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Review Article

Driftodontics in Orthodontic Treatment: A Review

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***ABSTRACT*:**
Natural migration of teeth into the space created by extraction with no applied force is defined as physiological drifting, which is also termed as driftodontics. This procedure can be applied to any case arch length deficiency. It is indicated to extract either the first of the second premolar, so that the adjacent teeth can drift naturally into the extraction spaces. In this article, we have discussed the definition, historical perspective, rationale, biomechanics and factors affecting physiologic driftitng.
Key words: Drifting, Migration, Distalizaton.

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INTRODUCTION

Orthodontists are often faced with a dilemma of extracting either the first or the second premolars in to correct the malocclusion. Factors such as discrepancy between teeth and alveolar bone, maxillomandibular relationships, facial profile, facial pattern, skeletal maturation, tooth asymmetries, disease and patient cooperation should be taken into consideration to diagnose and determine the tooth indicated for extraction.[1] The concept of permanent tooth extraction to correct the malocclusion was explained by Charles Tweed [2] and Begg 60 [3] years ago. According to theories put forth by Weinstein and Profitt, the relative stability of a tooth in the arch is maintained in equilibrium by intrinsic and extrinsic forces. When the teeth are missing or a tooth is extracted, the remaining teeth in the arch will spontaneously move to establish a new equilibrium. Extraction, caries, proximal reduction

or congenital absence can induce a spontaneous movement of the remaining teeth to establish a new equilibrium. Bourdet termed this adjustment as "physiological drift". When permanent teeth are extracted without any appliance therapy and the remaining teeth physiologically drift into the spaces, then it is defined as driftodontics. It is observed more frequently in the lower arch compared to the upper arch. [4][5]

BIOLOGICAL RATIONALE

The extraction of first permanent premolar maintains the functional position of the dentition and prevents loss of supporting alveolar bone. Arch length deficiency leads to displacement of permanent teeth from their ideal position over the supporting bone which leads to loss alveolar bone height. This can be prevented by early extraction of the primary and permanent teeth which may allow the remaining dentition to erupt in a less crowded arch, thus maintaining maximal alveolar support, better occlusal contacts and long term stability. [6][7]

MECHANISM OF DRIFTODONTICS

Numerous experimental animal studies were conducted to understand the mechanism behind the physiological drift. Moss et al. measured the rate of horizontal drift of teeth in six adult monkeys by clinical, radiographic and histological methods, and by assessment of plaster models of the teeth.[8] They concluded that posterior molars drifted mesially whereas premolars drifted distally. Another experimental study in rats was conducted by Roux et al. to precisely measure the amount of tooth movement into the extraction space and also the impact of occlusal forces on the tooth movement. They concluded that third molar drifted mesially and the rate decreased with time. The drift comprised of one-third rotation and two-third translation. However no influence of occlusal forces on tooth movement was detected.[9] From the clinical studies, it can be inferred that extraction of lower premolars causes mesial drifting of first molars and distal drifting of the canines, along with tipping and translation movement. Incisors drift into the extraction space and reduce further crowding. Alexandros et al have reported a risk of loss of anchorage of the first molars due to its mesial drifting, on the contrary individual research conducted by Weber and Glauser have concluded that mesial drifting of the molars is minimal and contribute only a small proportion towards extraction space closure. It is believed mesial drift is more with extraction of second premolar than first premolar. According to Robertson, Cavina and Moss, 91% of the first premolar space is taken up by mesial drifting of molars, on the other hand Weber stated that one-third is by mesial molar drift and two-third is by distal canine drift.[10][11]

METHODS TO EVALUATE DENTITION DRIFT

Manually measurements are analysed using lateral cephalometric radiographs and dental cast models. These methods can quantify the dentition drift in the mesial-distal direction. The two- dimensional analysis can quantify tipping and displacement of teeth. Three-dimensional analysis done to quantify the physiological drift is measured with cone beam computed tomography(CBCT) and 3D digital technology. This method can analyse the drift in mesial-distal, sagittal and vertical directions.[12]

FACTORS INFLUENCING PHYSIOLOGICAL DRIFTING

Tipping is the significant tooth movement that occurs after extraction. Studies show that extraction destructs the transseptal fibres between the teeth, which have the ability to regrow and reattach to the adjacent teeth thus contributing to physiological drifting.[13]

Soft tissues surrounding the teeth: A study conducted by Ogushi et al found that lip and cheek muscle show maximum pressure near the canine. This explains the possibility of drifting of canines distally under the influence of lip musculature.[14]

Occlusal forces: Study conducted by Southard et al reported that anterior component of occlusal forces could influence the mesial drifting of maxillary molars after first premolar extraction.[15][16]

Bone trabecular pattern: Due to the porous nature of maxillary arch, the physiological drifting may occur at a faster rate in comparison to the mandibular arch. Teng et al reported that maxillary extraction space decreased by an average of 0.792 mm/month after extraction, leading to an approximately 4-mm decrease in the extraction space over 6 months. Further analysis showed that faster tipping (1.127°/month) and movement (0.386 mm/month) were observed in the maxillary arch in comparison to the mandibular arch over the 6-month period.[12] Most of the reported literature has studied the phenomenon of physiological drifting in the lower arch. Limited literature is available to understand the dynamics of driftodontics in the maxillary arch as it usually requires a stronger anchorage for orthodontic support. Further research is needed to identify the characteristics of physiological drifting in the upper arch which may control the loss of anchorage in the duration between extraction and bonding upto the stage of softwire application. Hence, it is vital to design an appropriate research study to assess the problem.

Age and Gender: According to Gragg et al [17] gender did not influence the drift. According to Teng et al [12]

younger patients during the growth spurts show an excess growth of the mandible leading to mesial drifting of the maxillary molars to achieve a stable molar relationship. Also the age-related effects on tissue reaction, the proliferative rate of PDL cells, osteoclastic activities and mineral density in alveolar tissues could explain the greater drift in the younger population.

Crowding prior to extraction: Crowding has a positive influence on the canine drift in horizontal and vertical direction and minimal effect on the posterior teeth, proving that more severe is the crowding, faster is the distal tipping, distal displacement, and canine extrusion.

Periodontal status: Kirschneck et al reported that experimental periodontitis in rats accelerated the tooth movement induced by orthodontic forces. Increased osteoclastc activity contributes to root resorption and periodontal bone loss in periodontitis patients. This can influence the physiological drift during orthodontic treatment.[18]

Immediate placement or delayed placement: Two schools of thoughts exist regarding the immediate placement or non-placement of the appliance after extraction. Some orthodontic believe immediate placement of orthodontic appliances will minimize anchorage loss of the posterior teeth. On the other hand, delayed placement will allow the physiological drifting of teeth into extraction spaces thus reducing time duration for orthodontic treatment. A XBT buccal tube could prevent the continuous mesial tipping movement of the upper first molar initially, and the low friction design at the canine brackets can minimize the prevention of the distal drift, thus achieving both objectives with one option.[19]

Exogenous factors: Factors such as smoking, alcohol and certain medications such as diazepam, vitamin C, simvastatin, atrorvastatin or calcium compounds. The available literature exploring the influence of these exogenous factors in physiological drifting is limited. [20] An experimental study in rat model reported an orthodontic tooth movement with regular nicotine intake. [21]They also reported an elevated level of inflammatory markers under the influence of nicotine suggestive of accelerated orthodontic tooth movement. By contrast, alcohol abuse may have an inhibitory effect on tooth movement during orthodontic therapy. [22]

CONCLUSION

Physiological drift of the dentition-'driftodontics' after extraction of four first premolars can produce desirable changes such as spontaneous correction of incisor crowding. It becomes so much easier to band crowded teeth, rotate them, and incorporate them into the arch and can limit the use of multilooped arches. Furthermore, with proper manipulation and timing, the combination of physiologic drift with progressive banding of teeth as they erupt reduces the treatment time and chair time.

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