

World Journal of Trauma and Critical Care Medicine

Original Article

Open Access

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

William Zuccon¹, Claudia Guerra¹, Michele Colasuonno¹, Alain Ruini¹, Alessia Maglio¹, Agostino Dossena² e Giovanni Viganò³.

¹Department of Emergency - Complex Operative Unit of Emergency - Major Hospital, Crema, Italy; ²Director of Department of Emergency and Anesthesia and Intensive Care - Major Hospital, Crema, Italy' ³Director of Complex Operative Unit of Emergency - Major Hospital, Crema, Italy

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/3.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited

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.

[Address for correspondence and reprint requests to:](#)

¹Department of Emergency - Complex Operative Unit of Emergency - Major Hospital, Crema, Italy.

© 2014 Zuccon Wet al. Licensee Narain Publishers Pvt. Ltd. (NPPL)

Submitted: Sunday, March 02, 2014 Accepted: Saturday, March 15, 2014 Published: Sunday, Sunday, April 06, 2014

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

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

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% O₂). 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

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

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.

Acknowledgement

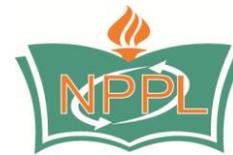
Thanks to Nursing Coordinators Mrs Claudia Mantoan and Mr Egidio Malpezzi and all Nursing Staff for the assistance during the procedures.

References

[1]. Annequin D, Carbajal R, Chauvin P, Gall O, Tourniaire B, Murat I. Fixed 50% nitrous oxide

- oxygen mixture for painful procedures: a French Survey. *Pediatrics* 2000; 105:47. [[pubmed](#)]
- [2]. Effectiveness of 50% nitrous oxide/50% oxygen during laceration repair in children. *Acad Emerg Med* 1998; 5: 112-17. [[pubmed](#)]
- [3]. Schmalbach T, Horneff G. Analgesia for joint punctures in children. Experiences with a nitrous oxide / oxygen mixture (Livopan®). *Ped Rheum* 2011; 9 (Suppl. 1): 37
- [4]. Onody P, Gil P, Hennequin M. Safety of inhalation of a 50% nitrous oxide/ oxygen premix. A prospective survey of 35828 administrations. *Drug Saf* 2006; 29: 633-40. [[pubmed](#)]
- [5]. Hennequin M, Collado V, Faulks D, Koscielny S, Onody P, Nicolas E. A clinical trial of efficacy and safety of inhalation sedation with a 50% nitrous oxide/oxygen premix (Kalinox®) in general practice. *Clin Oral Investig* 2012; 16: 633-42. [[pubmed](#)]
- [6]. Agrawal D, Manzi SF, Gupta R, Krauss B. Preprocedural fasting state and adverse events in children undergoing procedural sedation and analgesia in a pediatric emergency department. *Ann Emerg Med* 2003; 42: 636-46. [[pubmed](#)]
- [7]. Gilman MA. Opioid action of analgesic nitrous oxide. *Ann Emerg Med* 1990; 19:843. [[pubmed](#)]
- [8]. Collado V, Nicolas E, Faulks D, Hennequin M. A review of the safety of 50% nitrous oxide/oxygen in conscious sedation. *Expert Opin Drug Saf* 2007; 6: 559-71. [[pubmed](#)]
- [9]. Ekbohm K, Jakobsson J, Marcus C. Nitrous oxide inhalation is a safe and effective way to facilitate procedures in paediatric outpatient departments. *Arch Dis Chil* 2005; 90: 1073-76. [[pubmed](#)]

World Journal of Trauma and Critical Care Medicine



Published by **Narain Publishers Pvt. Ltd. (NPPL)**

The **Open Access** publishers of **peer reviewed** journals. All articles are immediately published online on acceptance.

All articles published by **NPPL** are available **free** online. Authors retain the copyright under the Creative Commons attribution license.

The license permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited