International Journal of Dental Hygiene

Official Journal of the International Federation of Dental Hygienists

ORIGINAL ARTICLE

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Complications of local anaesthesia. An observational study

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Abstract: *Objectives:* Local anaesthesia is increasingly used by dental hygienists. As little is known about the incidence of adverse effects during and after the administration of local anaesthetics, we evaluated side-effects associated with local anaesthesia. *Methods:* A prospective observational study was conducted using standard criteria among a group of 103 patients receiving mandibular block anaesthesia. *Results:* Physical reactions like clenching fists (14.5%), moaning (12.6%) and turning pale (7.8%) were frequently observed. Patients (3.8%) showed a painful reaction because of needle contact with a nerve or the periosteum. Systemic complications were not observed. After the injection, 41.7% said they felt tense during the administration; 4.9% of the patients reported swallowing problems and 3.9% a tachycardia. *Conclusions:* These results suggest that administration of local anaesthesia has a small risk of adverse events. Complications, if they occur, seem minor and transient in nature.

Key words: anaesthetic; complication; mandibular block; side-effect; tachycardia

Introduction

In many countries, dental hygienists are qualified to administer local anaesthesia, usually under the supervision of a dentist. This local anaesthetic can be applied in different ways; as topical anaesthesia which anaesthetizes nerve endings in the mucosa, infiltration anaesthesia which anaesthetizes the terminal nerve endings at the site of operation or regional nerve block anaesthesia (conduction anaesthesia). In the last case, the anaesthetic is injected near the nerve, blocking the peripheral area completely (1).

Dates:
Accepted 9 December 2008

To cite this article:
Int J Dent Hygiene **7**, 2009; 270–272
DOI: 10.1111/j.1601-5037.2009.00372.x
Brand HS, Bekker W, Baart JA. Complications of local anaesthesia. An observational study.

During the past decades, some studies have investigated the frequency of immediate complications during the administration of a local anaesthetic (2–6). However, in these studies, different types of anaesthetics, injection techniques and needles were used. Therefore, we conducted an observational study of physical reactions by patients during mandibular bock anaesthesia, thereby eliminating the variability in anaesthetics, instruments and injection techniques.

Study population and methodology

Mandibular block anaesthesia was administered to 103 adult patients (47 males and 56 females). A short verbal medical history was obtained from each patient. All patients were in good health, with one patient reporting an amoxicillin allergy. In all patients, articaine hydrochloride 4% with 1:100.000 adrenaline was used (Septanest SP®, Septodont, Bruxelles, Belgium). The anaesthetic was always administered after aspiration, using an automatic aspirating syringe and a 27-gauge needle with a length of 35 mm (XL Septojet®, Septodont, Bruxelles, Belgium).

The patients had been referred to the department of oral and maxillofacial surgery of an Academic Medical Centre for removal of a third molar in the lower jaw. All patients gave prior informed consent for observation of their behaviour during and immediately after the administration of the anaesthetic. The behaviour was observed by a single observer, using the criteria shown in Table 1 which were not disclosed to the patients. The observation of the physical reactions was restricted to the administration of the mandibular block anaesthesia and did not include subsequent procedures.

Table 1. **Observed physical reactions during and immediate after the administration of mandibular block anaesthesia in adult patients (*n* = 103)**

	Frequency *n* (%)
Fending off	0 (0.0)
Slapping	0 (0.0)
Kicking	0 (0.0)
Walking away	0 (0.0)
Clenching fists	15 (14.5)
Clutching chair	5 (4.9)
Clutching hand of nurse or companion	4 (3.9)
Moaning	13 (12.6)
Crying	2 (1.9)
Calling	0 (0.0)
Sweating	2 (1.9)
Turning pale	8 (7.8)
Vasovagal collapse	0 (0.0)
Hyperventilation	0 (0.0)
Reaction to needle contact with nerve	4 (3.8)
Blanching	0 (0.0)
Facial paralysis	0 (0.0)
Epileptic insult	0 (0.0)

Table 2. **Self-reported complaints by adult patients during and immediately after the administration of mandibular block anaesthesia (*n* = 103)**

	Frequency *n* (%)
Dizziness	2 (1.9)
Tachycardia	4 (3.9)
Warm	3 (2.9)
Tightness	0 (0.0)
Feeling tense	43 (41.7)
Swallowing problems	5 (4.9)

After administration of the anaesthetic, the patients completed a short questionnaire to explore whether they experienced certain physical reactions during the administration (see Table 2).

Results

The mandibular block anaesthesia was administered by an oral and maxillofacial surgeon (12 patients), an oral and maxillofacial surgeon in training (79 patients) or a dental student (12 patients). Physical reactions of patients, frequently observed during administration of anaesthesia, were clenching fists and moaning (14.5% and 12.6% respectively) (Table 1).

Turning pale was observed in 7.8% of the patients. Clutching to the dental chair, hand of the nurse or a companion, crying and sweating were each observed in less than 5% of the patients. Four patients (3.8%) showed a painful reaction when the point of the injection needle inadvertently touched a nerve. In two cases, the inferior alveolar nerve was touched, in the other two cases the lingual nerve.

The frequency of physical reactions was not different for oral surgeons, trainees and dental students. No statistical gender related differences were observed, except for clenching fists, which was more present in female patients than in male patients (21.4% versus 6.4%, $P = 0.031$). No cases of systemic complications like vasovagal collapse, hyperventilation or epileptic seizures were observed.

After administration of the anaesthetic, a small number of patients stated that they experienced swallowing problems, tachycardia, dizziness or a warm feeling during the injection (Table 2). Although 41.7% of the patients felt tense during the injection, a large majority agreed with the statement that anaesthesia could have been worse (89.3%).

Discussion

Although many patients felt tense during the injection (41.7%), the administration of mandibular block anaesthesia was

performed without complications in most patients. However, in 3.8% of the patients a painful reaction was observed when the needle touched a nerve (Table 1). In half of these cases, the inferior alveolar nerve was touched, in the other half the lingual nerve. In a previous study, an electric sensation during injection was reported by 6.3% of the patients, two-thirds with inferior alveolar nerve blocks (4). The contact of the needle with the nerve does not automatically mean that sensation disorders will occur, but the patient should be informed of the possibility prior to the procedure being carried out. The patient may also react to the 'electric' shock by suddenly pulling away the head, with the risk of self-inflicted damage (1).

A shot of pain may also occur if the artery wall is touched. The prick may stimulate orthosympathetic nerve fibres in the artery wall, causing a vessel spasm. The impulse is then carried along the blood vessel, leading to vasoconstriction in the peripheral supply area of the artery. This results in a sudden skin paleness of the respective half of the face, especially in the cheek and the area around the eye (1). This 'blanching' was not observed in our patients (Table 1), which is in agreement with previously reported low incidences of 0.3–1.2% (4, 5).

Paralysis of the facial nerve was also not seen (Table 1). This complication, also not observed by Lustig and Zusman (4), is caused by an incorrect path of the needle. The needle is inserted too deeply and too far dorsally, and the anaesthetic is deposited retromandibular in the deep lobe of the parotid gland. If this occurs, the patient is unable to close the eye at will and the movement of the lower half of the face is distorted. The function of the nerve will return spontaneously as soon as the effect of the anaesthetic has worn off. Because the patient is not able to blink during the paralysis, there is a risk of the eye drying out and being damaged. The dental hygienist should avoid damage by placing an eye patch or tape over the closed eyelid (1).

Systemic complications are rare during the administration of a mandibular block. Vasovagal collapse, hyperventilation and epileptic insults were not observed in our study. The low frequency is in agreement with the previous studies, in which insults occurred only in 0.07% of cases (3) and the incidence of vasovagal collapse varied between 0.1% and 0.6% (3, 4, 6). A vasovagal collapse is not always related to the administration of anaesthesia, but may also be induced by the anticipation of the subsequent surgical procedure. During a vasovagal collapse, the parasympathetic nervous system is activated and the orthosympathetic nervous system is inhibited. This causes a reduction in the heart rate and dilatation of the arterioles in muscles, inducing a temporary shortness of blood flow to the brain. The patient looks pale and may lose consciousness.

Table 3. **Some general preventive measures with regard to the use of local anaesthetics (1)**

Take a medical history beforehand
Reassure the patient and give accurate information
Never use more anaesthetic than necessary
Use the lowest concentration vasoconstrictor possible
Aspirate
Inject slowly
Observe any reaction of the patient during the injection
Have a medical emergency kit with medication available

With an (imminent) vasovagal collapse, the dental hygienist should place the chair in the Trendelenburg position, whereupon consciousness will return in a short time (1).

After the administration of the anaesthetic, 3.9% of the patients reported tachycardia (Table 2). The previous studies reported tachycardia during administration of local anaesthesia in 1.1% (3) and 4.1% of the patients (2). The tachycardia can be due to intravascular administration of the vasoconstrictor adrenaline (1). An increased heart rate may also be induced by psychogenic anticipation of the possible pain of the injection and/or subsequent treatment. Anxious patients have a higher heart rate before and during the administration of local dental anaesthesia than non-anxious patients (7, 8).

In conclusion, administration of a local anaesthetic seems associated with limited risks of adverse events. Although these side-effects are usually minor and transient in nature, the dental hygienist should prevent their effects as much as possible (Table 3). Taking a medical history is essential to identify dental hygiene patients with an increased risk of side-effects (1, 3).

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