

Review Article

HEADING OF ARTICLE – Splinting in Periodontics: An update

UNDER PEER REVIEW

Splinting in Periodontics: An Update

Abstract:

Establishing a stable or proper occlusion enhances the retention of teeth and the maintenance of periodontal health. Mobile teeth with good periodontium can be managed alone with occlusal equilibration; whereas mobile teeth with compromised periodontium can be stabilized by using splints. Splinting increases the life expectancy of loose teeth by providing support for the periodontium to reconnect as well as improving comfort, function, and aesthetics. From ancient times splinting has been used to control the tooth mobility but still it remains poorly understood and disputable areas of dental therapy. This article discusses splinting, its principles, rationale, indication, contraindication, prerequisite, history, and classification.

Key words: Splinting, periodontium, mobility

Introduction

Periodontal disease is the most frequent condition today, and it is marked by plaque collection, gingival irritation, and the loss of both connective tissue connections and alveolar bone, all of which lead to higher mobility of the teeth involved in the pathological process. In the patients coming to a dental office, one of the major complain we as a dentist encountered is the mobility of the tooth that mainly affects the patients comfort, functions and aesthetics. It affects the psychological well being of the patient to certain extent. Therefore, it should be diagnose and addressed at the early stages. Causes of tooth mobility can be reversible or irreversible in nature and should be treated appropriately. As the inflammation subsides, root planing, curettage, dental hygiene, and surgery may result in tooth stabilization; nevertheless, a temporary increase in mobility may occur shortly following surgery. To immobilize the tooth, we must improve the support of loose teeth while increasing their stiffness, which is why the SPLINT appliance,

equipment, or device is used. Splinting increases the life expectancy of loose teeth by providing support for the periodontium to reconnect as well as improving comfort, function, and aesthetics and it is a periodontal treatment method that is both poorly understood and essential to employ.^[1]

Definition

- A Splint is a device that is used to immobilize injured or sick body parts. A periodontal splint is a dental appliance that is used to keep movable teeth in their functional position.^[2]

Splinting does have the following general biologic benefits: (1) reduced periodontal tension and stiffness of teeth; and (2) natural reconfiguration of tooth motions from abnormal tilting to promoting vertical pressure.

- Splint is defined as an any apparatus, appliance device employed to prevent motion or displacement of fractured or movable parts (Francis G. Serio).^[3]
- According to Macphee and Cowley – Splint is a rigid flexible appliance used to stabilize and protect an injured part.^[4]

Principles of splinting

- Splinting reduce movement three dimensionally.
- The axis of rotation of the involved teeth must be placed in the remaining supporting bone.
- No inflammation should be present.
- Minimum one third of bone support remaining.
- Splinting should allow for oral hygiene methods.
- Splinting should not irritate soft tissues.^[5]

Rationale

- To provide rest.
- For stress reconfiguration, the occlusion forces are directed more radially across all of the teeth in the splint.
- For energy dispersion - It guarantees that energies do not exceed the adaptive capability of the periodontium.
- Recovery of functional stability.
- Psychological health.
- To secure moveable teeth following surgery, particularly regenerative treatment.

Indications

- Teeth mobility is used to describe the motion of teeth that is increasing or creating discomfort to the patient.
- In prosthetics, various abutments are required to support the pontics.
- Sustain moderate to advanced tooth motion that is resistant to conventional treatments.
- Control the teeth when greater tooth movement is there, which hinders the patient's regular masticatory functions.
- Keep teeth from tilting or drifting.
- Teeth that are unstable are secured during surgical intervention.
- After a stressful occurrence or trauma, stabilize your teeth.
- After orthodontic treatment, teeth should be secured.^[6]

Contraindication

- Tooth mobility ranging from high risk of developing within the context of periodontal disease and/or most important occlusal trauma.
- Unsatisfactory number of firm/sufficiently stiff teeth to conserve mobile teeth.
- And no earlier occlusal alteration on teeth with occlusal damage or occlusal hindrance.
- The patient's dental hygiene is deplorable.^[7]

Prerequisite

- Tooth/teeth to be stabilized should be free of gingival inflammation.
- Trauma from occlusion should be relieved prior to the tooth splinting.

History

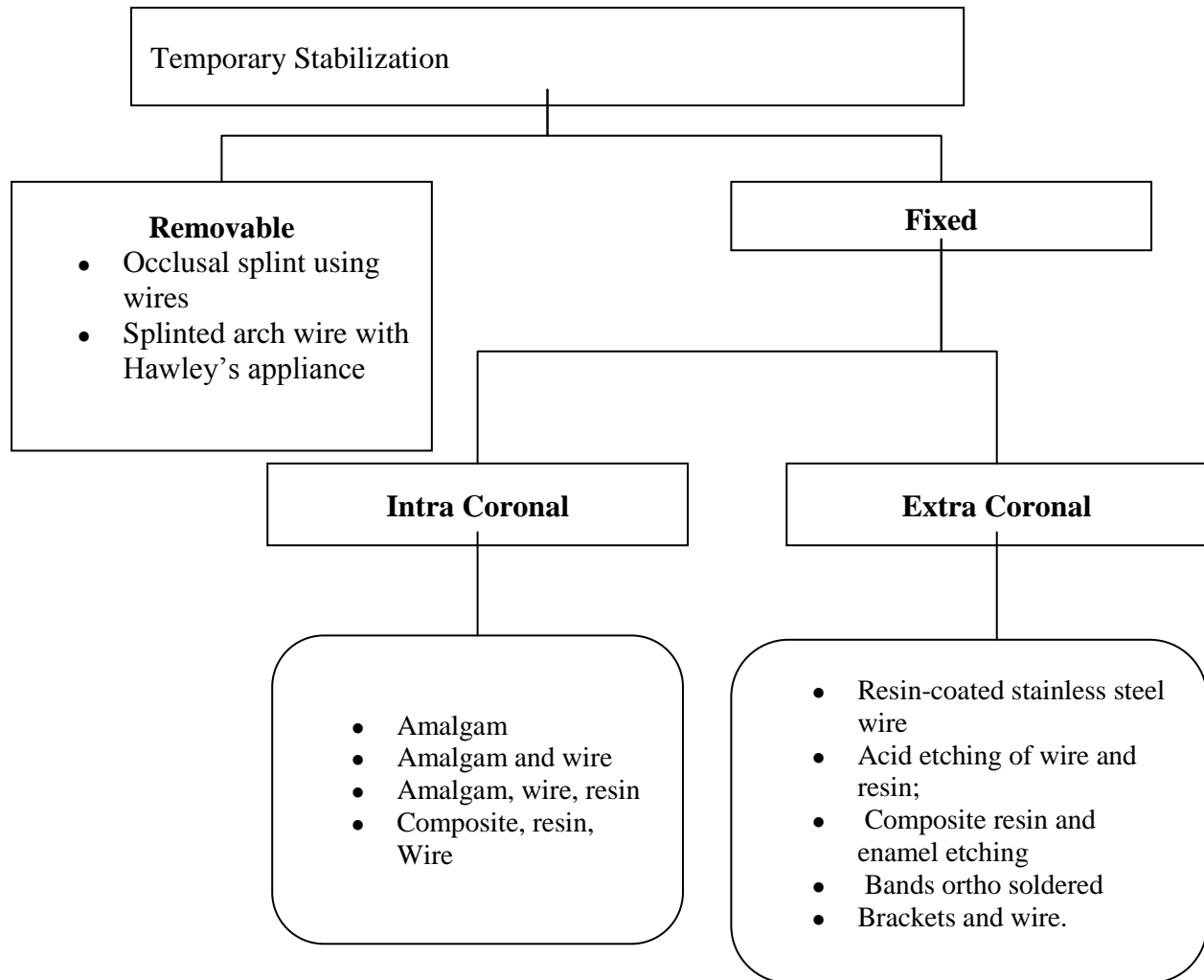
On a Phoenician mandible unearthed in modern-day Lebanon about 500 BC, two sculpted ivory teeth are attached to four natural teeth by gold wire. The evolution of splinted dental prosthesis advanced to its use of silver wire, followed by gold wire or ribbon appliances, to secure loose teeth.^[8]

For stability, Obin and Arvin (1951) anticipated the use of a self-curing internal splint.^[9] Harrington (1957) enhanced the splint by glueing stainless steel wire on it.^[9] Word and Weinberg (1961) invented innovative procedures, such as using a plastic matrix or wire augmentation. Nowadays, splints have developed from intracoronal bondable fibresplinting.^[10]

Classification of splinting

A. Proportional to the length of the stabilization period

1. Temporary Stabilization



2. Temporary stabilization

Examples of provisional stabilization include acrylic splints, metal band, etc.

Time duration can vary from months to several years.

3. Permanent splint:

a. Removable /fixed

b. Extra / intra coronal

- Full/Partial veneer crowns soldered together
- Inlay/Onlay soldered together

B. According to the type of material:

- Bonded composite resin button splint
- Braided wire splint
- A splints

C. According to the placement on the tooth

- a. Intracoronal
 - Composite resin with wire
 - Inlays
 - Nylon wire
- b. Extracoronal
 - Tooth bonded plastic
 - Welded bands

Splints that are regularly used:

1. Splints for the anterior region:

- Direct bonding system: It splints the teeth in interdental areas to use an acid etching technique and a light-cured cement. Because of its excellent fracture toughness, unfilled resin may also be used.
- Intracoronal wire and acrylic wire splint: A window on the lingual side of the tooth is prepared; also stainless steel wire is inserted in the slot to secure the teeth.
- A 1.5 millimeters deep slit was cut halfway between both the incisal and cingulum margins. After half-filling the resin, stainless steel wire is inserted into the slot.

Splint variation: A 1 millimeters bottomless mesial/distal box is constructed similar to the longitudinal of the tooth. While the pin is already being inserted into the slot,

2. Splints for the posterior region:

- Intracoronal amalgam wire splint: This type of splint utilizes resin restoration in the mesial/distal amalgam-restored areas of the tooth, along with reinforced wire, to secure the back teeth. A splint is used in a way similar with the slot preparations listed below: 1.5 millimeters deep and 2-3 millimeters broad a twisted stainless steel wire is being utilized and coated with resin prior finishing and polishing.

Different types of splints, their materials, and the benefits and drawbacks of each.

Type	Material detail
<p>Fiber reinforced Composite resin</p>	<p>For a variety stabilization reinforcement procedures, fiber splints are available in three unique ways</p> <p>Unidirectional fiber strip: Width - 3 millimeter</p> <p>Uses: Unidirectional glass strips are most suitable reinforcing temporary bridges, stabilizing mobile teeth and repairing dentures</p> <p>Braided rope strip: Width - 1 millimeter</p> <p>Uses: In cases when lingual space is limited these braided polyethylene ropes are suited</p>

	<p>best. These strips can also be used as posts.</p> <p>Woven fiber strip: Width - 2 millimeter</p> <p>Material : Woven glass</p> <p>Uses: These fiber strips stay in place due to lack of memory and adapt effortlessly to misaligned teeth as it gets easily tucked into interproximal contacts.</p>
Unidirectional	<p>These fibres are sewed together and positioned in a biaxial plane (e.g., 0, +45, -45).</p>
Pre-impregnated glass Fibers	<p>Goblet that has already been impregnated</p> <p>Fibers are extremely small and, if inhaled, can cause serious health problems. Silicosis and associated problems can occur when silica accumulates in the lungs. These materials, on the other hand, are visually beautiful and feature a surface texture akin to castable glass ceramics such as empress and OPC.</p>
Open-weave glass fibers	<p>Glass fibres with an open weave can help to avoid fracture formation and strain. It is</p>

	commonly used to adjust for the specific design and construction of periodontal splints. Polyester epoxy resins and polyester can both be used in conjunction with open weave glass fibres.
Provisional fixed partial Prosthetic splint	In cases where occlusal rehabilitation is complex we can use partial prosthetic splint. The fabrication is done using heat processed acrylic resin.
Definitive fixed partial Prosthetic splint	It also functions as a splint for the abutment and other supporting teeth.

Discussion

Sekhar et al. (2011) examined the effectiveness of 2 splinting materials: Ribbond ribbon + composite (experimental group) and stainless steel wire + composite (control group) (control group). One of the clinical indicators of chronic periodontitis was grade 1 to grade 2 movements of the maxillary or mandibular front teeth, and 30 people with chronic periodontitis were selected. Each patient participated in the trial for a period of 12 weeks. According to the authors, the experimental class had a greater success rate. The experimental group, according to the authors, had a higher reduction in tooth motion than the control class. Ribbond ribbon reinforced composite resin, according to the authors, was a good splinting material in terms of patient comfort, longevity, fracture resistance, biocompatibility, and visual approval.^[11,12]

Saquib (2019) did a study to review the bending strength and modulus of several periodontal splint materials and reported that ribbond had the greatest bending strength and modulus, next then F splint, ligature wire plus composite, and composite block.^[13,14,15]

FarhanDurrani et al (2019) evaluated and compared load sharing around periodontally damaged movable teeth splinted with metal-reinforced composite, fiber-reinforced composite, composite resins and concluding that after splinting, load on the canine enhanced while bone amounts around the incisors reduced, load on the incisors decreased, also metal reinforced composite was proved to be a useful splinting material in terms of stress distribution.^[16,17,18]

There are limited case controlled studies available in literature regarding tooth splints in periodontal therapy. However, based on the existing literature, Ribbond strip can be employed as a material of choice for splinting teeth during periodontal therapy, as well as having the highest flexural strength and flexural modulus.Splinting with Metal-reinforced composites outperformed conventional splinting materials in terms of stress distribution.

Conclusion

Tooth mobility is caused by the loss of tooth supporting structures as a result of periodontal disease. Tooth mobility has a negative psychological impact on functions, aesthetics, patient comfort, and confidence. Splints can help us overcome these issues. Splinting teeth to one another permits damaged teeth to rely on surrounding teeth for support. Patients must be taught how to practice improved and optimum oral hygiene.

References

1.Dr.SAJID.T.HUSSAIN, B.Sc., M.D.S. Department of Periodontics and Implantology, Sree Balaji Dental College and Hospital, Bharath University, Chennai, Tamilnadu, India. European Journal of Molecular & Clinical Medicine ISSN 2515-8260 Volume 07, Issue 03, 2020

2. Kamath S., Bhavasar NV Periodontal splints A Boon or a Bane?? JISP. 21-25
3. The Glossary of Prosthodontic Terms 7th Edition. The Journal of Prosthetic Dentistry 1999
4. The Glossary of Periodontal Terms, 4th Edition, The American Academy of Periodontology 2001.
5. Baruch H, Ehrlich J, Yaffe A. Splinting—a review of the literature Refuat Hapeh Vehashinayim 2001;18:29-40.
6. Malone W, Koth D. Theory and Practice of Fixed Prosthodontics. 8th Edition. Pg:71-87
7. Current concepts in Periodontics. B.R.R. Varma & R.P. Nayak. Page no. 309-311
8. Oikarinen K. Tooth splinting: a review of the literature and consideration of the versatility of a wire-composite splint. Endod Dent Traumatol 1990;6:237-5
9. Mangla, Chhaya & Kaur, Sukhpal. (2018). Splinting-A Dilemma in Periodontal Therapy.
10. Hoffmann-Axtehl W. The treatment of maxillofacial fractures and dislocations, in historical perspective. In: Kruger E, Schilili W, Oral and Maxillofacial Traumatology. Berlin: Quintessenz, 1982;1:17-40.
11. Sekhar, L. C., Koganti, V. P., Shankar, B. R., & Gopinath, A. (2011). A comparative study of temporary splints: bonded polyethylene fiber reinforcement ribbon and stainless steel wire + composite resin splint in the treatment of chronic periodontitis. *The journal of contemporary dental practice*, 12(5), 343–349. <https://doi.org/10.5005/jp-journals-10024-1057>⁸.
12. Agrawal, S., Kumar, S., Ingole, V., Acharya, S., Wanjari, A., Bawankule, S., Raisinghani, N., 2019b. Does anemia affect cognitive functions in neurologically intact adult patients: Two year cross sectional study at rural tertiary care hospital. *JOURNAL OF FAMILY MEDICINE AND PRIMARY CARE* 8, 3005–3008. https://doi.org/10.4103/jfmpe.jfmpe_599_19
13. Shahabesaquib comparative Evaluation of Flexural Strength and Flexural Modulus of Different Periodontal Splint Materials: An In Vitro Study *Appl. Sci.* **2019**, 9(19), 4197; <https://doi.org/10.3390/ap>

14. A.M., Parwe, S., Nisargandha, M., 2021. A Comparative Evaluation of Efficacy of Mustadi Yapan Basti and Baladi Yapan Basti in the Management of Oligozoospermia-Study Protocol. JOURNAL OF PHARMACEUTICAL RESEARCH INTERNATIONAL 33, 208–216. <https://doi.org/10.9734/JPRI/2021/v33i31A31686>
15. Ambekar, S.M., Quazi, S.Z., Gaidhane, A., Patil, M., 2021a. Steps towards Universal Health Coverage through Health and Wellness Center under Ayushman Bharat Programme Delivering Comprehensive Primary Health Care in Bhandara District. JOURNAL OF PHARMACEUTICAL RESEARCH INTERNATIONAL 33, 34–38. <https://doi.org/10.9734/JPRI/2021/v33i34A31820>
16. Durrani, F., Galohda, A., Rai, S. K., Singh, N. K., Verma, R., Yadav, D. S., & Karthickraj, S. M. (2019). Evaluation and comparison of stress distribution around periodontally compromised mobile teeth splinted with different materials: Three-dimensional finite element analysis. *Indian journal of dental research: official publication of Indian Society for Dental Research*, 30(1), 97–101. https://doi.org/10.4103/ijdr.IJDR_250_17
17. Ahuja, M.M., Kamble, R.H., Shrivastava, S., Gurudatta, N.S., Bidwai, P.S., Nambiar, K.M., 2021. Is Palatal Rugae Morphology Stable in Patients Treated with Myofunctional Therapy in Skeletal Class II Cases? JOURNAL OF EVOLUTION OF MEDICAL AND DENTAL SCIENCES-JEMDS 10, 562–566. <https://doi.org/10.14260/jemds/2021/122>
18. Ali, S., Rathi, R., Rathi, B., 2021. A Comparative Study on the Efficacy of Kantkari and Vasa Lozenges in Children with Kasa (Cough)-Study Protocol. JOURNAL OF PHARMACEUTICAL RESEARCH INTERNATIONAL 33, 25–33. <https://doi.org/10.9734/JPRI/2021/v33i31B31685>