Local Anaesthetics in Dental Medicine

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Dental medicine was fundamentally changed unlike any other medical discipline. Local anaesthesia is the most frequently used form of pain relief in dental medicine.

Since the discovery of the first tolerable local anaesthetic, injection methods and syringe systems were developed. And now injection systems are available for every type of application for performing dental and dental-surgical procedures. Modern production facilities and quality assurance systems ensure reliability, availability and consistently high quality (Figs. 1, 2).

**History**

The substance called Procaine, the first effective and tolerable local anaesthetic, was synthesized in 1905. One year later, adrenaline, which is added to local anaesthetics as a vasoconstrictor, was first successfully synthesized. By adding such vasoconstrictors, removal of the local anaesthetic is delayed, whereby the duration of local anaesthesia such as in the case of Lidocaine, for example, may be doubled.

**Local Anaesthetics in Dental Medicine**

The requirements imposed on a clinically usable local anaesthetic include water solubility, sterility, availability and tissue compatibility. In order to prevent toxic effects, a local anaesthetic should be inactivated as rapidly as possible after absorption.

Today, the local anaesthetics used clinically are divided into esters and amides based on their chemical structure. Because of their higher risk of hypersensitivity, the local anaesthetics of the ester group should be generally avoided. This group, Mepivacaine and Benzocaine have an area of indication as topical anaesthetics.

Only certain local anaesthetics are approved for routine use in dentistry. These include Lidocaine, Mepivacaine and Articaine, for example. These substances belong to the amide preparations. They exhibit very low allergenic potential. The occasionally observed intoleran-

**Approximately 90% of all dental anaesthetics performed in Germany use this substance. Articaine is used predominantly as a 4% solution (e.g., Septanest, Septodont; Espesten, 3M ESPF) (Fig. 4).**

**Vasoconstrictors**

Elimination of synthetic local anaesthetics from the site of activity is accelerated due to the fact that in contrast with natural cocaine, they have no vasoconstriction but vasodilatory activity. This results in more rapid absorption of the local anaesthetic. This drawback can be counteracted by the addition of vasoconstrictors such as adren-

By virtue of the vasoconstrictor, the elimination of the local anaesthetic is slowed and consequently there is a lengthening of the therapeutic utility time and a potentiating of the intensity of action. Another effect is the reduction of local perfusion, which can be an advantage in surgical procedures.

The majority of dental local anaesthetics contain the adjun-
tant adrenaline in concentrations of 1:80,000, 1:100,000 and 1:200,000. Sulphite is added as an antioxidant in order to sta-
bilize the oxygen-sensitive adren-
alin. Here, the corresponding risk of sulphate allergy must be considered. In the majority of cases, the lower adrenaline concen-
tration of 1:200,000 is ade-
quately. Nevertheless, a higher

duration, whereas in nerve block anaesthesia the reverse effect must be expected.

**Administration & Injection Methods**

In the majority of cases, local anaesthetics in dental medicine are administered in the form of topical, infiltration or nerve block anaesthesia. Special local techniques include intraalimentary, intrasupral, intrasupral and intrapulpal anaesthesia. In general, dental cartridges together with dental syringes are used for infiltration and nerve block anaesthesia. These make aspiration of the local anaes-

thetic possible before injec-
tion, and thus increase the safety of administration.

In addition, easy-break ampoules and, in cases of high use, multi-dose bottles are used.

Multi-dose dispensing bottles must, however, contain preservatives, which represents an allergenic risk.

Injection should be done slowly (circa 1 ml/60 sec.). In the case of intraliga-
timentary injection, an even slower injection is re-
quired. Here, special injec-
tion syringes are available, making uniform and reduced pressure injection possible. Recently, elec-
tronically controlled injec-
tion systems (Anaject, Wang), have become available.

Today, thin disposable needles with a precision bevel, such as the triple bevel needle (Septoject, Septodont), are used as injection needles. Developments are injection needles with a silicone coating for improved sliding character-
istics and cannulas. This trim-
ner wall thickness for reducing the required injection pressure and slowing the flow of the injec-
tion solution (Septoject XL, Septodont).

**Complications**

Most frequently, adverse non-specific systemic effects occur that are caused by the injection itself. In extremely rare cases, they require spe-
cific treatment and are only transient in nature. Drug-de-
pendent adverse effects such as intoxication or anaphylac-
tic shock are potentially life-

threatening.

Intoxication can be trig-
ered by overdose of the local anaesthetic or by vascular in-
jection.

The symptoms of intoxica-
tion are of the CNS type: Dia-
zziness, tremors, facial twitch-
ing, seizures, decrease in pulse and blood pressure and a respi-
datory or cardiovascular arrest can also occur.

The first symptoms in ana-
phylactic shock include reddening and swelling of the injection area followed by purities. A gen-
eralized release of histamine can cause cardiovascular shock symptoms like an increase in heart rate and a drop in blood pressure. Finally, the result of this can be cardiovascular arrest.

Intoxication and anaphyl-
actic shock require immedi-
ate action by the dental team and availability of operational emergency equipment. An es-

tential component of emer-
gency prophylaxis is a careful and regularly updated medical history.

**Literature**


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