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 anaesthetics, 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 1899. 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, stability 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. Of this group, etidocaine and benzocaine have an area of indication as topical anaesthetics.

Only certain local anaesthetics are approved for long 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 intolerable reactions are caused by the added preservatives (such as methylparaben) and/or excipients (e.g., sulphites) (Table 1).

Lidocaine is the most widely used worldwide, and is quite appropriate for spatially expanded treatments. It is used as a 2% solution for infiltration and nerve block anaesthesia. (e.g., Lignospan Special, Septodont). It can also be used in topical anaesthesia (XyloNur Spray, Septodont) for the mucosa.

Because of its very low vasoconstrictor activity, Mepivacaine can be used also without a vasoconstrictor. This local anaesthetic should be considered in patients with contraindications for the use of adrenaline or sodium chloride. It is also suitable for inter alia for special at-risk patients such as asthmatics, persons with allergies or cardiovascular-labile patients.

Because of the relatively short therapeutic utility time, the 5% solution should be used (e.g., Mepideron 5% Plain, Septodont) (Fig. 5).

Articaine is characterized by pronounced local anaesthetic activity with low toxicity.

Articaine is used particularly in maxillofacial surgery as a 4% solution (e.g., Septanest, Septodont). It is administered in the form of topical, infiltration or nerve block anaesthesia. Special local anaesthetics contain the adjuvants adrenaline in concentrations of 1:80,000, 1:100,000 and 1:200,000. Sulphite is added as an antioxidant in order to stabilize the oxygen-sensitive adrenaline. Here, the corresponding risk of sulphite allergy must be considered. In the majority of cases, the lower adrenaline concentration of 1:200,000 is adequate. Nevertheless, a higher adrenaline concentration is of interest if, in dental-surgical procedures, greater vasoconstriction is desired for a better intraoperative overview.

However, it must be noted that depending on the method of administration, different type effects must be expected by virtue of the vasoconstrictor added. In the case of infiltration anaesthesia, the duration and intensity of the local anaesthesia increases dose-dependently with increasing adrenaline addition, 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 intraligamental, intrasulcular, intrasuperficial 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 anaesthetic possible before injection, 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 allergy risk.

Injection should be done slowly (circa 1 ml/60 sec.). In the case of intraligamentary injection, an even slower injection is required. Here, special injection syringes are available, making uniform and reduced pressure injection possible. Recently, electronically controlled injection systems (Anaject, Wand), 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 characteristics and cannulae with a thinner wall thickness for reducing the required injection pressure and slowing the flow of the injection 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 specific treatment and are only transient in nature. Drug-dependent adverse effects such as intoxication or anaphylactic shock are potentially life-threatening.

Intoxication can be triggered by overdose of the local anaesthetic or by vascular injection.

The symptoms of intoxication are of the CNS type: Dizziness, tremors, facial twitching, seizures, decrease in pulse and blood pressure and a respiratory or cardiovascular arrest can also occur.

The first symptoms in anaphylactic shock include reddening and swelling of the injection area followed by puritis. A generalized release of histamine can cause cardiovascular shock symptoms such as an increase in heart rate and a drop in blood pressure. Finally, the result of this can be cardiovascular arrest.

Intoxication and anaphylactic shock require immediate action by the dental team and availability of operational emergency equipment. An essential component of emergency prophylaxis is a careful and regularly updated medical history.

Literature
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