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Management of Pain and Fear: Behavioural Management, Anaesthesia and Sedation

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Introduction

Dental emergencies often pose specific problems to a dental office. First, they do not happen too often and, especially in trauma situations, dentists have little opportunity to train for them. Second, they cannot be foreseen. Their unexpected nature interferes with the regular schedule of a dental office, so treatment usually occurs in an environment of time constraint and increased stress. Often, emergency situations represent the first contact between a very young patient and a dentist. And where children or adolescents are involved, parents or guardians are typically involved, too, which can hamper treatment provision. Furthermore, many children have a fear of dental treatment, fear of injection, or fear of pain. Finally, some dentists feel unconfident in handling children, which can further contribute to their stress. This chapter illuminates some key factors that need to be addressed when treating young patients in emergency situations.

Behavioural Management

Not all emergency treatments are associated with pain. In a university-based survey in Houston, TX conducted over 3 years, 816

children aged between 10 days and 15 years (average 5.1 years) entered the clinic as emergencies (Agostini et al., 2001). For 25% of these patients, the emergency situation was their first encounter with a dentist. Thirty percent of the patients had pain or painful swellings associated with early childhood caries (ECC), whilst 23% had a dental trauma. In less than 20%, pain was associated with soft tissues or eruption problems. It may be speculated that in a private office, the percentage of children with caries-related pain will be far higher than for trauma cases.

If pain is associated with eruption problems, the primary focus is on calming the parents and prescribing local anaesthetics (e.g. lidocaine gel or polidocanol gel) to relieve the pain (Figure 1.4.1). Talking to the parents and reassuring them that their child's condition is not dangerous helps greatly. Sometimes, preventative measures are sufficient to handle painful conditions (Figure 1.4.2a,b). Acute trauma conditions are also often easy to handle, because the patient is frequently in a post-shock state, and the overflow of epinephrine has an analgesic effect. Necessary treatments can usually be carried out with local anaesthetic under rubber dam isolation without lack of patient compliance. The dental assistant should be instructed to keep an

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Figure 1.4.1 Sometimes, patients seek emergency treatment over trivial matters. In this case of a loosely attached tooth, 73 lidocaine gel was applied, and the tooth was extracted by the child with the help of a dental floss ligature.

eye on the accompanying parent or guardian, who may be more upset than the patient themselves. A quiet voice, together with calm and concentrated dental treatment, helps to overcome such situations.

Painful conditions due to caries are more demanding. The child will usually have had dental ache for days or weeks; they may have received analgesics, which thus will not give pain relief anymore; they will have been awake at nights, as will their parents; and there has been plenty of time for them to develop a fear of the inevitable visit to the dentist. When a patient shows up under these conditions, perhaps during after-work hours, it is unhelpful to accuse the parents of

neglecting their oral health. The goal is to relieve the patient of their pain – preferably in a way that is as nontraumatic as possible, so that the patient is inclined to return for further treatments.

Diagnosis

It is necessary to correctly diagnose the origin of the pain. The primary diagnostic instrument is the dentist's ears. If parents tell you that their child "couldn't sleep all night", "is very sensitive to temperature", "cannot sharply inhale", or "had a deep caries filled last week", they have pulpitic problems, whilst if they say the child "cannot bite on the side", "had sharp pain last week, which stopped, but now cannot chew", or "had a big pain and now has swelling", they have a periapical pathology associated with a necrotic pulp. Be aware that pulp sensitivity tests are not very reliable in children and can return false positives due to fear, response of the adjacent soft tissue, or vitality in one root canal next to pulp necrosis in another, in multirooted teeth (Gopikrishna et al., 2009). Asking the child to point to the painful tooth aids in the diagnostic process. Gently blowing with compressed air helps locate a tooth with irreversible pulpitis. It is not necessary to provoke the maximum pain response in order to be sure of the diagnosis.

(a)



(b)



Figure 1.4.2 (a) A 5-year-old patient with disabilities was referred by a neurologist for extraction of the canines due to a painful self-injuring biting habit. (b) A vestibule protector was applied instead, preventing further biting. The habit was abandoned shortly thereafter.

If, according to the anamnesis, there is a suspicion of a symptomatic apical periodontitis, it is not necessary to knock at the suspected tooth with the handle of the mirror, because the provocation of acute pain will hamper subsequent treatment. Positive reaction to percussion may be checked with the fingers by pressing and moving the teeth. In the same diagnostic step, the fingers can be used for periradicular palpation. The dentist should always remember that his or her job is to take pain away, and not to worsen it. If visual

inspection is not possible in the dental chair, which may often be the case in toddlers and infants, the patient should be positioned on the parent's lap (Figure 1.4.3a) and leaned back on to the dentist's (Figure 1.4.3b). Often, if the patient is screaming, a visual inspection will be possible. Remember that visual inspection is mandatory before setting up a treatment plan. Soft dentine lesions (Figure 1.4.4a) warrant more attention as possible origins of pain than do darkened leathery dentine lesions (Figure 1.4.4b).

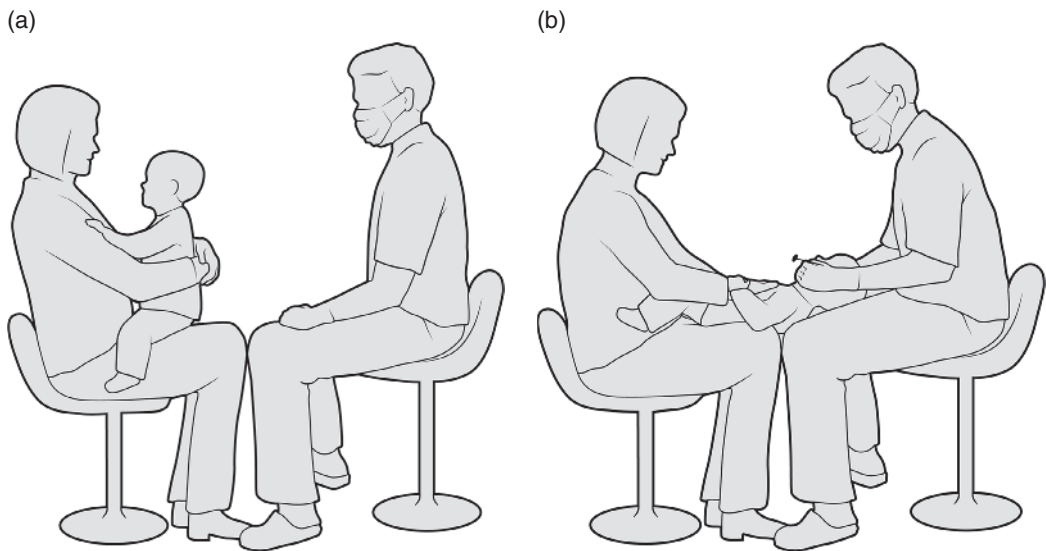


Figure 1.4.3 A safe position for inspection of toddlers and infants can be achieved when the child (a) sits in its parent's lap and (b) leans back on to the dentist's.

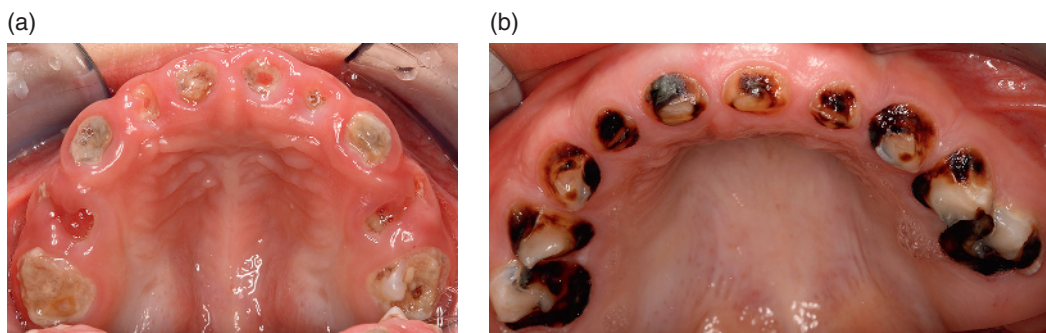


Figure 1.4.4 (a) Totally neglected oral health in a 4-year-old patient. Dentine is soft and covered with plaque, indicating active caries lesions. (b) Discoloured black dentine indicates the arrest of dentine caries. This can often be seen in patients whose parents take responsibility for their child's dental health with tooth brushing and diet control.

Fear Management/Anxiolysis

The key to paediatric management of emergency situations is trust and distraction. Roughly 40% of children referred to the School of Dental Medicine at the University of Bern as “noncompliant” or “not treatable” could be distracted by a TV screen mounted to the ceiling, allowing treatment (empiric data). Such a setting is inexpensive and may be enough to allow the handling of patients in emergency situations. Wireless headphones help reduce the sounds of dental treatment and can further distract the child. A screen in the ceiling allows the dentist to judge from the patient’s pupillae how great the level of distraction is. If the sight is focused on the screen, with little eye movement and perhaps reduced responsiveness, dental treatment can be carried out with confidence. A TV screen is especially helpful in children up to the age of 5 years. Other behavioural methods such as “tell–show–do” are applicable in children aged over 5, because they require some logical operative thinking. Some knowledge of hypnosis is helpful in calming and distracting patients, and may also help the dentist remain calm and concentrated.

Other nonverbal anxiolytic methods that can be applied with success include:

- Sweet taste. Let the patient drink some syrup. The effect is via sensory fibres (*N. lingualis*) to the thalamus and amygdala, and reduces the pulse speed. The patient feels better and more confident (perhaps due to excretion of beta endorphins).
- Cold sensation. Apply a cold towel to the patient’s forehead. This slows the pulse due to sympathetic thermoregulation of the thalamus, leading to centralisation of the blood.
- Cautious treatment.
- Simple images.
- Letting the patient talk.
- Making pauses.

The rationale behind these sometimes very helpful tricks, which work rapidly, is the

function of the amygdala. The amygdala is the central emotional control unit of the brain. The emotion “fear” is located there. The amygdala is mutually connected with cortical and subcortical structures. Sensoric afferences (seeing, hearing and feeling, and also memories of smells, emotions, images and sounds) are connected to the amygdala, which emotionally judges them with joy or fear. The body reacts quickly and unconsciously to its impulses.

It may be helpful to remember the “Three As of Anxiety” (Botto, 2006):

- 1) Ask how anxious the patient is.
- 2) Acknowledge what you have heard.
- 3) Address the patient’s fears by offering solutions.

Finally, be honest. Do not make a promise you cannot keep. Once a bond of trust has been established with the child, take care not to break it. If a hurtful procedure has to be undertaken, it is better to announce that there might be some pain than to promise that there will be no pain at all.

Local Anaesthesia

As already mentioned, local anaesthesia in trauma cases rarely poses a problem. Patients may have a fear of injections, for a number of reasons: fear of the needle, fear of the syringe, fear of the pain. Depending on their age, the necessity of using local anaesthetics should be reframed with positive words (“Let’s put the gums/teeth to sleep”, “We’ll gently apply some sleeping drops”). The pain of needle insertion can be minimised by applying a lidocaine gel on to the mucosa. A dry mucosa allows for better diffusion, and the onset of the anaesthetic effect may take 2 minutes. The terminal injection should be performed with a “gentle” thumb, and not hastily. The anaesthetic solution should be allowed to diffuse and take effect in the mucosa before the injection pressure increases. It may sometimes be advisable to ask the patient, especially when they are desperately opening

their mouth in a cramped way in expectation of further pain, to loosen the muscles and gently close the mouth a bit. This allows for a gentler diffusion of the anaesthetic solution. Often, when a painless injection can be applied, more than half of the game is won. There are some computerised injection devices on the market that look less like injection needles, and which inject the anaesthetic at slow speed. With these devices, periodontal ligament anaesthesia (PDL), anterior middle superior alveolar block anaesthesia (AMSA) or palatal anterior superior alveolar block anaesthesia (PASA), for example, can be carried out, which might offer advantages in pain management (Versloot et al., 2005). This is especially true where terminal injections would enter inflamed tissue. The patient and their parents should be reminded upon dismissal that the numbness of some facial regions may last, but not forever, and that biting and nudging of these parts might cause severe wounds (Figure 1.4.5a,b).

In some cases, the compliance of the patient is a priori not sufficient for treatment. It is then advisable to use a sedative regimen. In Switzerland, the two most common methods of conscious sedation are application of nitrous oxide/oxygen inhalation sedation and application of oral midazolam. Both require a healthy lung function without any respiratory obstructions. The patient's

paediatrician should be consulted before carrying out either method, and written informed consent should be obtained from the parents. When applying either method in a private dental office, the regulations of the appropriate national dental society should be strictly adhered to.

Nitrous Oxide/Oxygen

The application of nitrous oxide/oxygen is one of the earliest and best studied methods of influencing pain perception and anxiety levels, especially of paediatric patients. Inhalation sedation has an excellent safety record and a proven efficacy in a wide range of patients, both paediatric and adult (IACSD, 2015). Inhalation sedation must not be applied in patients younger than 3 years, in patients with psychic disorders, or in patients with otitis media (SDCEP, 2017). It is also contraindicated when a pregnant woman is in the same room. In dental emergency situations, only mild analgesia and anxiolysis warrant its use.

To achieve the sedation effect, the patient nasally inhales a mixture of nitrous oxide/oxygen up to a concentration of 50% nitrous oxide. In most cases, a lesser nitrous oxide concentration of 65–70% is sufficient. The patient remains conscious during inhalation sedation, and questioning and reframing about their subjective



Figure 1.4.5 (a) Serious lip injury 1 day after dental treatment in the lower jaw. (b) Haematoma caused by the injury. It is important to instruct the parents properly following a dental treatment.



Figure 1.4.6 Conscious sedation with oxygen/nitrous oxide allows perfect treatment conditions. Pulse and oxygen saturation are being monitored (left index finger).

perception of its physical effects (paresthesia of the extremities, cold forehead, warm belly, numb skin) may help deepen them. In order to be able to individually change the ratio of nitrous oxide to oxygen, a delivery device with separate bottles is recommended (Figure 1.4.6). However, this may not be allowed in certain countries, where only prefabricated equimolar 50/50 mixtures are available (e.g. Calinox). The patient is monitored throughout treatment using pulse oximetry. At the end, the patient inhales pure oxygen to prevent a diffusion hypoxia, because they will be exhaling nitrous oxide. Unlike with other sedation methods, after inhalation sedation with nitrous oxide/oxygen the patient is usually fully recovered and has no physical impairments (SDCEP, 2017).

Midazolam

Another possibility for conscious sedation in emergency situations is midazolam. The best way of delivering midazolam is intravenously, but in many clinical settings oral, intranasal

or suppository sedation with a concentration of 0.4–0.5 mg/kg body weight is increasingly popular. Ideally, midazolam should be administered titratable intravenously way, but if this cannot be done, an intravenous cannula should be placed in the patient's arm or the back of their hand once the desired sedation effect begins. The effect of midazolam is anxiolytic: the patient becomes drowsy and sometimes experiences a partial retrograde amnesia. However, midazolam has great inter-individual pharmacokinetics and pharmacodynamics; that is, the onset and offset of the effect can vary considerably (usually 20–30 minutes after administration and 30–45 minutes after termination, respectively), and the effect itself can be sufficient or borderline. Still, especially in very young patients, this type of sedation is the method of choice if an operative intervention is mandatory and if general anaesthesia treatment is not an option.

Concomitant pulse oximetry is also mandatory during and after sedation with midazolam (Langhan et al., 2012). The patient must have sufficient respiratory

function upon dismissal. Demanding physical activities should be refrained from during the day of sedation, because the reflexes will be subdued, increasingly the risk of further accident. If a dentist wants to administer midazolam in the private office setting, local regulative legislation must be followed. In some countries, midazolam may only be administered by anaesthetists or specially trained and certified dentists.

It must be stressed that nitrous oxide/oxygen and midazolam may be combined with local anaesthetics, but not with each other. The combination of midazolam and nitrous oxide by far surpasses the effect of either alone, and once led to the tragic death of a 4-year-old boy (Lee et al., 2017).

Referring the Patient

In some cases, the general state of health of the patient does not permit treatment in a private office. Figure 1.4.7 shows a boy presenting 2 days after a simple extraction of tooth 54. He had swelling, increased mobility of several teeth, pocket probing at depths of 12 mm and more on several teeth, and elevated temperature. Hospitalisation of the patient to receive intravenous antibiotics was the correct treatment. In order to avoid a spreading infection, the prescription of antibiotics and subsequent referral to a clinic or centre that offers treatment in general anaesthesia is recommended in such cases. The aim must always be to help the patient without harming them.

(a)



(b)



(c)



Figure 1.4.7 (a) The facial swelling and the reduced general condition indicate a serious problem. Spreading of the abscess could be seen on the (b) palatal and (c) buccal aspect. The patient had to be hospitalised and received intravenous antibiotic therapy.

References

- Agostini, F. G., Flaitz, C. M., Hicks, M. J. 2001. Dental emergencies in a university-based pediatric dentistry postgraduate outpatient clinic: a retrospective study. *ASDC Journal of Dentistry for Children*, **68**, 300–1, 316–21.
- Botto, R. W. 2006. Chairside techniques to reduce dental fear. In: Mostofsky, D. I., Forgione, A. G., Giddon, D. B. (eds). *Behavioral Dentistry*. Oxford: Blackwell Munksgaard, pp. 141–52.
- Intercollegiate Advisory Committee for Sedation in Dentistry (IACSD). 2015. Standards for conscious sedation in the provision of dental care. Available from <https://www.rcseng.ac.uk/-/media/files/rcs/fds/publications/dental-sedation-report-2015-web-v2.pdf> (last accessed 30 January 2019).
- Gopikrishna, V., Pradeep, G., Venkateshbabu, N. 2009. Assessment of pulp vitality: a review. *International Journal of Paediatric Dentistry*, **19**, 3–15.
- Langhan, M. L., Mallory, M., Hertzog, J., Lowrie, L., Cravero, J., Pediatric Sedation Research Consortium. 2012. Physiologic monitoring practices during pediatric procedural sedation: a report from the Pediatric Sedation Research Consortium. *Archives of Pediatric and Adolescent Medicine*, **166**, 990–8.
- Lee, H., Milgrom, P., Huebner, C. E., Weinstein, P., Burke, W., Blacksher, E., Lantos, J. D. 2017. Ethics rounds: death after pediatric dental anesthesia: an avoidable tragedy? *Pediatrics*, **140**(6), e20172370.
- Scottish Dental Clinical Effectiveness Programme (SDCEP). 2017. Conscious sedation in dentistry. Available from <http://www.sdcep.org.uk/wp-content/uploads/2018/07/SDCEP-Conscious-Sedation-Guidance.pdf> (last accessed 30 January 2019).
- Versloot, J., Veerkamp, J. S., Hoogstraten, J. 2005. Computerized anesthesia delivery system vs. traditional syringe: comparing pain and pain-related behavior in children. *European Journal of Oral Science*, **113**, 488–93.