovery</b>
<b>Early discharge</b>

in 4/0-5/0) or intradermal, while the incision with the scalpel and the drainage of subcutaneous abscesses, for the most part of the trunk and extremities, also provided for the positioning of the tampon in iodoform.

The operative protocol provided for the information to the parents and, if the age of the children for doing so, the acquisition of informed consent and the compilation of the clinical diary. The extemporaneous sedoanalgesia was performed according to guidelines with a mixture of 50% nitrous oxide and 50% oxygen, inhaled through a face mask and the patient in spontaneously breathing (administration regulated by a valve mechanism and by a dosage 'graduated' from the normal respiratory capacity of the patient); the dedicated following treatment was carried out at least 3 minutes after the administration of the medicinal gas, with an average duration of total inhalation of 7 minutes.

## Results

All 37 patients completed the treatment and showed a good compliance procedure, where the analgesic and anxiolytic effects proved to be effective for the entire time of the procedures, with a significant reduction in pain and with a good tolerance to the face mask. In 3 cases complications occurred just after the cessation of the inhalation; specifically, an episode of nausea (abscess drainage), regressed after few minutes, an

episode of vomiting (cutaneous suture) not extended and without consequences, and one case (cutaneous suture) of sudden pronounced sedation, completely regressed after 5 minutes of observation, continuous monitoring of vital signs, and oxygen therapy (100% O<sub>2</sub>). Except for the latter case, the discharge of the patients occurred within 30-60 minutes from the procedure.

### Considerations

The conscious sedoanalgesia possesses a high degree of efficiency and is mostly indicated for the treatment of pain of short duration, or where is required a rapid analgesic and anxiolytic action or of short duration in order to perform minor surgery, even in non-fasting patients [6]. The advantages are demonstrated in Table 1.

In fact, the analgesia/sedation makes use of a inhalant gaseous mixture, inert, colourless, odourless, which is administered with a face mask to a patient in spontaneously breathing; the mixture is composed of medicinal oxygen to 50% and nitrous oxide to 50%. While the high percentage of oxygen helps to ensure a good oxygenation of the blood and an optimal level of haemoglobin saturation, on the other the nitrous oxide (laughing medicinal gas) has analgesic, sedative-hypnotic, anxiolytic and amnesic properties [5]. Moreover, it has a very rapid kinetics (rapid uptake and distribution, rapid pulmonary elimination after initial absorption and no metabolism), a short on and offset action time and a fast recovery, with modest side effects (the most frequently reported in the literature are dizziness, otodynia, euphoria, nausea and vomiting, headache, anxiety, pronounced sedation and respiratory depression) [2,3,6].

Due to the high diffusivity and the low solubility of nitrous oxide in blood and in other tissues, is reached quickly the saturation of this gas in the blood and in target organs (central nervous system); its action allows the release of endogenous opioids and subsequent ability to inhibit pain

impulses at the level of the central and spinal nervous system, interfering with the conduction pathways of pain inducing analgesia, without loss of consciousness [7]. The analgesic effect is due to the inhibition of the receptors for the NMDA (N-methyl-D-aspartate), while the anxiolytic and sedative effect is related to the activation of the receptors of GABA (gamma-aminobutyric acid) [8].

The analgesic (raising the threshold of pain and impaired perception of painful stimulus) and sedatives (healthy state of consciousness vs slight alteration of the perception of space and time) effects tend to appear after 4-5 inhalations of the gas, reaching maximum effectiveness after 2-3 minutes of inhalation [2]. It is therefore necessary to begin the administration of the drug few minutes before the surgery and continue it throughout the duration of the procedure, or for the time when you want to get the analgesic effect, which usually fade within 5 minutes after the cessation of the inhalation. Some Authors, at the end of the procedure, consider useful the administration of 100% oxygen for 3 minutes for the washout of the drug [9]. Although the pain is a physiological response to an injury, it is often influenced both by the subjective threshold of the patient to the sensation of pain, but also from emotional responses based on remote individual experiences; in some cases, if necessary, and during special or prolonged treatments may be necessary the association with other analgesics, according to specific protocols regarding the pain treatment [2, 5]. The mixture of laughing gas has some contraindications as shown in **Table 2.**

In the series reported all patients had a state of good health and showed no contraindications to sedoanalgesia. The parameters for an evaluation of the analgesic and anxiolytic effects were proportioned with observational method, referring to the facial expression and to the presence of crying (Faces Scale for Pain) and the movements, with the cooperation of

**Table 2: Contraindications to the administration of laughing**

<b>Polytrauma</b>
<b>Complex craniofacial trauma with altered state of consciousness</b>
<b>Confusion – Intracranial hypertension</b>
<b>Mental illness – Poisoning by excessive drugs</b>
<b>Pneumothorax – Pneumopericardium – Pneumomediastinum – BPCO – Pulmonary hypertension</b>
<b>Cardiopulmonary or coronary bypass – Heart failure</b>
<b>Vitamin B12 (vegetarian) or folic acid (or genetic disorders, metabolic enzymes) deficiency</b>
<b>Patients receiving intraocular injections of gas</b>
<b>Middle ear infection – Recent <i>myringoplastica</i></b>
<b>Liver disease</b>
<b>Bowel obstruction</b>
<b>Immunosuppression</b>
<b>Pregnancy (in the first 6 months)</b>
<b>After scuba diving</b>
<b>Repeated use of medicinal laughing gas</b>

the patient, with the tolerance to the face mask, as well, if possible in relation to the age, with the verbal response (Verbal Rating Scale) and the scale of assessment of the pain (Visual Analogue Scale) [2,9]. All 37 patients completed the treatment with a good compliance to the procedures, and where the analgesic and anxiolytic effect were effective (FSP < level 2 / VRS and VAS < 1 – 2); no major complications have occurred and, with the exception of one case in observation and in oxygen therapy for the unexpected pronounced postprocedural sedation, the discharge was premature. Finally, the nausea and vomiting are usually side effects of the medicine regardless of the fasting state of the patient before the procedure [6].

### Conclusions

In the pediatric age, the conscious sedoanalgesia is effective and it is non-invasive, facilitating the procedures during 'short-term' operations of minor surgery in emergency. The inhalative analgesia is a valid alternative for the treatment of skin wounds or subcutaneous abscesses; in the majority of patients, it provides a fast and

adequate management of the 'procedural' pain, it affects positively the psychological state of the patient (reducing fear, worry and anxiety) and avoids both the continuous monitoring of vital signs, both the subsequent follow-up.

Despite its ease of use, the inhalative analgesia should be administered by trained staff, aware of the eligibility criteria of the patient, of possible side effects and complications and, if necessary, should provide the ready availability of sources of supplemental oxygen or other instrument of resuscitation for priority assistance of the airways tract.

The application of the protocol and the advantages of this method improve the quality of care and have a high level of enjoyment and satisfaction for the patient, for the parents and for the health workers.

### Authors' Contribution

**ZW:** Conducted the study, did the literature search and prepared the manuscript.

**GC and CM:** Literature review and prepared the manuscript.

**RA and MA:** Helped in contributed to preparation of manuscript.

**DA and VG:** Revision of the manuscript for publication

All Authors have the training certificate, have performed the procedures, have seen the final manuscript and approve its publication

### Conflict of interest

This study does not have any financial support from manufacturer or other sources. None of the Authors has any conflict of interest to declare.

### Ethical Considerations

A informed consent was obtained from the patient for publication of this manuscript.

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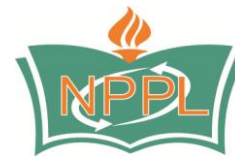
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