ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 11, Issue, 06, pp.4582-4585, June, 2019

DOI: https://doi.org/10.24941/ijcr.35613.06.2019

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

REVIEW ARTICLE

DENTAL VIBRATOR – FASTER, BETTER AND PAINLESS TOOTH MOVEMENT: A REVIEW

[1,*]Dr. Tanushree Sharma, [2]Dr. Kamlesh Singh, [3]Dr. Ragni Tandon, [4]Dr. Pratik Chandra [5]Dr. Aftab Azam and [6]Dr. Abhi, A.

[1]Pg Student, Department of Orthodontics, Saraswati Dental College, Lucknow
[2]Professor, Department of Orthodontics, Saraswati Dental College, Lucknow
[3]Professor And Head, Department of Orthodontics, Saraswati Dental College, Lucknow
[4] Reader, Department of Orthodontics, Saraswati Dental College, Lucknow
[5] Professor, Department Of Orthodontics, Saraswati Dental College, Lucknow
[6]Pg Student, Department of Orthodontics, Saraswati Dental College, Lucknow

ARTICLE INFO

Article History:
Received 20th March, 2019
Received in revised form
25th April, 2019
Accepted 22nd May, 2019
Published online 30th June, 2019

Key Words:
Dental vibrators,
Accle Dent, Sure Smile.

Corresponding author

ABSTRACT

Today, many people receive orthodontic treatment for better occlusion, improved oral function and harmonized facial appearance. However, two perplexing challenges have not been solved in clinical orthodontics, i.e. long treatment time (on average 2-3 years) and iatrogenic root resorption. Figuring out these challenges will dramatically improve the quality of orthodontic care. The following article deals with the first challenge i.e Long treatment time and the most reliable and effective way to enhance the tooth movement.

Citation: Dr. Tanushree Sharma, Dr. Kamlesh Singh, Dr. Ragni Tandon, Dr. Pratik Chandra Dr. Aftab Azam and Dr. Abhi, A. **2019.** "Dental vibrator – faster, better and painless tooth movement: A review", *International Journal of Current Research*, 11, (06), 4582-4585.

INTRODUCTION

The history has shown attempts to correct maloccluded teeth since 3000 year ago. Egyptian mummies have been found with crude metal bands wrapped around individual teeth, and primitive and surprisingly well-designed orthodontic appliances have also been found with Greek and Etruscan artifacts (Jose, 2010). From Pierre Fauchard, passing through Ben Kingsley, Calvin Case, and finally to Edward H. Angle, we have seen technology evolved. The modern era of orthodontics has initiated its history around 1900 and has gone from metal bands adjusted around the teeth to bonded braces on the buccal and the lingual sides, as well as clear aligners, mini-implants/ mini-plates, self-ligating brackets, digital models, lasers and so on. Thus, the continuing quest for improvements on materials and techniques leads us to the desire to treat patients faster, better, and totally painless. Although, pain is an all-too-common experience of patients undergoing any form of dental treatment, to the extent that 77% of a patient population reported some degree of pain from a visit to the dentist (Lowe, 2013).

Pain following orthodontic adjustments appears to be equally prevalent (Petersson *et al.,* 2010; Meredith, 2010). Although analgesics have been found to reduce such discomfort, in most cases they do not totally eliminate it (Cucchiaro, 1996). Moreover, some patients may be allergic to these agents, and one report suggested that nonsteroidal anti-inflammatory drugs may adversely affect the rate of tooth movement (Huang, 2001).

Mechanism of tooth Movement: Orthodontic tooth movement (OTM) is a process of mechanically-induced bone modeling wherein new bone formed on the tension side and resorbed on the compression side of the periodontal ligament (PDL). Historically, it has been found that when forces are applied, three distinct phases of tooth movement can be observed, namely the 1st strain phase in which the PDL is squeezed (less than 5 seconds), the 2nd lag phase in which tooth movement pauses due to hyalinization formed in the PDL (as long as 7-14 days), and the 3rd move phase in which the tooth moves readily with significant undermining resorption of the adjacent alveolar bone (Kau, 2010). Therefore, if the 2nd phase (hyalinization in the PDL) can be

Figure 1. Dental vibrator

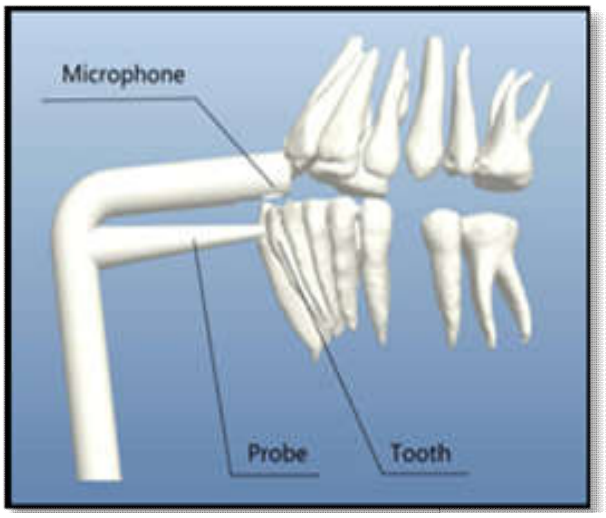

Figure 2. Action of vibrator on tooth

Figure 3. Structure of vibrator

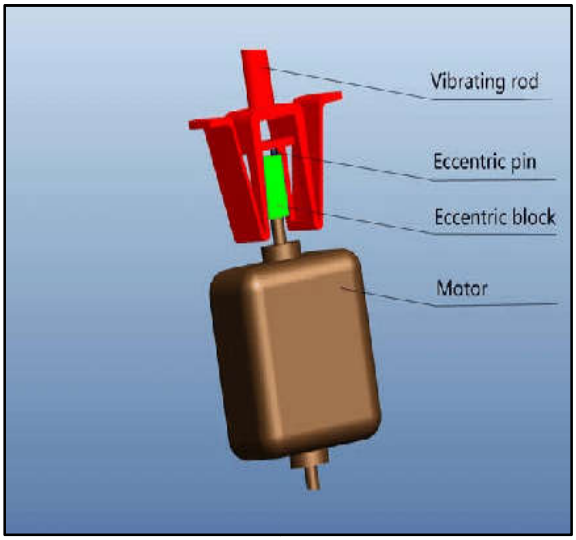

Figure 4. Vibration source

avoided or minimized, the tooth can move smoothly and faster (Mandall, 2006). To accelerate tooth movement, physical and pharmacological approaches can be used. Physical approach includes low-energy laser irradiation (Mah, 2001) and magnetic fields (Scholz, 2010; Marie, 2003), Transcutaneous electrical stimulation (TENS) and pharmacological approaches includes injection of prostaglandin E2 (PGE2) and 1,25-(OH)2D3 during tooth movement. However, many side effects, such as local pain, severe root resorption, and drug-induced side effects have been reported.

Vibrators: As one of the pioneers that specialize in this issue, Liu has reported that once mechanical vibration (4Hz, 20μm displacement, 5 min/day) is applied to help orthodontically move teeth for four weeks in mice, compared with the non-vibrated tooth movement group, the tooth movement rate under vibration is increased by regarding five hundredth. However, cautions should be taken once extrapolating the experimental findings and conclusions from animals to human being. With the advancement of research, a new orthodontic company "Ortho Accel" based in 2007 brought his brand generation of dental vibrator named "Accele Dent" (Fig 1B) into the market in 2009.

The patient compliance was 67% with sensible patient perception. It was thus all over that the Accele Dent device is a useful adjunct to odontology treatment. If used appropriately, it can accelerate routine orthodontic tooth movement. Presently, the "Accele Dent" device is marketed in the European Union and Australia, while the gap to the US market cannot happen till the end result of an current clinical trial being conducted at the University of Texas Health Science Center San Antonio gets approved by the US Food and Drug Administration (FDA). According to the manufacturer, AcceleDent is a simple, removable dental device that patients need to use between the teeth for twenty minutes daily. The product is hands-free and allows the user flexibility to carry out most routine tasks during use like doing prep, watching tv and reading. This device can be used with any type of appliance, such as fixed braces and/or clear aligners. If proven efficacious, we could face a revolution in the orthodontic arena. Another "new" orthodontic system has additionally been present in the literature since 2002. It is called SureSmile®[10]. In this system, the orthodontist needs to scan the teeth and associated structures 3-dimensionally and send the records

over to the company through the internet, with the doctor's prescriptions and preferences for brackets, for treatment planning and fabrication of the appliance. The orthodontist only has to follow the track set by the company to complete the case and possibly to retain as well. By looking back in our profession, we realize that traditionally, the orthodontists have relied heavily on a standard prescription designed into the bracket for the first 1/2 the treatment cycle. In the half, the doctor focuses on correcting errors resulting from improper diagnosis, limitations of the standard bracket prescription and placement. This stage of the treatment is considered a extremely reactive phase. The frequency of patient visits increases substantially, and the demands on doctor time increase. Sure Smile is designed to facilitate a proactive care delivery model.

It enables the orthodontist to offer personalised and targeted therapeutics victimization robotically fancied prescription arch wires (Scholz, 2010). The robot is driven by input from the doctor. In simple words, impressions are not taken any longer as a result of teeth square measure scanned with special intraoral scanner and a digital model is produced, the doctor then sees a malpositioned tooth, changes the position in the computer, the information is distributed mechanically to the company which activates the robot to manufacture a pre-adjusted wire. This, in turn, will be sent back to the participant dentist to be delivered to the patient mouth. Dr. Saschdeva states that "the treatment planning software has several practical components: 3D visualization, measurement, communication, decision creating with simulation, bracket placement, setup and archwire design, quality and outcome assessment, and SureSmile patient management. Each of these utilities used either singularly or in combination enables the doctor to build higher advised decisions and style the targeted prescription archwire". According to his statements, it will take a motivated and old dentist a minimum of 2 years and therefore the completion of at least 100 patients to develop ability in treating with SureSmile. However, we believe that the orthodontic community would be interested to visualize unbiased strong level of evidence studies showing that teeth will be moved quicker, better, and more with efficiency with SureSmile technology (Mah, 2001).

Patient compliance: Patient compliance and co-operation is one of the important and initiating factors in accelerating the tooth movement without which achieving the goal of short duration treatment is nearly impossible. Patient needs to gently bite onto the soft plastic wafer, which is being vibrated by the battery powered motor. If used in proper manner, device could be a boon in suppressing the orthodontic pain and speeding up the tooth movement. This device could bring a change in how we see our lengthy orthodontic treatments.

DISCUSSION

Shapiro E, Roeber FW *et al.* (1979), for the very first time in their study reported the use of pulsating force induced by piezoelectricity with the ultimate objective of achieving physiologic tooth movement. A study done by Rubin, Recker *et al.* (2004) demonstrated the concept that the low level mechanical vibrations increase the rate of remodeling in mechanical loaded long bones, which is currently used in the prevention of osteoporosis based on an increase in bone metabolism and decrease in bone loss in post menopausal women. Kusano H, Tomofuji T *et al.* (2006) found that, both ultrasonic & vibratory toothbrushes increased the proliferation and collagen synthesis of gingival fibroblasts in dogs. Liu D (2009) reported that, when mechanical vibration is applied to move experimental tooth group in mice and compared with non vibrated tooth group, the tooth movement rate under vibration increases by about 50% (Mah, 2001). Similarly, a study done by Kau CH, Nguyen JT *et al.* (2010) in humans reported that low- magnitude, high frequency resonance vibration of short durations when combined with orthodontic force can enhance orthodontic tooth movement without additional tissue damage. These are the compelling evidences that gave the idea of using mechanical vibrations for enhancing bone metabolism and thus can be used for accelerating orthodontic tooth movement.

Conclusion

There are various surgical and non-surgical approaches which can be used to accelerate tooth movement but vibration as a dynamic load has shown osteogenic and anti-catabolic effects on bone unlike static load by orthodontic appliances which have a catabolic effect. Vibrations have the advantage of minimal side effects in comparison to other methods of accelerating tooth movement and have proven to be safe low impact alternative that enhances bone remodeling.

REFERENCES

Chang W. J. and Lee, S. Y. et al., 2007. "A newly designed resonance frequency analysis device for dental implant stability detection," Dental Materials Journal, vol. 26, no.5, pp. 665-671.

Cucchiaro, S. J., Cucchiaro P. J. and Dario, L. J. et al., 1996. "Structural analyzer, in particular for medical implants," U. S. Patent No. 5, 518, 008. 21.

Huang H. M. and Lee, S. Y. et al. 2001. "Natural frequency analysis of periodontal conditions in human anterior teeth," Annals of Biomedical Engineering, vol. 29, pp. 915-920.

Jose, J. A. Bosio, and D. Liu. 2010. "Moving teeth faster, better and painless, is it possible?" Dental Press J Orthod, vol. 15, no. 6, pp.14-17.

Kau CH., Nguyen JT., English JD. 2010. The clinical evaluation of a novel cyclical force generating device in orthodontics. *Orthodontic Practice US*;1(1):43-4.

Kau, H., Jennifer, T. N., Jeryl, D. 2010. "The clinical evaluation of a novel cyclical-force generating device in orthodontics," Orthodontic Practice US, vol. 1, num. 1, pp. 43-44.

Kusano H., Tomofuji T., Azuma T., Sakamoto T., Yamamoto T., Watanabe T. 2006. Proliferative response of gingival cells to ultrasonic and/or vibration toothbrushes*, Am J Dent.,* 19(1):7-10.

Liu D. 2010. Acceleration of orthodontic tooth movement by mechanical vibration. Access: From: http//iadr.confex.com/iadr/webprogram.

Lowe, M. K.2013."Vibrating orthodontic remodelling device," U. S. Patent No. 8, 500, 446. 6 Aug.

Mah, J., Sachdeva, R. 2001. "Computer assisted orthodontic treatment: the SureSmile process," Am J Orthod Dentofacial Orthop, vol. 120, no. 1, pp. 85-87.

Mandall, N., Lowe, C., Worthington, H., Sandler, J., Derwent S. and Abdi-Oskouei, M. et al. 2006. "Which orthodontic archwire sequence? A randomized clinical trial," Eur J Orthod, 28(6), pp. 561-566.

Marie, S. S., Powers, M., Sheridan, J. J. 2003. ”Vibratory stimulation as a method of reducing pain after orthodontic appliance adjustment,” J Clin Orthod, vol. 37, no. 4, pp. 205-208.

Meredith N. and Petersson, P. 2010. ”Bone implant testing,” U. S. Patent, 3 April.

Rubin C., Recker R., Cullen D., Ryaby J., McCabe J., McLeod K. 2004. Prevention of postmenopausal bone loss by a low-magnitude, high-frequency mechanical stimuli: A clinical trial assessing compliance, efficacy and safety. *J Bone Miner Res.,* 19:343-351.

Petersson and Youngson, C. 2010. ”Dental Attachment Quality Testing Device,” U. S. Patent, 29 December.

Scholz R. P. and Sachdeva, R. C. L. 2010. ” Interview with an innovator: SureSmile chief clinical officer Rohit CL Sachdeva,” Am J Orthod Dentofacial Orthop, vol. 138, no. 2, pp. 231-238.

Shapiro E., Roeber FW., Klempner LS. 1979. Orthodontic movement using pulsating force induced piezoelectricity. *Am J Orthod.,* 76(1):59-66.

****