What's new for the clinician – summaries of recently published papers (October 2024)

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1. CLEANSING EFFICACY OF ELECTRIC ORAL-B® IO™ ULTIMATE CLEAN VERSUS ORAL-B® GENIUS® WITH THE CROSSACTION BRUSH HEAD: A RANDOMISED-CONTROLLED STUDY

Introduction

The huge number of electric toothbrush brands and models available to the consumer nowadays is evidence of the constant evolution in electric toothbrush design and performance to improve plaque removal performance in the mouth. Various manual and powered toothbrushes and brush head designs are available in the market. Powered toothbrushes have become increasingly popular due to their ease of use, highly effective plaque removal and positive impact on oral health.[1] Many advanced toothbrush models have incorporated bristle head designs, such as multi-level, criss-cross arrangements and rounded ends, to enhance plaque removal further. Additionally, several systematic reviews and meta-analyses have shown that powered toothbrushes are more effective than manual toothbrushes in reducing plaque and gingivitis in both the short and long term.[1]

Oscillating-rotating technology (O-R) with a round brush head was introduced by Oral-B® in 1990. Over the past few decades, the size and design have been modified several times to improve the cleansing efficacy, patient compliance and brushing experience. The Oral-B® CrossAction brush head with angled bristles has been the leading O-R head in various of brush series (Fig. 1a). Alongside the angled bristles, the head has micro-pulse bristles designed to eliminate interdental plaque. In 2020, Oral-B® launched the new iO™ series that merges the oscillation-rotation mechanism with micro-vibrations produced at the site of plaque removal.[1] The handle of iO™ toothbrushes features a linear magnetic drive, which differs from the gear-based motor used in older O-R brushes. It is compatible with a new set of round brush heads with an increased diameter 2mm larger compared to the CrossAction brush head and the CrissCross bristles have a tuft-in-tuft design to ease interdental cleansing efficiency (Fig. 1b). Due to the brush head sizes, swivelling the brush head into the interdental spaces is no longer possible and is not recommended.

Polak and colleagues (2024)[1] undertook an independent clinical trial that sought to compare the cleansing efficacy of two brush heads with different brushing technologies, the Oral-B® iO™ Ultimate Clean brush head and the CrossAction brush head with the previous O-R technology. The null hypothesis posits no significant differences regarding full-mouth plaque indices between the two types of toothbrushes and brush heads.

Materials and methods

Thirty adult volunteers who met the following inclusion criteria were invited to participate in this trial. They were ≥ 18 years, made home use of an O-R toothbrush and had more than five teeth per quadrant. Exclusion criteria were a dental or medical profession or education, community periodontal index of treatment needs (CPITN) grade 3 or 4, pregnancy or breastfeeding, systemic diseases or conditions that were associated with an increased risk of infection or necessitated concomitant antibiotic therapy with dental treatment, existing caries lesions requiring treatment, dental implants and mental and behavioural disorders that could impede (verbal) communication. Teeth with direct or indirect restorations were not excluded.

This was a randomised-controlled, examiner-blinded, crossover study that investigated the cleansing efficacy of toothbrushing with the Oral-B® iO™ Ultimate Clean brush head versus Oral-B® Genius® with the CrossAction brush head (Figs 1a & 1b). The study design consisted of four appointments for each study participant. At the initial consultation, the participants received comprehensive

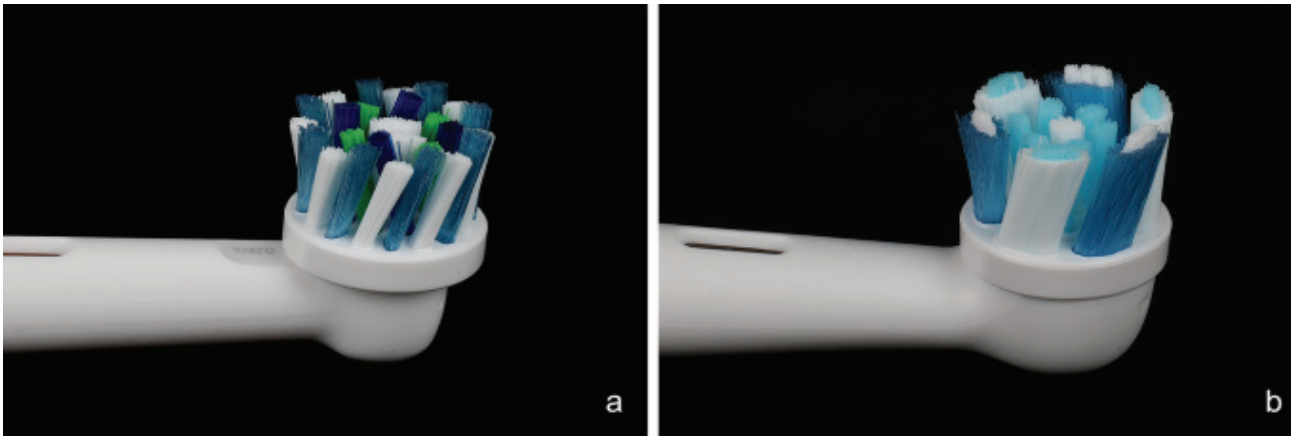

Fig 1a & 1b: (a) Oral-B® CrossAction brush head with angled bristles. The bristle tufts of the two outer tings are alternately of different lengths with a height difference of 1mm. (b) Oral-B® iO™ Ultimate Clean toothbrush head with a 2mm increased diameter and CrissCross bristles.

information regarding the research protocol and participants received the necessary toothbrushing products. Each cleaning cycle began with a new brush head.

Baseline data included the Rustogi Modified Navy Plaque Index (RMNPI) after plaque disclosing with 2Tone and the gingival bleeding index (GBI). The RMNPI divides each buccal and lingual tooth surface into nine sections (A-I) to indicate the presence or absence of plaque dichotomously. RMNPI is the percentage of biofilm adhering sites to measured sites. It enables differentiation between the marginal areas of the teeth (A-C), interdental areas (D-F) or overall tooth surfaces (A-I). To evaluate gingival inflammation by GBI, a periodontal probe (PCP 12) was inserted into the gingival sulcus, and bleeding was assessed dichotomously at six sites per tooth. The percentage of bleeding sites to measured sites was calculated. One trained and blinded investigator conducted all clinical assessments.

Participants were allocated to either group A, which used the Oral-B® iO™ Ultimate Clean brush head, or group B, which used the Oral-B® Genius CrossAction brush head. Calibrated study assistants instructed to the participants to ensure that the data collection remained blinded and unbiased for the examiner. Participants were instructed to refrain from interdental hygiene and use any chemical rinsing solution during the study period. Subjects of group A received hands-on training using the Oral-B® iO™ with the Ultimate Clean brush head according to the manufacturer's instructions. Similarly, subjects in group B who were asked to brush their teeth with the Oral-B® Genius® CrossAction brush head were also generously instructed. Both toothbrushes were held at a 90° angle to the tooth surface for five seconds on each tooth surface and then moved slowly along the gumline to follow the contour of the teeth. After detailed instruction, professional tooth cleaning was conducted with airflow polishing (Airflow®) and ultrasonic devices if necessary.

After completing the 28-day trial period using the assigned test products, the study participants presented for their second appointment. Their oral hygiene indices were re-examined, followed by a 14-day washout period, when the subjects resumed their normal cleaning routine. Participants were reassessed after 14 days (third visit). Again, oral hygiene indices were recorded, followed by a full plaque disclosure, thorough instruction for the second test product, and professional tooth cleaning. Analogous to the first test cycle, the study participants used the other assigned toothbrush (those who used Oral-B® iO™ in the first part were now allocated to the Oral-B® Genius® CrossAction brush headgroup) for 28 days before attending their fourth and final appointment for a hygiene index examination and professional tooth cleaning.

Results

Seventeen women and 13 men with a mean age of 33.53 ± 7.53 years (range 20-66 years) finished the study (dropout rate 0%). This study analysed 871 teeth.

At baseline, the median of the overall RMNPI was 40.05% (IQR 28.63-47.64). The two study groups had no statistically significant differences in baseline data. After 28 days of using the iO™ brush head without interdental cleaning, the median overall ç decreased to 25.09% (19.16-34.70). This value was statistically significantly lower than the median overall RMNPI attained after 28 days of using the CrossAction brush head as a control procedure (median overall RMNPI 30.60%; IQR 23.45-36.39) ($p = 0.029$).

The RMNPI splits every buccal and lingual tooth surface into nine sections (A-I) and was calculated as a percentage of biofilm adhering sites to measured sites. The iO™ brush head showed statistically significantly lower plaque levels after 28 days of home use compared to the conventional oscillating-rotating toothbrush with the CrossAction brush head (control) for full-mouth data ($p = 0.019$), approximal buccal sites ($p < 0.001$), marginal lingual/palatal ($p < 0.001$) and for marginal buccal sites ($p = 0.027$).

Subgroup analysis revealed the higher cleansing efficiency of the Oral-B® iO™ brush head was attributable to approximal and marginal sites. There was a statistically significantly lower plaque index after 28 days of cleaning with the iO™ compared to the CrossAction on marginal lingual/palatal sites (median 36.85% versus 56.10%; $p < 0.001$) and on marginal buccal sites (median 40.24% versus 49.18%; $p = 0.027$). In addition, the iO™ exhibited a significantly lower plaque index than the CrossAction at approximal buccal sites (19.48% and 40.54%, respectively; $p < 0.001$). In contrast, no statistically significant difference existed in approximal lingual/palatal areas.

Statistical analysis revealed that unlike the plaque indices, gingival bleeding indices showed no statistically significant differences between the baseline and the test phase or between the different brush heads. At baseline, the median GBI was 1.54% (0-6.26). After using the iO™ for 28 days without any kind of interdental cleaning the median GBI was 0% (0-0.01). After 28 days of cleaning with the CrossAction, the median GBI was 0% (0-0.14).

Conclusion

The Oral-B® iO™ electric toothbrush displayed enhanced plaque removal efficiency compared to the conventional oscillating-rotating technology (Oral B Genius).

Implications for clinical practice

This study highlights the potential benefits of advanced toothbrush technologies for plaque reduction.

REFERENCE

1. Polak AL, Wiesmüller V, Sigwart L, Nemec N, Niederegger L, Kapferer-Seebacher I. 2024. Cleansing efficacy of the electric toothbrush Oral-B® iO™ compared to conventional oscillating-rotating technology: a randomised-controlled study. Clinical Oral Investigations, 28(9), pp.1-8

2. THE EFFECTS OF CHLORHEXIDINE GEL AND TRANEXAMIC ACID APPLICATION AFTER TOOTH EXTRACTION ON THE RISK OF ALVEOLAR OSTEITIS FORMATION: A DOUBLE BLIND CLINICAL STUDY

Alveolar osteitis (AO) (also known as dry socket or alveolitis), one of the primary complications of tooth extraction, manifests as severe pain in and around the extraction site within 1-3 days post-extraction. The incidence rate varies depending on the type of tooth extracted, but generally it occurs in 1-4% of cases following extraction. It is 10 times more common in lower teeth compared with upper teeth, with a 45% occurrence rate in mandibular third molars.[1]The signs and symptoms of AO typically begin 2 to 4 days after tooth extraction and mainly involve severe, intense pain radiating to the ear and neck. The surrounding mucosa is

erythematous. The alveolar socket may be empty and dry or contain blackish necrotic clot fragments and food debris that can be easily removed with an appropriate instrument. Halitosis is pronounced. Usually, there is no swelling in the face, fever, purulent discharge or lymphadenopathy. On probing examination, the walls of the alveolus are very sensitive.

For the treatment of alveolitis, the extraction socket is irrigated to remove accumulated food debris and infected tissues. Afterward, alveogyl (Septodont) can be placed in the socket to alleviate pain. Alveogyl contains butamben as an anaesthetic, eugenol for pain relief and iodoform as a disinfectant. Nonsteroidal anti-inflammatory drugs (NSAIDs) and antiseptic mouthwashes are prescribed. Ensuring the presence of a clot in the socket is crucial for healing.

Although treatment options for alveolitis are limited, there are numerous clinical practices to prevent its occurrence and reduce its incidence. Methods such as chlorhexidine (available as a gel, solution, spray, cream or toothpaste) , antibiotics, analgesics and irrigation of the socket with lidocaine gel can be used, but no treatment method has been universally accepted as successful.[1]

Transamine is found in the form of trans-4-aminomethylcyclohexane-1-carboxylic acid. It belongs to a class of drugs called antifibrinolytics, which facilitate and preserve blood clot formation. It is used to control postoperative bleeding, stopping bleeding during surgery and preserving the formed clot.[1]Chlorhexidine and tranexamic acid have been extensively studied in the literature. However, there is a lack of comparative research evaluating these two materials specifically for the prevention of AO. Gumrukcu and colleagues from Turkey (2024)[1] undertook a trial that sought to examine the effects of chlorhexidine and tranexamic acid on the incidence of AO.

Materials and methodsA total of 96 healthy patients (mean age: 38, range: 19-62 years) with indications for extraction of molar and premolar teeth were included in this trial. A total of 113 teeth (85 molars, 28 premolars) were enrolled in the study. Randomisation was applied when grouping the teeth included in the study (groups were subdivided into a, b and c and then randomly assigned). All extractions were performed by the same surgeon. Postoperative evaluations and data collection were carried out by a different surgeon.

For inclusion, patients were aged between 18 and 65 years, had lower jaw premolar and molar teeth with extraction indications, and had regular oral hygiene practices. Patients were excluded if they were allergic to substances to be used in medication or operation (artikain, tranexamic acid, chlorhexidine), had antibiotic use within 30 days before extraction, had clinical and radiologic evidence of any pathology and infection in the surgical area within 30 days before or on the day of extraction (such as periapical pathology, pericoronitis), had routine use of oral antiseptics, had the presence of any immune system disease, systemic fever, lymphadenopathy (LAP) or other symptoms, women who were lactating or pregnant, used oral contraceptives or patients who neglected follow-up appointments (3-7 days).

The 96 patients who presented for tooth extraction were randomly divided into three groups:

Patients in group 1 were treated post-extraction with irrigation using saline only, followed by the placement of a gelatin sponge in upper third of the socket (a total of 30 patients).

Patients in group 2 were treated post-extraction with irrigation using saline, followed by the application of 2% chlorhexidine gel (absorbed in gelatin sponges) (Spongostan®) in upper third of the socket (a total of 30 patients).

Patients group 3 were treated post-extraction with irrigation using saline, followed by the application of tranexamic acid 50mg/ml injectable solution absorbed in gelatin sponges (Spongostan®) in the upper third of the socket (a total of 36 patients).

All tooth extractions were performed by using articaine anaesthetic solution, providing inferior alveolar and buccal nerve blocks. All extractions were conducted using the closed tooth extraction technique. After elevating the tooth with an elevator and loosening it, extraction was completed using a suitable forceps according to the tooth type. No extraction socket was primarily closed post-extraction. The extraction sockets were left to natural healing processes.

Patients were scheduled for follow-up visits on days 3 and 7 after tooth extraction. Pain and swelling levels were scored by patients using a visual analog scale (VAS) ranging from 0 to 10. Values between 1 and 3 were considered mild pain, 4 to 6 moderate pain, and 7 to 10 severe pain Additionally, forms recording the presence of halitosis, trismus and exposed bone socket were collected and analysed on days 3 and 7.

Results

In the study, AO developed in 12 out of 113 extracted teeth (10.6%), ranging in age from 19 to 62 years. It was observed in 11 molars (91.6%) and one premolar (8.3%). Among the patients, 34 (30.1%) were found to be smokers.

When the distribution of AO development frequency was examined among the groups, it was found that in group 1, AO occurred in five out of 31 teeth (16.1%); in group 2, it occurred in six out of 42 teeth (14.3%); and in group 3, it occurred in one out of 40 teeth (2.5%). Considering all extracted teeth (113 in total, comprising 85 molars and 28 premolars), AO developed in 12 teeth (10.6%). Of these teeth with AO, 11 were molars (91.6%) and one was a premolar (8.3%).

When evaluated by age groups, the number of teeth with AO was two (16.7%) in the 16-30 years age group, seven (58.3%) in the 31-45 years age group, and three (25%) in the 46-60 years age group. Among the teeth with AO across the three groups, when evaluated in terms of smoking status, it was determined that in group 1, out of a total of five teeth with AO, two were smokers; in group 2, the one tooth with AO belonged to a smoker; and in group 3, out of a total of six teeth with AO, one was a smoker. 3.5% of patients experienced trismus on day 3, 0.9% experienced trismus on day 7, 36.3% experienced halitosis on day 3 and 2.7% experienced exposed bone on day 7.

The average age of the patients was 37.95 ± 11.3 years. The average pain score on the third day was 2.27, and on the seventh day it was 0.51. The average swelling score on the third day was 2.0, and on the seventh day it was 0.81.
When looking at the average pain scores measured on the

third and seventh days, statistically significant lower pain and swelling scores were found in the absorbable gelatin sponge group on the seventh day compared with the third day ($p=0.001$).
After tooth extraction, a total of 11 sockets (9.7%) were found where the bone was exposed without mucosal coverage. Upon examining the relationship between alveolitis and exposed bone, it was determined that out of these exposed sockets, 10 were associated with alveolitis. When evaluated by groups, in group 1, five sockets had exposed bone, and four of these developed alveolitis; in group 2, one socket had exposed bone, and this developed alveolitis; in group 3, five sockets had exposed bone, and five of these developed alveolitis.

In the chlorhexidine group, the pain score on the seventh day ($p=0.042$) and the age criterion ($p=0.013$) were significantly higher compared with the other groups. Similar scores were obtained in the Spongostan and tranexamic acid groups.

In the tranexamic acid group, the swelling score on the seventh day was significantly higher compared with the other groups ($p=0.007$). Similar scores were observed in the Spongostan and chlorhexidine groups.

Conclusion

The researchers found that in the gelatin sponge group, pain and swelling scores significantly decreased on the seventh day. This outcome may be attributed to the gelatin sponge's support in promoting clot formation. The application of all three interventions (gelatin sponge, tranexamic acid and chlorhexidine gel) reduced the incidence of AO.

Implications for practice

Due to the small number of teeth that developed AO, more studies are needed to determine superiority in terms of reduction of AO.

REFERENCE

1. Gumrukcu Z, Karabag M, Guven SE. 2024. The effects of chlorhexidine gel and tranexamic acid application after tooth extraction on the risk of alveolar osteitis formation: a double blind clinical study. Clinical Oral Investigations, 28(9), pp.1-9

Online CPD in 6 Easy Steps

The Continuing Professional Development (CPD) section provides for twenty general questions and five ethics questions. The section provides members with a valuable source of CPD points whilst also achieving the objective of CPD, to assure continuing education. The importance of continuing professional development should not be underestimated, it is a career-long obligation for practicing professionals.