

New Technique For Splinting Traumatized Anterior Teeth Or Dento alveolar Segment . A Clinical Study

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الخلاصة

الاهداف: هنالك العديد من تقنيات استخدام جبيرة التثبيت للعظم الساند المتحرك وكذلك الاسنان المتحركة في مقالات الصدمات السنية . جبيرة سلكية ، جبيرة تقويم الاسنان ، جبيرة راتنجية . **المواد وطرائق العمل:** تم استخدام تقنية جديدة لصدّات الاسنان والعظم السنخي الساند لها نتيجة الحوادث او العمليات الجراحية . هذه التقنية هي استخدام مادة الاكريلك الباردة كجبيرة مباشرة لتثبيت الاسنان والعظم السنخي دون الحاجة الى التخدير الموضعي او العام لأغراض التثبيت . **النتائج:** اجريت الدراسة في الفترة من سنة ٢٠٠٨ – ٢٠١٤ . اربعة واربعون مصاب في الاسنان الامامية والعظم السنخي ، ومريضان استخدم التثبيت بهذه الطريقة ايضا بعد عملية جراحة تقويمية تجميلية للفك الاعلى . النتائج كانت سقوط الجبيرة بعد يومين لاحد المرضى كمضاعفات ، اما في باقي المرضى تم ازالته بعد ١٤ – ٢١ يوما . **الاستنتاجات:** تعد هذه التقنية في علاج الصدمات للأسنان الامامية اجراء موثوق به وبسيطا وسهلا وكذلك اقل كلفة واستهلاكاً للوقت .

ABSTRACT

Aims:: Many different splinting techniques have been described in dental trauma articles. Wire-composite splint, Orthodontic splint, TTS splint, Resin splint, Kevlar/fiberglass splint (fiberglass), Self-etching and bonding material, Suture splint. We describe here a new technique for splinting traumatized teeth and alveolar bone. To evaluate the simplicity and reliability of cold-cured acrylic resin immediate splinting in the management of traumatized anterior teeth. **Results:** A total number of (46) patients with traumatized dental or dento-alveolar segment due to accident or operation were managed with immediate cold-cured acrylic resin splint without the need for anesthesia for fixation, the study carried out from January (2008–2014). Forty four dento-alveolar trauma patients, 2 patients following upper dento-alveolar osteotomy, 2 splints dropped down (2) days post-splinting, the splints removed (14-21) days. **Conclusion:** this new technique in the management of dento-alveolar trauma is a reliable, simple, easy, less technical, painless and less time consuming procedure.

Key words: Cold-cured acrylic, Dental trauma, New technique, Splinting.

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INTRODUCTION

Dental trauma represents one of the few situations where dentists are called upon to

make unscheduled diagnostic and treatment decisions in an area that is outside their routine experience⁽¹⁾. Three to four in 10 children has been estimated that carry on

injuries to their permanent teeth before leaving school age⁽²⁾. Oral region trauma comprises 5% of all injuries. Among all facial injuries, dental injuries are the most common; of which avulsions occur in 1–16% of all dental injuries⁽³⁾. It is common practice that injured primary teeth are not splinted but left to heal spontaneously or extracted⁽⁴⁾. The avulsed primary teeth should not be replanted to avoid damage to the developing permanent teeth. However, every effort should be undertaken to save traumatized permanent teeth⁽⁵⁾. The International Association of Dental Traumatology has presented a series of articles about guidelines for the evaluation and management of traumatic dental injuries⁽⁴⁾, as follows: Clinical examination⁽⁶⁾. Radiographic examination, Sensitivity tests (electric pulp test or cold test), Patient instructions; Patients should be advised on how best to care for teeth that have received treatment after an injury⁽⁷⁾. Experimental studies demonstrated that rigid splinting, i.e. immobilization, or a prolonged splinting period may lead to extensive PDL healing complications⁽⁸⁾. Several studies have shown that physiologic tooth mobility is not or only minimally altered following the application of modern splinting techniques⁽⁹⁾. Requirements of modern splints for stabilization of traumatized teeth: intraoral application, simple procedure (placement and removal), adequate fixation

for whole stabilization period, no additional trauma to splinted teeth, allowing physiologic tooth mobility, no interference with occlusion, be easy to keep clean, no damage to gingival tissues, esthetically acceptable, and endodontic treatment and sensitivity testing should be possible⁽¹⁰⁾. Many different splinting techniques have been described in dental trauma articles. Wire-composite splint, Orthodontic splint, TTS splint, Resin splint, Kevlar/fiberglass splint (fiberglass), Self-etching and bonding material, Suture splint⁽¹¹⁾. One week is theorized enough for immobilization in cases with minor supporting tissue injuries⁽¹²⁾. Since the periodontal ligament reaches its normal strength 7 to 14 days following trauma⁽⁹⁾.

Aim of the Study: Is to perform a new type of cold-cured acrylic (CCAR) splint to treat dental or dento-alveolar fracture, in a trial to overcome emergency situation and to minimize: Stress and discomfort associated with the operative procedure, Time needs to achieve the goal and Technical additives required for splinting.

ETHICS OF HUMAN AND ANIMAL EXPERIMENTATION

All work is approved by the scientific committee of Nineveh Health Directory / MOH / Iraq by licenses' Number (1648) in date 12/2 / 2019)

MATERIALS AND METHODS

The study carried out for (46) patients since Jan (2008-2014) those where attending Al-Salam Teaching Hospital, Mosul. All patients were subjected to oro-facial trauma, all affected teeth by trauma were permanent teeth whether luxated or avulsed. The material used for fabrication of splint consist of cold-cured acrylic resin (powder and liquid).

Inclusion criteria

- Traumatized anterior teeth alone with mobility or even avulsion
- Dento-alveolar fracture alone
- Both

Exclusion criteria

- Root Fracture of tooth
- Involvement of posterior teeth
- Fracture basal bone

The affected traumatic site examined with appropriate radiographic investigation, an emergency treatment carried out for wound management if present; then re-alignment of the affected teeth manually if needed,

fabrication of the CCAR splint, application of a small soft bar of the prepared material equal in length to the required length of dentition to be fixed (one sound permanent tooth from each side next to the affected teeth or two deciduous sound neighboring teeth), the applied material adapted continuously and gently, directly upon the natural teeth in patient mouth, by non-gloved Vaseline moistened fingers to create an even, thin layer covering the whole surfaces of the planed teeth to be supported (keeping attention to the incisal and occlusal surfaces cover to be as thin as possible), the gingival margins considered as a boundary for the prepared splint Figure (1)



Figure(1): Fabrication of CCAR on cast

Patient informed to occlude his teeth to make a bite impression on the surface of the unset material, manual adaptation continue till initial setting and hardness of the material

occur Figure (2), finally, the patient advised to use copious water mouth wash for few minutes to ensure cooling effect on the hardened splint.

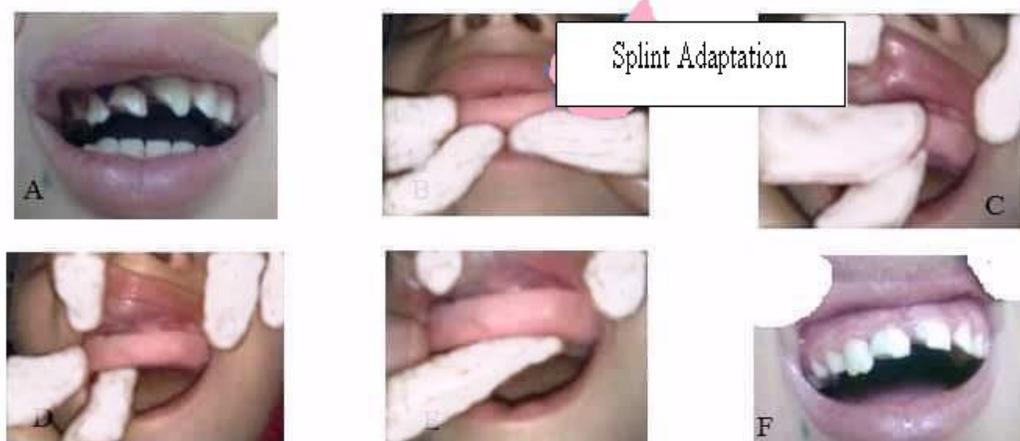


Figure (2): Dento-alveolar trauma Patient. A- Preoperative view of Dento-alveolar trauma
B - C Manipulation of CCAR to the traumatized teeth. D – E Continues adaptation of CCAR
. F - 21 days after splint removal

In our study, we try to note and record the following: **Acceptance of the procedure:** whether the patient, especially children accept or refuse the application of splint and during the period of fixation. **Splint drop down:** this new type of splinting depend on mechanical way for retention and stability without using any chemical or cementing additives, necessitating close and careful follow up to record dropping of the appliance. **Success and failure:** in this record, we notes the post-stabilization results of the defective site to ensure effectiveness of the procedure. **Oral hygiene and gingival health:** to actualize healthiness of the gingival tissue following the application of the splint, we record the clinical inflammatory change in the gingiva during and after stabilization period. **Occlusal Align ment after fixation:** the splint minimally interfere with occlusion, we try to clinically monitor the occlusal

alignment before and after stabilization. **Time of application:** time of treatment procedure is an important factor to evaluate the overall integrity of this new splinting. **Effect of heat generation:** heat generation at the time of cold-cured setting, may affect the outcome effectiveness of the treatment. **Instructions during stabilization:** Patients and their parents advised to keep the oral hygiene as clean as possible, daily mouth wash, start normal oral feeding, and to keep in touch in case of splint dropping. **Splint removal and short follow up:** Two to three weeks later, the affected area examined and the splint removed with hand piece drill, by grooving along the whole incisal and \ or occlusal edge, wedge force applied to the groove to separate the shelves of the splint, then patient referred to pediatric dentist for further dental management

RESULTS

From total (46) patients managed, (44) patients aged (6–12) years were due to trauma to the anterior upper dento-alveolar area that need treatment of the defect by fixation, and 2

patients were 17 and 19 years old following upper segmental setback osteotomy orthognathic operation Figure (3), the splints removed 14 (for dental trauma) to 21(for dento-alveolar trauma) days following fixation.



A



B

Figure(3): Osteotomy Patient. A. Seventeen years old female have an acrylic splint following anterior segmental osteotomy. B. 19 years old female have an acrylic splint following anterior segmental osteotomy

Acceptance of the procedure: patients, mostly children, accept the procedure at time of application and during the period of fixation without child's resistant to

application. The child keep quite without pain or noisy during application and manipulation of the materials although no

anesthesia is used added to that no disturbance in feeding process.

Splint drop down: only two splints (4.3%) dropped down 2 days post-splinting, due to poor adaptation.

Success and failure: a case treated 2 days post-accident, with mobile upper left central incisor, but it was failed to respond to fixation (2.1%) following 14 days of splinting. Two cases have dental mobility grade 1 and advised to keep fluid and soft oral take for the following 2 weeks, with the affected teeth out of occlusal load in both cases, all other cases reveal normal stable teeth after treatment period.

Oral hygiene and gingival health: all patients had a history of mild gingival redness after removal of the splint, without any significant clinical manifestation of impressive gingival inflammation.

Alignment after fixation: all treated dento-alveolar segments pass the required period of fixation with normal occlusal level.

Time of application: the time for splinting range from 3–5 min, which is the time of CCAR setting.

Use of anesthesia: three cases out of total sample needs infiltration of local anesthetic solution for correction of palatally malposed anterior teeth that interfere with occlusion.

Effect of heat generation: the

polymerization of CCAR leads to heat generation, meticulous mouth wash or if the procedure applied in dental clinic, continuous profuse irrigation of the splint with normal saline with presence of good suction prevent any discomfort during the final step of the procedure.

DISCUSSION

Splinting defined by Dawson as stabilize traumatized teeth (one or more) by joining together. Others defined it as a rigid or flexible device that maintains injured teeth or dentoalveolar fracture bone piece in position and protect an injured part. The active term of splinting in dentistry is defined as the joining of two or more teeth into a rigid unit by means of fixed or removable restorations or devices.⁽¹³⁾

Splinting or stabilization of affected teeth was known to be one of the critical phases of treatment of traumatized teeth that are displaced, subluxated, luxated, and avulsed teeth. Dental splinting facilitates repositioning of displaced teeth to their original location and ensures adequate fixation with reduced pain and improved comfort along with protection against traumatic forces during healing period.^(14, 15)

Splints will achieve the indicated purpose for the fabrication and application when the ideal requirements are given in consideration. It should integrate firm teeth adjacent to the mobilized one to reduce the

extra load forces in the traumatized teeth. Rigid fixation is mandatory for the traumatized teeth and not inflict torsion stresses on any included teeth. It should not irritate the pulp. It should be inert not rub the soft tissues, gingiva, cheeks, lips, or tongue. Comfortable and easy to keep clean for the patient. Available, relatively low-priced and medically acceptable. Fabricated easily and maintenance simple. Capable of removal, insertion and esthetically acceptable.⁽¹⁶⁾

Takahiro SHIRAKO, et al⁽¹⁷⁾ in their research; establishment of experimental models to evaluate the effectiveness of dental trauma splints. The researchers use perio test model to evaluate different types of splinting methods. The different types of splint can be estimated according to severity in clinical usage.

B Kahler etal⁽¹⁸⁾ describe splint types:

- Composite and wire splints
- Composite and fishing line splints
- Orthodontic wire and bracket splint
- Fiber splints (polyethylene or Kevlar fiber mesh).
- Titanium trauma splint
- Arch bar splints
- Wire ligature splints
- Composite splints⁽¹⁸⁾

From reviewing many papers looking for role of cold cure acrylic as a

splinting of traumatized tooth or teeth no one have been use such material. As well as this new splint in our opinion has great role in fixing and supporting avulsed permanent tooth easily which most common seen in children in the mixed dentition getting away from serious esthetic and psychological implications from loss of avulsed tooth.⁽¹⁹⁾

Choosing splinting methods depend on the number of teeth involved and the fracture level. Four to six weeks is considered as the perfect time needed for adequate immobilization. It's important to anchor the teeth or fractured segment rigidly for at least 3-4 weeks on both sides.⁽²⁰⁾

Splinting the traumatized dental or dento-alveolar segment with direct application of CCAR offer a variety of advantages especially in equipment-deficient situation. It provides coverage, protection, isolation and splinting in less than 5 min under any emergent situation even without using dental chair or equipment. Regarding the simplicity of this application which needs only a 2x0.5 cm of CCA Resin bar, in addition, the acceptance of the procedure by the 44 children were so clear and offer no resistance against application.

The major advantage of this technique, that it provides splinting without immobilization of the covered teeth that create the best situation for healing process

without causing any harmful effect upon involved sound teeth periodontium, in that it does not provide direct contact fixation but engagement of the traumatized segment for silent period of healing, isolated out of oral environment. Tooth structure will not be compromised by this technique, even by simple acid etching and avoid limited surface attachment to the tooth in that none of the affected teeth provide a wide broad support for the affected part, enhancing integrity of the traumatized teeth. In addition, this procedure is easy to fabricate directly in the

mouth, placed passively on the teeth, not traumatize the teeth or gingival tissue during application and fixation period, allow for accepted oral hygiene, easily removed and being functional splint. This technique in comparison with any other splinting technique not needs an assistant, accessory materials or further technical devices like wires, arch bars, light cure machine, acid etch, dental chair, electricity, instruments, cutter, scissor, anesthesia, dryness or cotton, it can be performed even in home Figure (4).



Figure(4): Child patient operated as an emergency in home following avulsion of left central incisor in a curfew situation, no interference with occlusion.

Heat that generates when the material get setting, obviated by instructing the patient to use meticulous water mouth wash at the moment when the material start setting, which leave the splint cold after hardness, or in handicapped patients, irrigation of the splint when it start to set with a disposable or triple syringe may reduce the effect of heat. The disadvantage of this technique includes minimal

interference with occlusion which last for the period of stabilization. Patients accept this disadvantage without any noticeable complain or even discomfort. This could be minimized by clenching over the splint while adapted, with simple excursion to create a safe condition for the occlusion during stabilization. Other disadvantage, the splint may interfere with endodontic treatment for the traumatized teeth during the period of

stabilization, postponing the procedure till we remove the splint.

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