What's new for the clinician?

Excerpts from and summaries of recently published papers

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1. The effect of toothbrushing instruction versus no toothbrushing instruction on plaque removal among young adults.

Schmalz, G, Kiehl, K, Schmickler, J et al. Clin Oral Invest. 2018; 22: 1147- 55.

There is consensus in the literature that (meticulous) tooth brushing at least once per day is sufficient to maintain oral health and to prevent caries and periodontal diseases.[1] Toothbrushing is also regarded as an important vehicle for application of anti-caries agents, such as fluorides. However, most patients are not able to achieve sufficient plaque removal by performing oral hygiene measures at home. Therefore, tooth brushing twice daily is recommended by most of the dentists in order to improve plaque control. This rule is followed by most of the patients taking care for their oral health and has shown to be effective in maintenance of oral health in numerous studies.[1] Hence, using a toothbrush (TB) within the personal daily oral hygiene procedure is nowadays a standard in developed societies.

The literature distinguishes between manual (MTB) and powered (PTB) systems, in which the latter are repeatedly described to be more effective in plaque removal and reduction of gingival inflammation.[1] It is furthermore possible to differentiate within PTB into oscillating-rotating (OR) and sonic-active (SA) modes of action. The available literature shows the largest body of evidence for the effectiveness of OR systems.[1]

The ability to effectively remove plaque is thought to be influenced by instructions received from oral health professionals, especially in the cases of manual toothbrushing. Additionally, the influence of instruction for PTB is also unclear. Schmalz and colleagues (2018)[1] reported on a randomized clinical study (RCT) that compared instructed and non-instructed young, oral healthy participants within different groups including manual toothbrushing(MTB), powered oscillating-rotating (OR) toothbrushing, and powered sonic-active (SA) toothbrushing regarding their effectiveness in plaque removal and reduction of gingival inflammation. The aim of the study was to detect the effect of an instruction within a group using OR, SA, or MTB in young, oral healthy adults. It was hypothesized that PTB including OR and SA would be less dependent on instructions compared with MTB.

Materials and methods: This was a prospective RCT with a six-arm parallel design. Participants were randomly divided into three groups (powered oscillating-rotating (OR); powered sonic-active (SA) and manual toothbrushing (MTB); n = 50 each group) with two subgroups each: participants receiving no instructions (NI) and participants receiving instructions (I) (n = 25 per group).

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ACRONYMS

GI: Gingival Index
TB: toothbrush
MTB: manual
PTB: powered
PBI: Papilla Bleeding Index
mod. QHI: Quigley–Hein Plaque Index
OR:oscillating-rotating
SA: sonic-active
RCT: randomized clinical study

A total of 162 participants were screened for eligibility, of whom 150 were included in the study. The following inclusion criteria were defined: Healthy oral conditions, i.e., no active carious lesions, which require invasive treatment (D-T = 0), and no periodontal treatment need (PSR/PSI ≤ 2) Periodontal Screening recording; Periodontal Screening Index); a minimum number of 20 remaining teeth; age between 18 and 30 years; ability to give informed consent and voluntary participation. The exclusion criteria were the following: Inability to participate due to severe general diseases; diseases affecting motor skills; presence of metabolic diseases (diabetes mellitus), infectious diseases (hepatitis A/B/C, HIV), renal insufficiency, seizure or neurological disorders, pregnancy, addiction (alcohol, drugs), required antibiotic prophylaxis due to endocarditis risk or immunosuppression (e.g., due to organ transplantation).

The plaque accumulation at screening examination of each patient was classified into three categories using the baseline-modified Quigley–Hein Plaque Index (mod. QHI) as follows: good (< 1), moderate (1–2), or poor (> 2). Based on these categories, as well as smoking habits, gender, and left-handedness, a matching was performed to ensure comparable groups.

Three types of toothbrushes were chosen: OR (Pro1000 Precision Clean, Procter & Gamble), SA (SoniCare™, Philips), and MTB (elmex®INTERX). Furthermore, all participants used the same toothpaste (Sensodyne® Fluoride) during the whole time.

Gingival inflammation was evaluated using the Papilla Bleeding Index (PBI) and the Gingival Index (GI) by Loe and Silness. The PBI score ranged from score 0 (no bleeding) to score 4 (profuse bleeding). GI was used to assess changes of the gingiva. A score from 0 (normal gingiva, inflammation-free, no discoloration, no bleeding) to score 3 (severe inflammation, reddening and swelling, tendency toward spontaneous bleeding or ulceration) was used.

Plaque accumulation (using the Plaque Index by Quigley and Hein (QHI) modified by Turesky et al) on the smooth surfaces of the tooth (buccal, oral) was assessed and evaluated on a scale with six grades (score 0 = no plaque; score 5 = plaque extending to the coronal third). Furthermore, the Marginal Plaque Index (MPI) was used to differentiate plaque extension at the gingival margin. The evaluation was performed on eight measuring points at each tooth (score 0 = no plaque; score 1 = plaque).

All study-related examinations were performed under standardized conditions by a skilled, calibrated, and blinded dentist (kappa > 0.8) at baseline, 2, 4 and 12 weeks.

All participants received a professional tooth cleaning including the removal of supragingival calculus, biofilm, and extrinsic discolorations as well as the polishing of the tooth surfaces at baseline. Then, the participants received the corresponding TB according to their group allocation (OR, SA or MTB). With respect to their subgroup (I or NI), participants got a brush-specific instruction. All groups were required to brush twice daily for 2–3 min and to abandon other oral hygiene aids such as dental floss and/or interdental brushes or mouth rinses. Furthermore, all participants had to use the same toothpaste (Sensodyne® Fluoride)

Results: One hundred thirty-one participants could be included for final analysis. Thereby, 43 individuals comprised to powered oscillating-rotating OR (OR-I = 21, OR-NI = 22), [44] to powered sonic active (SA) (SA-I = 22, SA-NI = 22), and 44 to MTB group (MTB-I = 22, MTB-NI = 22). During the study period, 11 participants (SA 4, OR 5 and MTB 2) missed their allocation appointment, and 8 participants missed their follow-up without any reason. All baseline parameters including gender, smoking habits, left-handedness, DMF-T, PBI, and mod. QHI were comparable between the groups.

Within the manual toothbrushing (MTB) group over the study periods (baseline to 12 weeks), no statistically significant changes in modified QHI and MPI were found for both subgroups (I and NI; $p > 0.05$,). With OR, I and NI subgroups showed a statistically significant reduction of MPI (I: $p = 0.04$, NI: $p < 0.01$) and of modified QHI ($p < 0.01$). Similarly, the SA group showed a significant reduction of MPI (I: $p = 0.05$, NI: $p < 0.01$) and of modified QHI ($p < 0.01$) for both subgroups. Comparing the outcome of all subgroups at 12 weeks, no statistically significant differences could be found between any of the subgroups for MPI ($p = 0.34$) and modified QHI ($p = 0.08$).

Within the MTB group, no statistically significant changes in PBI were found between baseline and 12 weeks for both I ($p = 0.14$) and NI ($p = 0.15$). Regarding GI, a significant improvement could be found in the I subgroup of MTB ($p = 0.03$). In the OR group, no significant reduction of PBI and GI was detected ($p > 0.05$). Within the SA group, the I subgroup showed a statistically significant reduction in PBI ($p = 0.02$), and, for the NI subgroup, a significant improvement of GI was found ($p = 0.05$). Comparing the outcome of all subgroups at 12 weeks though, no statistically significant differences could be found between any of the subgroups for PBI ($p = 0.29$) and GI ($p = 0.97$).

At the final examination at 12 weeks (t3), only the modified QHI showed statistically significant differences between I and NI participants, regardless of the toothbrush system. Thereby, a significantly lower QHI was found for I compared to NI group (1.13 ± 0.32 vs. 1.17 ± 0.33; $p < 0.01$).

MPI (I: 0.62 ± 0.57, NI: 0.56 ± 0.15; $p = 0.07$), PBI (I: 0.45 ± 0.34, NI: 0.54 ± 0.38; $p = 0.80$), and GI (I: 0.97 ± 0.13, NI: 0.99 ± 0.09; $p = 0.90$) showed no statistically significant differences at 12 weeks.

Conclusion: The researchers concluded that the toothbrush system (MTB, OR, or SA) as well as the presence or absence of a single standardized brush-specific instruction has no relevant influence on plaque removal and reduction of gingival inflammation in young, orally healthy adults.

Implications for Practice: The results of this trial suggest that instructions on how to brush has a limited effect in this age cohort.

Reference:

1. Schmalz G, Kiehl K, Schmickler J et al. No difference between manual and different power toothbrushes with and without specific instructions in young, oral healthy adults—results of a randomized clinical trial. Clin Oral Invest; 2018; 22: 1147- 1155.

2. Intraligamentary anesthesia versus inferior alveolar nerve block for extraction of posterior mandibular teeth: A RCT

Kämmerer PW, Adubae A, Buttchereit I et al. Prospective clinical study comparing intraligamentary anesthesia and inferior alveolar nerve block for extraction of posterior mandibular teeth. Clin Oral Invest. 2018; 22: 1469-75.

Tooth extraction is one of the most common dental treatment measures requiring local anaesthesia. Currently, the inferior alveolar nerve block (IANB) is still the most commonly used technique for providing local anaesthesia in the posterior mandible.[1] With the IANB, a wide area of the mandible is anesthetized; extended restorative and surgical procedures can then be carried out using one injection only. However, this technique is painful, has a relatively high failure rate and has technique immanent risks, such as transient or even persistent damage of the lingual and/or the inferior alveolar nerve.1 Further disadvantages of IANB may include intravascular injections, hematoma, muscle injury, and trismus. In general, the duration of soft tissue anaesthesia after IANB exceeds the time required for most dental treatments and there is an increased risk of burn and/or bite injury especially in children and patients with mental disabilities.[1]

ACRONYMS

IANB: inferior alveolar nerve block

NRS: numeric rating scale

ILA: intraligamentary anaesthesia

NSAD: anti-inflammatory

An alternative technique to consider is the intraligamentary injection. When using intraligamentary anaesthesia (ILA), the local anaesthetic solution is injected under relatively high pressure directly into the periodontal space of the tooth to be anesthetized. The injected solution is forced laterally through the cribriform plate into the marrow space and into the blood vessels of the alveolar bone. From there, the solution spreads to adjacent teeth and structures.[1] This results in a profound anaesthesia with an immediate onset of action and an anaesthetic duration of approximately 30–45 min using only a small amount of anaesthetic solution (about 0.2 ml for each root). The anaesthesia is limited to a single tooth and its supporting structures while anaesthesia

of the lips, cheeks, and tongue is avoided. Reversible damage of periodontal tissue, bone and root resorption, and severe bacteremia are reported disadvantages of this technique.

Kämmerer and colleagues (2018)1 reported on a trial that sought to evaluate the efficacy of ILA—in comparison with IANB—for non-surgical extraction of mandibular posterior teeth. The primary objective was to evaluate the differences between ILA and IANB in respect to the pain perceived by the patient during the injection and during the extraction procedure, as well as the anaesthetic quality (complete/sufficient vs. insufficient/no effect), based on the outcome of treatment and the degree of discomfort associated with the extraction procedure. Differences in latency time, need for second injection, amount of anaesthetic solution, and duration of the local numbness were also assessed. A further objective of the study was to clarify whether impaired wound healing (dry socket) is more frequent after ILA.

MATERIALS AND METHODS

Patients of both sexes at least 18 years old with clinical indication for local anaesthesia because of scheduled extraction of one or more mandibular posterior teeth were considered for inclusion into this trial. Only teeth requiring simple extraction were included. Exclusion criteria were the following: incapacitated patients, pregnancy, lack of compliance, and chronic or simultaneous taking of psychotropic or anti-inflammatory (NSAD) drugs in temporal context with the dental treatment. Teeth with acute apical infections or drainage of pus from the gingival sulcus or surrounding tissues and teeth with more than 0.5-mm mobility in any direction were not included in the study. If more than one tooth on one side of the mandible was to be extracted under ILA, each tooth was considered as independent sample, as each tooth required its own anaesthesia. When, however, more than one tooth on one side was extracted under IANB, only one tooth that best fulfilled the inclusion criteria was considered. In the cases of bilateral dental extraction, either ILA or IANB was administered first on one side and tooth was extracted on this side. After completing the treatment and documentation on this side, the other technique was then administered on the other side and another tooth was extracted.

IANB was administrated using disposable syringes and 25-gauge/42-mm needles. For the administration of ILA, pistol-type syringes (Ultraject®) and 30-gauge short-bevel/16-mm needles were used. The Ultraject® syringe consists of a screw-able holder for the local anaesthetic cartridge with a plastic protection tube and a fixture for attachment of the screw-able needle, a body of the syringe consisting of a toothed piston rod and a pawl for locking the piston rod, a trigger lever, and a handle with the mechanism of pressure limitation. The automatic pressure-limiting mechanism ensures that the applied pressure does not exceed 120 N. When pulling the trigger lever too quickly, the pressure transmission will stop automatically. The local anaesthetic agent used for both techniques was Ultracain D-S (articaine 40 mg/ml plus suprarenin 0.006 mg/ml)

The exact time of the injection, the anaesthetic technique used, and the injected amount of local anaesthetic solution were recorded. Immediately after injection, each patient had to determine how painful the injection was using an 11-point segmented numeric rating scale (NRS). Numbness was tested with a dental probe on the gingiva immediately after the injection and further each 10 s in case of ILA and each 30 s in case of IANB till full numbness was declared, and the time of onset of the anaesthetic effect was recorded. The subjective quality of the anaesthesia was documented using a Likert scale (complete, sufficient, insufficient, and no effect). Anaesthesia was assessed as complete when it was possible to remove the tooth without pain and discomfort. The ability to remove the tooth successfully with mild but tolerable pain and discomfort was assessed as sufficient anaesthesia. Anaesthesia was assessed as insufficient when anaesthetic effect was reported by the patient subjectively, but the tooth could not be extracted successfully with tolerable pain and discomfort. Severe pain during the extraction and absence of subjective anaesthetic effect were assessed as no anaesthetic effect.

Cases of insufficient and no anaesthetic effect after the first injection were considered as primary anaesthetic failure. The need for second injection was documented. If the anaesthesia was still incomplete after the second injection and the completion of the treatment without pain was not possible, a combination of both anaesthetic techniques was undertaken. These cases were considered as cases of secondary anaesthesia failure. After complete removal of the tooth, the total time for the procedure was recorded. Patients were asked to remain seated for several minutes after completion of treatment and to evaluate the overall pain and unpleasantness of the entire treatment again using the 11-point segmented numeric rating scale (NRS). Prescription of postoperative antibiotics was done in only few cases with an increased risk of wound healing disturbances. One day later, the patients were asked (via telephone) about the duration of soft tissue anaesthesia. The wounds were examined for signs of retarded healing (dry socket) at a second appointment within 1 week after tooth extraction. The criteria for the diagnosis of a dry socket were as follows: empty alveolus, denuded bone surface being very sensitive to probing, extreme pain that lasted more than three days after extraction, and unpleasant taste and/or odour.

RESULTS

Two hundred sixty-six patients of both sexes (176 males, 90 females) were included in this study (teeth n = 301). For data evaluation, patients were categorized into two evaluation groups (group I and II) based on whether one or both anaesthetic techniques were used in individual patients (unilateral or bilateral tooth extraction). Group I (patient n = 238, teeth n = 245) involved the patients who received either ILA or IANB for indicated unilateral dental extraction while group II (patients n = 28, teeth n = 56) involved the patients who received both ILA and IANB because of indicated bilateral dental extraction (split-mouth). ILA was compared with IANB in each group separately, and the results in group I were then compared descriptively with those in group II (split-mouth).

In group I, the injection pain was rated with a mean of 2.19 ± 1.8 points on the NRS for ILA and 3.65 ± 1.9 for IANB. In group II, mean ratings of 2 ± 1.7 and 4.2 ± 1.8 were given for ILA and IANB, respectively. In both evaluation groups, injection of ILA was statistically significantly less painful for the patients ($p < 0.001$).

The pain perceived by patients during tooth extraction was rated with a mean of 2 ± 1.7 for ILA (1.6 ± 1.4 in group II) and a mean of 1.7 ± 1.9 points for IANB in evaluation groups I and II. The difference in pain during tooth extraction under ILA and IANB was not statistically significant in both groups ($p = 0.211$; 0.936).

The mean ratings for unpleasantness of the treatment under ILA were 2.3 ± 1.6 in group I and 2.1 ± 1.6 in group II in comparison to mean ratings of 2.5 ± 2 and 2.5 ± 1.8 for procedures under IANB in groups I and II, respectively. In both groups, the difference was not statistically significant ($p = 0.31$ and $p = 0.427$).

After the first injection of ILA in group I, complete anaesthesia could be achieved in 80/105 cases (76.19%). In 13/105 cases (12.38%), the anaesthesia was sufficient. In 11/105 cases (10.48%), the anaesthesia was insufficient, and in one case (0.95%), there was no anaesthetic effect. In case of IANB, complete anaesthesia could be achieved in 109/140 cases (77.86%). In 6/140 cases (4.29%) the anaesthesia was assessed as sufficient. In 23/140 cases (16.42%), anaesthesia was insufficient, and in two cases (1.43%), there was no anaesthetic effect. In group II, complete anaesthesia could be achieved in 23/28 cases (82.14%) of ILA. In 5/28 cases (17.86%), anaesthesia was sufficient. After IANB, complete anaesthesia could be achieved in 23/28 cases (82.14%). In 2/28 cases (7.14%), the patients assessed anaesthesia as sufficient, and in 3/28 cases (10.72%), the anaesthesia was insufficient. Accordingly, the success rate of ILA in extraction of mandibular posterior teeth was 88.6% after just one injection (100% in group II); this rate increased to 99% after the second injection. IANB, however, had a success rate of 82.2% after the first injection (89.3% in group II), and 98.6% after the second injection (100% in group II). The difference between the success rates of ILA and IANB after the first injection was statistically not significant

The latency between the injection of the local anaesthetic and the onset of the anaesthetic effect was significantly shorter after ILA (mean 0.22 ± 0.6 min; 0.32 ± 0.7 in group II) than after IANB (mean 3.3 ± 1.9; 4 ± 2.8 min in group II; all $p < 0.001$).

The mean amount of local anaesthetic solution used was substantially less in the cases of ILA 0.35 ± 0.2 ml (0.36 ± 0.1 ml in group II) when compared with IANB 2.08 ± 0.3 ml (2.08 ± 0.2 ml in group II; all $p < 0.001$).

The mean duration of treatment under ILA was 5.6 ± 5.4 min in group I and 4.8 ± 4.2 min in group II. The mean duration of treatment under IANB was 10.7 ± 6.9 min (8.6 ± 5.5 in group II). The treatments under ILA were significantly shorter than those under IANB in both evaluation groups ($p < 0.001$ and $p = 0.007$).

The mean duration of soft tissue numbness was 47.7 ± 33.5 min for ILA (46 ± 16.4 in group II) and 228.6 ± 53.4 min for IANB (244 ± 59.6 in group II). The duration of soft tissue numbness after IANB was statistically significantly longer than that after ILA (all $p < 0.001$) and exceeded by far the average time required for tooth extraction.

Impaired wound healing (dry socket) was observed in six cases (5.7%) after ILA and in three cases (2.1%) after IANB. A comparison of the frequency of occurrence of impaired wound healing after ILA and IANB showed no statistically significant difference ($p = 0.178$). No case of clinically relevant bacteremia was observed in this study.

CONCLUSIONS

This study concluded that ILA fulfilled the requirements of a substantially complete and patient-friendly primary local anaesthetic technique. It represents a safe and reliable alternative to IANB for extraction of mandibular posterior teeth.

IMPLICATIONS FOR PRACTICE

The results suggest that ILA can be considered as an alternative technique especially for single tooth extraction in the posterior mandible. IANB should be restricted to more extensive dental treatment measures.

Reference

1. Kämmerer PW, Adubae A, Buttchereit I et al. Prospective clinical study comparing intraligamentary anesthesia and inferior alveolar nerve block for extraction of posterior mandibular teeth. Clin Oral Invest. 2018; 22: 1469-75.