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What's new for the clinician – summaries of recently published papers

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1. DO DIFFERENT ORTHODONTIC PLIERS USED IN BRACKET DEBONDING HAVE DIFFERENT EFFECTS ON PAIN AND SENSITIVITY?

Pain is an important physiological and emotional experience, whose intensity may vary with age, gender, emotional state, cultural background and previous pain experience.[1] Almost 95% of patients undergoing orthodontic treatment have reported varying degrees of pain. After an orthodontic force is applied, an immediate and a delayed painful response occurs[1]. While the cause of the immediate response was to be the compression of the periodontal ligament (PDL), the delayed response was attributed to the hyperalgesia of the PDL. This hyperalgesia is associated with prostaglandins which make the PDL sensitive to algogens released in the environment, such as histamine, bradykinin, serotonin and substance[1].

During the removal of the brackets, mechanical stresses occur in the PDL with the force applied to the tooth. Studies have reported that patients are able to withstand intrusive forces significantly more than torsional and extrusive forces. In order to reduce the pain or discomfort during removal of orthodontic brackets, different methods such as taking analgesics, using special debonding pliers, finger pressure, or biting a cotton roll, wax template or acrylic wafer are recommended.[1]

The debonding procedure includes removing the brackets and residual adhesive. Removal of the brackets can be done using tools such as bracket removing pliers, ultrasound, laser and electrothermal debonding. In addition to these, removal of residual adhesive can be done using tungsten carbide burs, fiberglass burs, adhesive removal pliers, abrasive discs, ultrasound and laser[1].

Meriç and Kılınç (2022)[1] reported on a trial that sought to evaluate the effects of two different orthodontic pliers on pain experience during debonding and to evaluate whether the air and cold stimuli applied after debonding (T1) and one week later (T2) caused an increase in sensitivity. The null hypotheses were as follows: (1) There was no difference between the pain experience scores caused by weingart and bracket remover plier during debonding; (2) There would be no difference in sensitivity scores due to air and cold stimulation applied after debonding and one week later.

Materials and methods

This was a prospective, split-mouth study comprising 35 subjects who completed orthodontic treatment. Patients were included if: (1) They were aged between 13-24 years old, (2) They provided informed consent, (3) They were bonded with 0.022" slot metal brackets and double buccal tubes (Mini Master Series), and (4) They had good general and oral health. Patients were excluded if they had a history of previous orthodontic treatment, had any history of systemic disease that could be associated with dentine hypersensitivity, and had a history of taking medicine in the previous 24 hours prior to the start of the study.

Allocation concealment was done using opaque sealed envelopes. In each patient, two diagonal quadrants (upper right and lower left or vice versa) had been randomly assigned to the Bracket remover plier "BRP" group and contralateral diagonal quadrants to the Weingart plier "WP" group. If the debonding process started with "BRP" (upper right), the other side (upper left) was debonded with "WP" pliers and vice versa.

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Blinding at the debonding appointment was not possible as the operator in that time point was performing debonding. However, thermal stimulation in the T0, T1 and T2 time points was made by an independent researcher who was unaware of the previous processes. The analyst was blinded to all stages.

In all patients the enamel surface was etched using 37% phosphoric acid gel for 20s and rinsed. Light-cured Transbond XT primer and adhesive (3M Unitek) were used to bond bracket and tubes. At the debonding appointment (T0), compressed air and freshly melted ice water was applied to each tooth before the brackets were removed. First, air was applied to all teeth, and after 1min, cold stimulus was started. Air stimulus was applied (1s) using air–water syringe under constant pressure, and cold stimulus was applied (3s) with freshly melted ice water using dental syringe. Both stimuli were applied to the buccal cervical third of each tooth.

The level of discomfort felt by the patient during the application of air and cold stimulus was asked verbally and recorded by the patient individually for each tooth. The 11-step numeric rating scale (NRS) tool between 0 and 10 was used to assess discomfort (0=no pain, 10=worst pain imaginable).

After the air and cold stimulation was completed, the brackets were removed. All brackets were debonded by the same right-handed operator. Brackets and tubes were debonded using both bracket remover plier and weingart plier in a split-mouth design. While debonding was performed using weingart plier, the brackets were debonded by squeezing them from the mesial-distal surfaces, while debonding was performed using bracket remover plier, the brackets were removed by squeezing their upper and lower wings.
During debonding, patients were asked to bite a cotton roll in order to reduce discomfort. Rectangular stainless steel archwires were left in situ during debonding procedure. The debonding was started with the upper right quadrant, then continued with the upper left, lower left and lower right quadrants, respectively. The first bracket removed in each quadrant was the buccal tube of the 1st molar tooth and the debonding process towards the anterior teeth was completed in order. The level of discomfort was asked verbally and recorded for each tooth during the bracket removal. After all brackets were removed, residual adhesive was cleaned carefully by using slow-speed tungsten carbide finishing bur. Air and cold stimulations were repeated and recorded after the debonding (T1) and one week later (T2).

Results

Of the 35 patients, 2 were excluded from the analyses. There were slightly more females (51.5%) compared to males (48.5%). Tooth extraction was performed in 57.6% of the patients. The mean age of the patients was 17.1 years, and the mean duration of treatment was 34.7 months.

According to the WP and BRP groups, there was no statistically significant difference between the median values of sensitivity scores by applying air before debonding in both upper and lower teeth (T0 time point) ($p>0.050$). According to the Weingart plier “WP” group and the Bracket remover plier “BRP” group, there was no statistically significant difference between the median values of sensitivity scores by applying cold before debonding in both upper and lower teeth (T0 time point) ($p>0.050$).

A statistically significant difference was found between the distribution of debonding pain scores in the Upper 4 teeth according to the removal pliers ($p=0.017$). The median pain score of the WP and BRP pliers was 0. This difference is due to the difference between negative and positive ranks. Positive rank was obtained as 1 while negative rank was obtained as 8. This is an indication that WP plier pain scores are higher than BRP plier pain scores. A statistically significant difference was found between the distribution of debonding pain scores in the L6 tooth according to the removal plier ($p=0.026$). Median pain score of WP and BRP plier was obtained as 0. This difference is due to the difference between negative and positive ranks. Positive rank was obtained as 3 while negative rank was obtained as 10. This is an indication that the pain scores of the WP plier are higher than the pain scores of the BRP plier. There was no statistically significant difference between the distribution of pain scores in the other teeth according to the removal plier ($p>0.050$).

There was no statistically significant difference between the distribution of debonding pain scores both in lower and upper teeth in WP and BRP pliers according to gender ($p>0.050$).

A statistically significant difference was found between the distribution of sensitivity scores measured at T1 time in the U3 tooth by applying air according to the WP and BRP groups ($p=0.024$). The median values of WP and BRP pliers were obtained as 0. This difference is due to the difference between negative and positive ranks. While the positive rank was 0, the negative rank was obtained as 6. This is an indication that WP plier sensitivity scores are higher than BRP plier sensitivity scores. There was no statistically significant difference between the distribution of sensitivity scores measured at T1 time in the other teeth by applying air according to the pliers ($p>0.050$). According to the WP and BRP groups, there was no statistically significant difference between the median values of sensitivity scores measured at T1 time both in upper and lower teeth by applying cold ($p>0.050$).

According to the WP and BRP groups, there was no statistically significant difference between the median values of sensitivity scores measured at T2 time both in upper and lower teeth by applying both air and cold ($p>0.050$).

There was no statistically significant difference between sensitivity scores of teeth in three time points by air and cold application both in WP group and in BRP group ($p>0.050$).

Conclusion

The researchers concluded that while the debonding pain and sensitivity scores were statistically significant between the teeth assessed, there was no clinical significance between the two pliers in terms of pain and sensitivity. No gender difference was found in pain perception.

Implications for practice

Both methods of debonding and bracket removal were found to have equivalent performance when measured against the pain and sensitivity outcomes.

REFERENCE

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2. EFFECTS OF CONVENTIONAL COMPLETE DENTURES AND IMPLANT-SUPPORTED OVERDENTURES ON ALVEOLAR RIDGE HEIGHT AND MANDIBULAR BONE STRUCTURE: 2-YEAR AND 6-YEAR FOLLOW-UP STUDY

Tooth loss and edentulism remains a significant public health problem in many parts of the developing world. Rates of edentulism among certain communities in the Western Cape have been found to be among the highest in the world. Edentulism produces physical and psychological problems that impair the individual's oral and overall health, lowering their quality of life[1].

Edentulism rehabilitation is needed in order to restore the patient's chewing function, aesthetic appearance and social life[1]. Conventional complete denture (CCD) is a common and traditional method of treating edentulism. Nowadays, edentulous people are mostly seen in the poorest segment of the population. As a result, basic and low-cost traditional prosthesis is needed. During chewing, the conventional complete denture (CCD) causes masticatory forces to transmit over the residual ridge; this may increase bone resorption. The treatment concept of mandibular implant-supported overdentures (ISO) was designed to eliminate these disadvantages in CDD and provide better retention and stability of the lower denture.

It is accepted that alveolar bone resorption after tooth extraction is unavoidable as a result of a lack of periodontal ligament stimulation. Furthermore, after tooth extraction, a scar forms on the mucosa. With the usage of a prosthesis, the surface tension force of the mucosa increases. When the produced force exceeds the physiological limit, pathological bone resorption is induced[1]. In addition, according to Wolff's law[1], jaw bones, like all bones, have the potential to adapt to functional stimulus and changing stressors. This adaptation creates a constant process of remodelling at the bone interface with osseous implants[1]. After implant insertion, functional stimulation induces bone apposition in the edentulous mandible[1].

These changes, which occur as a result of resorption and apposition in the mandibular alveolar bone, can be evaluated by measurements of the alveolar crest height. In addition, there are indices that evaluate the mandibular bone structure in general. Some of these are the panoramic mandibular index (PMI) and mandibular cortical width (MCW), gonion index (GI) and antegonial index (AI), and they are qualitative and quantitative measurements used in panoramic radiography to evaluate mandibular bone structure[1]. The angle created by a specific horizontal plane and the posterior surface of the articular eminence is known as articular eminence inclination (AEI). The condyle movement path and the degree of rotation of the disc on the condyle surface are defined by the AEI[1].

Saribal et al (2022) reported on a study that sought to evaluate the short- and long-term changes in the mandibular bone structure of patients rehabilitated with implant supported overdentures (ISOs) and conventional complete dentures (CCDs), using alveolar bone loss (ABL), radiomorphometric indices and articular eminence inclination (AEI).

Materials and methods

This study consisted of the following groups:-
"Study group 0" was the group formed using the 126 patients' first available panoramic radiographs. These first radiographs were taken 2 or more years after the patient was edentulous.

"Study group 1" was the group formed using the 126 patients' panoramic radiographs taken 2 or 6 years after their first panoramic radiograph.

The conventional complete denture (CCD) group consisted of 63 individuals who used CCD. The Short-term subgroup consisted of 30 patients who had 2-year follow-up radiographs. The Long-term subgroup consisted of 33 patients who had 6-year follow-up radiographs.

The Implant supported overdenture (ISO) group consisted of 63 individuals who used ISO. The Short-term subgroup consisted of 30 patients who had 2-year follow-up radiographs. The Long-term subgroup consisted of 33 patients who had 6-year follow-up radiographs. All ISO patients had two implants in the region between the mandibular intercanine and the maxilla was in occlusion with CDD. All prostheses used by the patients were made with the same procedure and method within the groups. The conventional impression techniques and muffle method were used. The attachment type was the O-ring system and ball attachment, in which the holding element was a rubber ring. In addition, bilateral balanced occlusion was achieved. The implant lengths were between 10 and 11.5mm and the implant diameters were between 3.5 and 4.5mm.

A control group of 126 patients was formed, which was compatible in age and gender with the research groups. These patients had a healthy periodontal condition and no tooth loss.

For inclusion:- (1) Patients were completely edentulous for more than 2 years (except for the control group), (2) The images and anamnesis records of the patients were complete, (3) There was an absence of fractures or artefacts that may interfere with measurements in panoramic radiographs, (4) Patients did not have joint complaints and/or TMJ disorder symptoms such as crepitation, clicking, popping, snapping, pain, limited mouth opening and deflection.

Patients were excluded if there was:- (1) Presence of panoramic radiograph image with low diagnostic quality, (2) Presence of any pathological lesions and/or fractures in the maxilla and/or mandible, (3) Use of drugs and/or hormone replacement therapy that will affect bone metabolism (bisphosphonate, glucocorticoid, calcitonin, fluoride etc), (4) Presence of systemic disease that will affect bone metabolism (hyperparathyroidism, thyroid disease, chronic renal disease etc), (5) Patients were receiving head and neck radiotherapy.

The same digital panoramic X-ray system and exposure parameters were used for all panoramic radiographs. Alveolar bone loss (ABL), panoramic mandibular index (PMI), mandibular cortical width (MCW), gonion index (GI), antegonial index (AI) and articular eminence inclination (AEI) measurements were made in both groups.

ABL were measured and evaluated as anterior, right-left premolar and right-left molar. On the right and left sides, panoramic morphometric indices and AEI were measured, and the averages of these values were analysed. Cohen kappa statistic values showed a strong intraexaminer agreement (0.936–0.987) and interexaminer agreement (0.942–0.956).

Results

There were 63 patients in both the ISO and CCD groups, 45 females and 18 males. There were 126 patients in the control group, 90 females and 36 males. There was no statistically significant difference between mean ages of the three groups

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(p<0.001). The mean age of the CCD group was 62.73 (11.6) years, the mean age of the ISO group was 63.24 (10.82) years and the mean age of the control group was 62.58 (11.04) years.

The "study group 0" values are the measurement results from the first available panoramic radiographs of the patients. These first radiographs were taken 2 or more years after the patient was edentulous. The "study group 1" measurements are radiographs taken 2 or 6 years after the initial radiographs. Both study groups showed significantly lower mean alveolar bone height than the control group in all mandible regions (p<0.000). Comparison with patients without tooth loss once again showed that edentulousness causes loss of the alveolar crest.

ISO group showed significantly lower mean ABL than CCD group in anterior region (p=0.000), right premolar region (p=0.005), left premolar region (p=0.005), right molar region (p<0.000) and left premolar region (p<0.000) in short term. ISO group showed significantly lower mean ABL than CCD group in anterior region (p=0.021), right molar region (p<0.000) and left premolar region (p<0.000) in long term. There was no statistically significant difference between the CCD and ISO groups in right premolar region (p=0.200) and left premolar region (p=0.134) in long term.
Both study groups showed significantly lower mean MCW (p<0.000), PMI (p<0.000), AI (p<0.000), GI (p<0.012) and AEI (p<0.002) than the control group. There was no statistically significant difference between the CCD and ISO groups in terms of changes in the mean MCW (p=0.765), PMI (p=0.328), AI (p=0.587) and GI (p=0.665) in long term (Table 5). There is no statistically significant difference between the CCD and ISO groups in terms of changes in the mean MCW (p=0.769), PMI (p=0.374), AI (p=0.577) and GI (p=0.535) in short term. There is no statistically significant difference between the CCD and ISO groups in terms of changes in the mean AEI in short term (p=0.120) and long term (p=0.154).

CONCLUSION

In the long and short term, edentulousness reduced alveolar crest height, MCW and AEI in individuals, but had no effect on PMI, AI or GI. The use of prosthesis did not prevent the decrease of alveolar crest height, MCW or AEI (CCP or ISO). In the short and long term, however, ISO prostheses caused less ABL in the mandibular anterior and molar regions than CCD prostheses.

Implications for practice

The clinical outcomes measures support ISOs instead of CCDs over both the short term and longer terms of use.

REFERENCE

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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.