Republic of Iraq
Ministry of Higher Education
and Scientific Research
University of Baghdad
College of Dentistry

Orthodontic Emergencies

A Project Submitted to The College of Dentistry, University of Baghdad, Department of Orthodontics in Partial Fulfillment for the Bachelor of Dental Surgery

By

Huda Ahmed Kadhem

Supervised by:

Dr. Hala Mohammed Jasim
(B.D.S, M.Sc (Orthodontics)

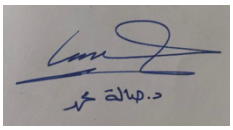
April, 2022

Certification of the Supervisor

I certify that this project entitled "**Orthodontic Emergencies** " was prepared by the fifth-year student **Huda Ahmed Kadhem** under my supervision at the College of Dentistry/University of Baghdad in partial fulfilment of the graduation requirements for the Bachelor Degree in Dentistry.

Supervisor's name

Dr. Hala Mohammed Jasim



Date

April, 2022

Dedication

First of all, I thank Allah Almighty for unlimited gratitude .

I would like to dedicate this work to my life my mother, who supported me, encouraged me, gave me all the support, love, comfort and facilitation of study.

To my family

To my sisters

To everyone who helped me one day.

Acknowledgment

Special thanks to our Dean, the Dean of the College of Dentistry University of Baghdad, **Prof. Dr. Raghad Abdulrazaq Al-Hashimi**, for upgrading the standards of our college.

My grateful thanks to **prof. Dr. Yassir Abdul-Khadem Yassir,** chairman of Department of Orthodontic at College of Dentistry/University of Baghdad.

I would like to express my deep gratitude to my supervisor **Dr. Hala Mohammed Jasim** for her scientific guidance, effort and support to finish this project.

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VFR	Vacuum-formed retainer
Fig.	Figure
NT	Nickel titanium
OPG	Orthopantomogram
CPR	Cardiopulmonary resuscitation
GDPs	general dental practitioners
NO.	Number

Introduction

Orthodontics is the branch of dentistry concerned with facial growth, development of the dentition and occlusion, and the diagnosis, inter- ception, and treatment of occlusal anomalies **(Mitchell *et al*., 2019).**

Salzmann (1943) define orthodontics as 'a branch of science and art of dentistry which deals with the developmental and positional anomalies of the teeth and the jaws as they affect oral health and the physical, esthetic and mental well being of the person.This definition may be over fifty years old yet even at that time the potential of orthodontics was not lost. The emphasis is on maintenance of oral, physical and mental health of the patient and also his/her esthetics (**Singh, 2007).**

Emergency can be defined as any condition perceived by the prudent layperson, or someone on his or her behalf, as requiring immediate medical or surgical evaluation and treatment.The first objective of an orthodontist when the patients comes in for an emergency appointment is to take into account the complete history of the problem and relieve the patient of any pain and discomfort. The second objective should be to reassure the patient that these problems are not permanent **(Shyamala *et al*., 2018).**

The most common emergencies patient reports after few weeks into orthodontic treatment are tooth pain, bracket breakage, loose bands, wire poking, tooth mobility, ulcers or soreness in the mouth, bleeding gums, missing elastics or ties, difficult in maintaining oral hygiene, missing part of the appliance and a piece of an appliance getting swallowed. Though orthodontic emergencies cannot be considered as an actual emergencies, it is common for a general dental practitioner to encounter orthodontic emergencies after first few weeks of orthodontic treatment or even later **(Pradeep *et al*., 2016).**

Aims of the study

This review aimed to:

Review emergency cases that may occur during the orthodontic treatment and their management.

Chapter one: Review of the literature

1.1 Orthodontic emergencies associated with removable appliance

As the name suggests, these appliances can be removed from the mouth by the patient. The patient can insert and remove these appliances without the intervention of a clinician. They may be active or passive, depending upon their capability to exert/generate forces **(Bhalajhi, 2010).**

The removable orthodontic appliances are made up of three components as shown in fig. 1 **(Mitchell *et al*., 2019).**

1. Active components—comprises of springs, screws or elastics.
2. Retentive components—usually include clasps.
3. Base plate—can be made of cold cure or heat cure acrylic.
4. Anchorage.

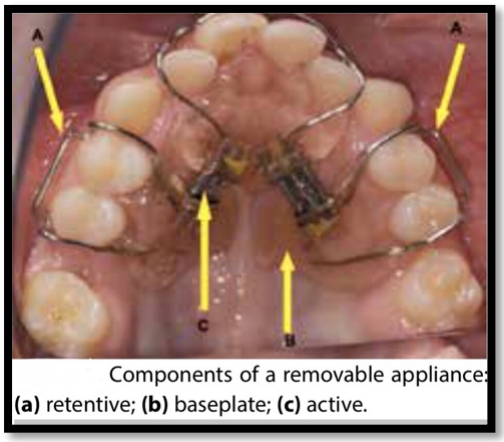

Figure 1: component of removable appliance (Dowsing *et al*., 2015).

General problems with removable appliances include (Mitchell *et al*., 2019).

- Initial difficulties with speech.
- Temporary excessive production of saliva.
- Initial general discomfort.

These symptoms will soon pass once the patient has become used to the appliance, therefore every patient should be encouraged to persevere. If any of these problems persist for more than a few days, then it is more than likely that the patient

is not wearing the appliance for a sufficient amount of time to get used to it. Patients should be encouraged to wear appliances as directed by their orthodontist and also informed that, only if they do so will the initial feelings of discomfort subside. They also need to be reminded that failure to follow the instructions will almost certainly compromise the treatment outcome (**Dowsing *et al*., 2015; Pradeep *et al*., 2016).**

1.1.1 Fractured components of removable applance

Loose, non-retentive appliances are a common cause of emergency visits and can be avoided by careful design and adjustment of the retention components of the appliance, ensuring that sufficient clasps are prescribed at the outset. Satisfactory retention of a removable appliance will add to the patient's confidence and his/her enthusiasm to wear the appliance, which will therefore maximize the chance of a successful outcome (**Pradeep *et al*., 2016).**

A)Fractured retentive components

It is not uncommon for an Adams clasp to fracture. If there are a number of other Adams clasps providing retention, often the only treatment required is the removal of the fractured clasp and smoothing of any cut wires as in fig. 2a&b **(Dowsing *et al*., 2015).**

Another option, if there are fewer retentive components, is to remove the fractured bridge of the Adams clasp leaving the arrowheads engaging the undercut for retention as in fig. 2c **(Mitchell *et al*., 2019).**

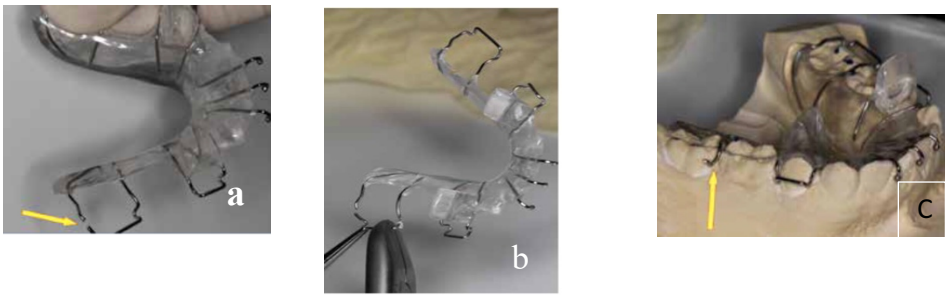

Figure 2: (a) Fractured Adams clasp. (b) Wire work trimmed to remove fractured section. (c) Single arrowhead of Adams clasp used for retention (Dowsing *et al*., 2015).

B) Fracture of active components

Appliances are susceptible to damage around areas containing active components such as springs or expansion screws as in fig. 3. If a spring is significantly distorted and further tooth movement is required, then there may be no option but to replace it. If the patient using an expansion screw has left the appliance out of the mouth for a day or two, even after a temporary repair, the appliances can be extremely difficult to seat fully, as some relapse of the expansion will have occurred. The dentist can attempt to turn the screw back, in quarter- turn increments, until the patient can comfortably, fully insert the appliance (**Dowsing *et al*., 2015).**

Figure 3: Irreversible damage to an active component of a removable appliance (Dowsing *et al*., 2015).

C) Fracture of small areas of the acrylic including bite plane and buccal capping.

If this is fairly minimal, and doesn't affect the design or the integrity of the appliance, then smoothing of the rough edges is all that is required to prevent soft tissue trauma. If the damage is more severe, a new impression is usually necessary for the appliance to be repaired by a technician **(Pradeep *et al*., 2016; Mitchell *et al*., 2019).**

1.1.2 Problems related to appliance hygiene

Such as Candida albicans infection causing inflammation to the palatal tissues on the fitting surface of the appliance as in fig. 4 , are not uncommon. Alternatively, infection may manifest as angular cheilitis with cracks appearing at the corners of the mouth as in fig. 5. Measures instituted by the general dental practitioner initially involve instruction to achieve meticulous appliance hygiene, which may include recommendation of a proprietary brace cleaner **(Pradeep *et al.*, 2016; Mitchell *et al.*, 2019).**

If rapid resolution does not occur, antifungal medication, such as Miconazole applied to the affected area, may be required (**Dowsing *et al.*, 2015).**

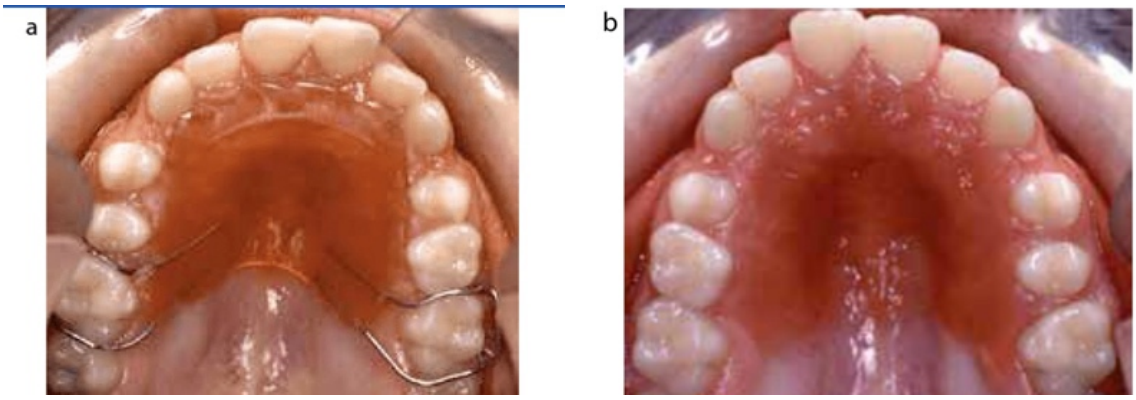

Figure 4: (a,b) Candida infection associated with baseplate of upper removable appliance (Dowsing *et al.*, 2015).

Figure 5: Angular cheilitis at corners of mouth (Dowsing *et al.*, 2015).

1.2 Orthodontic emergencies associated with fixed appliances

1.2.1 Dental Pain following Appliance Placement

After the initial bracket placement it is normal for the patient to feel pain or discomfort for few days. It is ideal for the orthodontist to discuss about the initial discomfort during the initial stages with the patient as well as parent **(Mitchell *et al*., 2019).**

During the complaint of immense pain which may affect eating and sleeping, prescribing analgesic drugs are a common protocol. One of the important advice following orthodontic treatment would be advising the patients to eat soft foods and rinse the mouth with warm salt water if necessary **(Jones and Chan, 1992).**

1.2.2 Soreness in the mouth or ulcers

One of the most common complaint the patients reports is of ulcers or soreness in the mouth after rubbing of the parts of appliance in the soft tissues. Use of orthodontic relief wax is an effective method to reduce the discomfort. Alternatively applying an topical anesthetic gel in the affected area such as Orabase or Oragel can offer temporary relief **(Shyamala *et al*., 2018).**

Figure 6: **Orthodontic relief wax (Sodipo and Birdsall, 2017).**

1.2.3 Tooth mobility

During orthodontic treatment a small amount of tooth mobility is considered normal consequence in the biology of tooth movement. However care must be taken to locate the exact cause of the problem. If there is an excessive tooth mobility due to any occlusal trauma or night grinding, care must be taken to restrict further damage to the teeth. A temporary bite plane or cap splint should be advised for these patients.

Within few weeks the tooth mobility would be reduced. Meanwhile soft diet is advocated during this treatment and avoiding of any hard or sticky foods is restricted (**Nakago *et al*., 1994).**

1.2.4 Root resorption

Root resorption within normal range is considered insignificant in most cases due to the application of orthodontic force. However if there is an high magnitude of force applied to the teeth, the patients reports with an excessive mobility in the teeth. Care must be taken in these patients and ideally an Orthopantomogram (OPG) can determine the extent of root resorption. If the resorption is beyond the normal limits, the treatment can be terminated temporarily or permanently based on the severity of the situation **(Walker, 2010).**

1.2.5 Bleeding gums

Another common problem the patient complains after the initial bracket placement is of bleeding gums as in fig. 7. Bleeding gums can be associated with gingivitis or periodontitis. This may happen due to maintenance of poor oral hygiene which can lead to increase debris and plaque accumulation. A thorough instruction on strict oral hygiene maintenance with brushing, flossing and usage of mouthrinses should be stressed on the patient before as well as after the braces placement. Also care must be taken on taking a complete medical history prior to orthodontic treatment to rule out any medical problems associated with bleeding gum **(Fatma *et al*., 2014).**

Figure 7: Swollen/bleeding gums (Sodipo and Birdsall, 2017).

1.2.6 Lost spacer or seperator

The need of separator is important to ensure a proper band placement. A lost spacer or separator can lead to delay in the banding process which inturn delays the entire orthodontic treatment. If the patient calls and reports of lost seperator it is ideal to make an appointment and place the seperators again **(Shyamala *et al*., 2018).**

1.2.7 Loose or broken brackets

Loose or broken bracket as in fig. 8 is one of the common situation an orthodontist faces after the initial appointment especially in young teenagers. This may be due to eating of hard or sticky foods, trauma from occlusion or injury during contact sports. If the patients calls with a complaint of broken bracket, the first advice is to ask the patient not to panic and to check if the bracket is secured within the archwire or ligature or it has debonded and fell off completely. An orthodontic relief wax can temporarily stop any discomfort the patient might feel till he visits an orthodontist. In any case it would be ideal to call in the patient as early as possible and rebond the bracket to avoid delay in the treatment. And aducate patient about reasons for avoiding sticky foods **(Nazeer, 2013; Mitchell *et al*., 2019).**

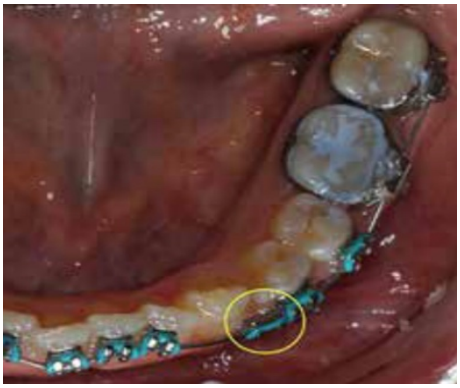

Figure 8: De-bonded bracket (Sodipo and Birdsall, 2017).

1.2.8 Protruding archwire

Protruding distal end of the archwire as in fig. 9 is another problem the patient faces during initial weeks of braces placement. There can be number of reasons pertaining to cause this problem. Some of the common causes may include improper

trimming of the archwire distally after placement, any harmful habits such as biting anything hard or excessive wire distally can be due to active tooth movement. Protruding distal wire can traumatize the soft tissues and lead to severe ulcerations and soreness in the mouth. The ideal treatment would be to schedule the appointment early and trim the archwire with the help of distal end cutter or if the wire is completely removed from the molar tube, then care must be taken to reinsert the wire back into its position. All nickel titanium wires if placed need to be cinched back to avoid the wire poking the patient. An orthodontic relief wax rolled and placed in the area of protruding archwire can help the patient in relief of any discomfort till an appointment with an orthodontist is made **(Gustavo and Henrique, 2016).**

Figure 9: **Protruding archwire (Sodipo and Birdsall, 2017).**

1.2.9 Improper or ill fitting appliance

Usually removable appliance can rarely lead to any trauma to the tissues as the appliance can be taken out when encountered with pain or discomfort. However some appliances such as transpalatal arch, lingual arch, quad helix or expansion screw which are fixed to the molar bands if not placed properly can traumatize the palate and soft tissues leading to severe injury and bleeding. If there is severe inflammation of the palate it is ideal to remove the appliance till the palate heals which usually recovers within few days. If one part of the appliance is debanded or broken care must be taken to carefully remove the appliance and fabricate a new one.

In case of emergency if the patient cannot visit you or is travelling abroad it is ideal to advise the patient to any nearby dentist who can remove the broken part to avoid any injury. However it is ideal to visit an orthodontist as soon as possible **(Shyamala *et al*., 2018).**

1.2.10 Swallowing part of the appliance

Although swallowing any part of the fixed appliance is very rare it can happen. The most common part of the appliance swallowed has reported to be the molar bands, buccal tubes, elastics, seperators and expansion key as in fig. 10. **Naragond *et al*** advises to check the efficiency of the appliance to withstand occlusal forces before delivering the appliance to the patient. Early diagnosis of the ingested foreign particle can reduce the severity in the treatment later. Non invasive procedures such as Hemlich maneuver, CPR, abdominal thrusts and laxatives can be utilized as the emergency procedure to removed the ingested foreign body till help arrives. However it is ideal to visit a physician as soon as possible in these cases **(Appasaheb *et al*., 2013).**

Appliance component missing? Inhaled or ingested **(Simon J. Littlewood and Laura Mitchell, 2019):-**

(1) If airway obstructed, call ambulance and try to remove obstruction.

(2) If there is a risk that the component has been inhaled then refer the patient to hospital for a chest X-ray and subsequent management (give patient another similar component to aid radiologist when examining films)

(3) If there is a danger that the component is>5 cm and has been swallowed then seek the advice of the local hospital. If>6 days previously, object has probably passed through patient's system.

Figure 10: **abdomen x-ray to locate foreign body (Dowsing *et al*., 2015).**

1.3 Orthodontic emergencies associated with functional appliance

The term functional appliance refers to a large and diverse family of orthodontic appliances designed mainly to correct Class II malocclusion. They were developed primarily in Europe but have been adopted by orthodontists in many countries. They all work by posturing the lower jaw forward, the stretched musculature and soft tissues creating a force, which is transmitted to the dentition. In addition, the soft tissue envelope surrounding the teeth is changed. This results in tooth movement, establishment of a new occlusal relationship and reduction of the overjet. The efficiency of these appliances in the correction of sagittal discrepancies in growing patients has intrigued orthodontists for many years, particularly the question of whether they significantly affect skeletal growth **(DiBiase, 2015).**

1.3.1 Complaints associated with functional orthodontic appliances (Simon J. Littlewood and Laura Mitchell, 2019).

1. Appliance comes out at night

Possible cause

- Appliance not retentive due to poor design.

- Clasps not retentive if patient habitually clicks appliance in and out, the clasps flex and become less retentive.
- Insufficient wear of appliance during day.

Management

- Consider adding additional clasps and/or a labial bow. If not feasible then re-make appliance with improved design.
- Adjust clasps.
- Ask patient to increase daytime wear

2. Teeth and jaws ache

possible cause

- Common occurrence during initial stages of treatment.

Management

- Reassure patient.

1.4 Extra oral appliances

Extra oral appliances are used in orthodontics to apply forces to the jaws, dentition or both and the popularity of these appliances is cyclical. Although the use of retraction headgear for the management of Class II malocclusion has declined over the last 20 years with the refinement of non-compliance approaches, including temporary anchorage devices, headgear still has a useful role in orthodontics. The use of protraction headgear has increased as more evidence of its effectiveness for the treatment of Class III malocclusion has become available **(Almuzian *et al*., 2016).**

1.4.1 Headgear

Headgear as in fig. 11 usually consists of an external headgear cap connected to a facebow that transfers force from the back of the head to the dentition . This method of supplementing anchorage is not without risk. Ocular injuries from

headgear have been reported in the past . Usually caused by the inner arms of the facebow . At least two independent safety mechanisms are now recommended in all headgear patients, to prevent recoil injuries following accidental disengagement **(Samuels, 1996).**

If there is any evidence whatsoever that the facebow has a tendency to come out of the headgear tubes, the headgear wear should be immediately stopped. The patient must be referred back to see his/her orthodontist as soon as possible Should an ocular injury be suspected, then immediate referral of the patient to the local hospital accident and emergency unit for an ophthalmic opinion is indicated. Any undue delay may well compromise the possibility of a successful restoration of vision **(Yang *et al*., 2010).**

Figure 11: **Headgear and facebow being worn (Dowsing *et al*., 2015).**

1.4.2 Complaints associated with extra-oral appliances and their management (Simon J. Littlewood and Laura Mitchell, 2019).

1. Face-bow comes out of tubes at night

Advise patients at the time of fitting that if this problem does occur they should stop wearing the headgear and contact their orthodontist should adjust the inner arms of face bow.

2. Face-bow tipping down anteriorly and impinging on lower lip

If the force vector is below the centre of resistance of the molars they will tip distally. To avoid this adjust outer arms up to raise moment of force above centre of resistance of molar to counteract tipping and ensure movement of force acting through centre of resistance of teeth at time of fitting and check at each visit.

3. Face-bow tipping up anteriorly and impinging on upper lip

If the force vector is above the centre of resistance of the molars they will tip mesially. To avoid this adjust outer arms down to lower moment of force below centre of resistance of molar to counteract tipping. Ensure movement of force acting through centre of resistance of teeth at time of fitting and check at each visit.

4. Trauma to the face and eye

It is a rare but serious consequence (ophthalmitis and blindness) due to accidental disengagement or recoiling injuries. Prevention through: Demonstration of the safe use of the headgear to the patient and parent, verbal and written instructions and incorporation of safety mechanisms **(Almuzian *et al*., 2016).**

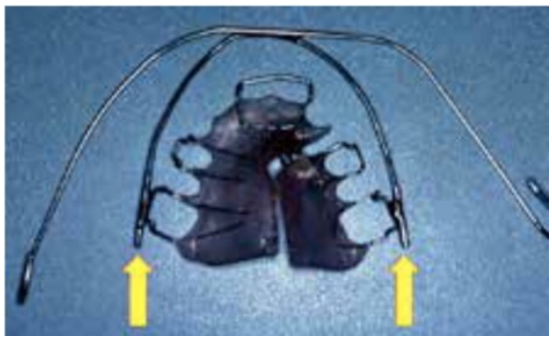

Figure 12: Facebow inner arms can be potential source of eye damage (Dowsing *et al*., 2015).

1.5 Orthodontic emergencies associated with retainer

1.5.1 Bonded retainers or fixed retainer

These retainers are acid etched and bonded on the tooth surface (**Kneirim, 1973).**

Bonded retainers are used these days in a significant number of cases. A multi strand wire is attached to the individual teeth using composite cement and these retainers are designed to stay in place for many years **(patel and Sandler, 2010).**

1.5.1.1 The problem associated with bonded or fixed retainer

Problems occurring with these retainers can include the fracture of the wire in between the teeth or the retainer becoming either partially or fully detached from the teeth **(Segner and Heinrici, 2000).** If just one composite pad has become dislodged from its tooth as in fig. 13, it is usually a fairly simple matter to remove the remnants of composite with a burr, clean the lingual tooth surface and re-bond another pad of composite using an acid etch technique.This can provide an easy and quick solution, as long as there has been no distortion of the retainer wire or movement of the associated tooth.

If the retainer wire has actually fractured or distorted, the loose or sharp ends should be cut and smoothed and the patient redirected to his/her original orthodontist for any necessary further treatment, as there is always the possibility that relapse may occur **(Shah *et al*., 2005).**

Figure 13: Composite off one tooth only, no relapse yet seen (Dowsing *et al*., 2015).

1.5.2 Removable retainers

The removable type, vacuum formed retainers fig. 14. They were first designed in 1971 by Ponitz (**Ponitz, 1971).** They are invisible retainers made of thermoplastic material like polyethylene polymers and polypropylene polymers **(Raja and Littlewood, 2014).**

The most common design for the vacuum formed retainers is the full coverage including the occlusal surface of the most distal tooth. The vacuum formed retainers

are trimmed past the gingival margin by 1–2 mm on the buccal and 3–4 mm on the lingual side **(Rowland and Hichens, 2007).**

Figure 14: **Upper and lower VFRs (patel and Sandler, 2010).**

Problems caused by these retainers include, occasionally, trauma on insertion, particularly around the gingival margins. It is a very simple matter for the general dental practitioner, or even the patient, to trim the prominent flange back with a pair of sharp scissors then smooth the cut ends with an emery board fig. 15. Retainers can also wear down or fracture, in which case replacement will be necessary. Most orthodontists advise the patients that, at some time in the future, their own dentist may need to take impressions to replace lost or broken retainers, albeit on a private basis **(Dowsing *et al*., 2015).**

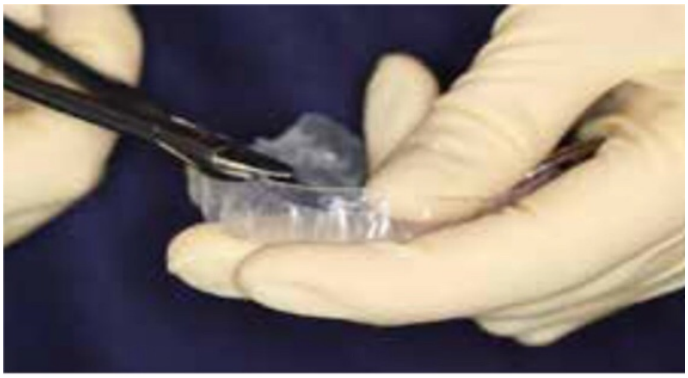

Figure 15: Trimming of a vacuum-formed retainer with sharp scissors or crown shears (Dowsing *et al*., 2015).

1.5.3 Hawley retainers

Hawley retainers fig. 16 are the most common and popular, century-old appliance designed by **Charles Hawley** in the year 1919 **(Proffit, 2006).**

They are made of acrylic baseplate and wire component. The wire components consist of either short or long labial bow to contact the labial surface of incisors fabricated from 0.7 mm stainless steel wire and clasps for retention. Suffer from all the problems of removable appliances and therefore have exactly the same solutions. Additional problems specific to the hawley type of retainer may include distortion of the labial bow, which will need to be carefully readapted to the upper labial segment teeth to minimize the chance of relapse anything more than very minor distortion will need the appliance to be sent back to the laboratory, or to the treating orthodontist for attention **(Singh *et al*., 2007).**

Figure 16: Hawley retainer (patel and Sandler, 2010).

Chapter Two: Discussion and comments

Orthodontic emergencies though not frequent but they do occur. My project states the most common orthodontic emergencies that can occur and how to handle these emergencies by a general dental practitioners **(Shyamala *et al*., 2018).**

One of the first health care professional to encounter an orthodontic emergencies are the general dental practitioners. **Murray *et al* in 2015** stated the importance of handling orthodontic emergencies by general dental practitioners. He stressed that if proper diagnosis and management of orthodontic emergencies are carried out, the discomfort and pain of the patient is reduced leading to appropriate treatment outcomes. **Sodipo *et al* in 2017** stated the importance of general dental practitioners to have sufficient knowledge in giving orthodontic 'first aid' during emergency **(Murray and Sandler, 2015; Sodipo and Birdsall, 2017).**

Emergencies can occur in all fields of dentistry, the knowledge of handling these emergencies should be known to all dental practitioners. It is ideal for an orthodontist to brief about the common problems while undergoing orthodontic treatment to the patient as well as the parent prior to the treatment in verbal as well as written format to ensure a smooth journey of the entire treatment. Care must be taken to ensure the patients that the problems are temporary and with time it will resolve. Unlike medical emergency orthodontic emergency need not require immediate attention in most cases. But in some cases it may cause pain and discomfort to the patients. The general dental practitioners are considered first by patients to seek temporary relief till their appointment with their orthodontist is scheduled. Sufficient knowledge about common orthodontic emergencies and their management among general dentists can benefit the patient as well as orthodontist in delivering stable treatment outcomes without any delay **(Shyamala *et al*., 2018).**

Chapter Three: Conclusion and Suggestions

1. Many dental patients reviewed by GDPs undergo orthodontic treatment whether removable, fixed, functional and retainer that can give rise to various orthodontic problems causing patients to make an unscheduled appointment to their GDPs.
2. These problems can vary in their severity, from mild discomfort to a fractured component, but most can be easily managed by GDPs with advice and reassurance or by simple techniques using instruments and materials commonly found in a dental practice.
3. Usually patients can be stabilized until their orthodontist can review them.
4. Some true emergency cases, such as airway obstruction and inhalation of a foreign body, immediate referral to A&E center may be required.

Sufficient knowledge about common orthodontic emergencies and their management among general dentists can benefit the patient as well as orthodontist in delivering stable treatment outcomes without any delay.

Educate the orthodontic patients about the need to visit the general dentist or orthodontist in case of any harm to the patients due to the orthodontic devices or fracture in any part of applance.

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