Review Article

CLINICAL KNOWLEDGE OF ORTHODONTICS COMPLICATION AND EMERGENCIES AMONG INTERNS AND DENTISTS IN RIYADH CITY

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https://doi.org/10.51847/9H6hhUJo8E

ABSTRACT

Complications with orthodontic dental appliances can potentially be considered a dental emergency. It is described as any unscheduled orthodontic appointment for the treatment of an emergency problem with an orthodontic appliance that may affect aesthetics, eating, or pronunciation. Orthodontic emergencies sometimes happen, and they can be stressful for both the patient and the parents. They range from basic situations that can be handled by a general dentist to more complicated cases that necessitate a referral to a specialist orthodontist An online questionnaire of about 13 questions was distributed among dental interns and general practitioners in Riyadh city. Questions were focused on different types of orthodontic complications and emergencies that could occur during daily dental life practice and the proper way of managing them. Significant difference was seen among genders when inquired about the management of TMJ dysfunction during active orthodontic treatment (p-value: .047). As far as the work experience of participants was concerned, statistically significant differences were observed when inquired about the management of labial laceration caused by orthodontic appliance (p-value: .038). Most common practice on receiving patients with orthodontic emergency was revealed to be specialist referral.

Key words: Orthodontics complications, Emergencies, Dental interns, Saudi dentists.

Introduction

Dental crises and complications are a broad phrase that refers to any urgent problem involving the teeth or supporting tissues that require rapid attention from a trained dentist. Complications with orthodontic dental appliances can potentially be considered a dental emergency. It is described as any unscheduled orthodontic appointment for the treatment of an emergency problem with an orthodontic appliance that may affect aesthetics, eating, or pronunciation.

Orthodontic emergencies sometimes happen, and they can be stressful for both the patient and the parents. They range from basic situations that can be handled by a general dentist to more complicated cases that necessitate a referral to a specialist orthodontist. They can be short term complication as: (Discomfort or pain, Irritation of lips or cheek ulcers, Debonded bracket or fixed appliance, Archwire length problems, Lost ligatures from fixed appliance) or to more complicated problems such as: Broken removable appliance, loosed retainer, Aspirated or Swallowed piece of the appliance, root resorption, periodontal disease, decalcification, and temporomandibular dysfunction (TMD) [1].

These issues can emerge depending on the orthodontic process used, medical understanding in this sector, the patient's overall dental health, and oral hygiene practices [2].

Literature review

Dental emergencies do not always involve pain; it describes any accidental issue that can occur to the patient without previous appointment. The goal of the treatment is to provide the best possible care to all patients with all sorts of emergencies in order to provide rapid pain and distress relief. As a result, treatment will continue to progress on the proper path. This will make dental care more efficient and effective [3].

Mainly all dental emergencies including orthodontic appliances emergencies will be handled with general practitioner dentist through emergency dental clinics. They should be trained to be clinically qualified in managing orthodontic emergencies. Students' knowledge and confidence in handling orthodontic crises are insufficient, as was published in the literature [4].

The Association for Dental Education in Europe (ADEE), for example, states that dental graduates should be prepared

to handle all types of orthodontic crises, including referrals when necessary. Orthodontic emergencies can occur in many different ways, some require an immediate treatment that includes:

Extended arch wire
It is an extra elongated wire usually located distal to the last bracket that may cause laceration of the mucosa. It has to be managed by cutting the extended part by using distal end cutter pliers. Alternatively, the wire can be bent into a non-traumatic configuration, however bending flexible arch wires, such as those composed of nickel-titanium, can be problematic. Bending should also be avoided if wire protrudes via bondable tubes rather than bands, as wire manipulation frequently causes the tubes to become dislodged.

Debonded, loose bracket
Brackets are the parts of orthodontic fixed appliance that are attached to the center of each tooth, to generate forces that help to move teeth to the correct direction. If the patient eats hard or crunchy foods during therapy, the brackets may fall off. Accordingly, it can be managed by replacing the bracket in its ideal position; it may need to drop a wire size to fully engage the bracket.

Discomfort and pain
Discomfort or pain for couple of days can happen after bonding or in activation visit of orthodontic fixed appliances. Reassure the patient that it's regular and interim, and advise them to eat delicate foods and rinse their mouth with warm saltwater. Prescribe pain killers such as Aspirin, Acetaminophen or Ibuprofen, if the patient does not have any allergies to medication.

Irritation of cheeks and lips
New brackets might irritate the mouth, especially the labial mucosa, at times. A small bit of released wax works well as a barrier between the metal and the remainder of the mouth.

Inhaled or ingested piece of appliances
This condition is rare, but when it happens:

- The fragment could have been aspirated if the patient was coughing hard or had trouble breathing. If the fragment is visible, remove it; if it isn't, refer the patient to a chest x-ray.
- If the component is swallowed then re-assure the patient that the piece probably pass through the digestive system.

Detached fixed retainer
Retainers are passive orthodontics appliances that help in maintain and stabilizing the position of teeth after orthodontic treatment.

1. If fixed retainer detachment occurs:
   - If retainer is not distorted and teeth are well aligned: isolate, re-bond with composite restoration in the correct position.
   - If retainer distorted and teeth well aligned, Apply new retainer.
   - If teeth have relapsed, refer to orthodontist for follow up or re treat.
2. If patient lost their removable retainer a new impression should be taken to fabricate a new one [5].

When dental complications' related signs and symptoms occur during orthodontic phase, that treatment can be delayed to a regular dental appointment, these complications includes:

White spot lesions (WSL)
Plaque retention sites promote enamel demineralization, resulting in white spot lesions. Plaque and acidogenic bacteria form around the fixed appliance in the absence of adequate oral hygiene. It is a step of the carious process that occurs around fixed orthodontic appliances. It can be reduced with the right approach to prevention, management, and treatment. White spot lesions most usually affect the maxillary anterior teeth, followed by the lateral incisors, canines, premolars, and central incisors [6].

Furthermore, the distribution of WSLs has been characterized in different ways in the literature. According to Gorelick *et al*., the maxillary lateral incisor was the most usually afflicted tooth [7]. Mizrahi, on the other hand, found that the most usually afflicted teeth were the maxillary and mandibular first molars [8]. In another study, Øgaard concurred with Mizrahi's conclusions in another investigation [9].

For the visual inspection, the following scale was used

- **Score 0** =No visible white spots or surface disruption (no demineralization).
- **Score 1** =Visible white spot without surface disruption (mild demineralization).
- **Score 2** =Visible white spot lesion having a roughened surface but not requiring a restoration (moderate demineralization).
- **Score 3** =Visible white spot lesion requiring restoration (severe demineralization).

Clinical trials revealed a rapid increase in the number of WSLs during the first six months of treatment, followed by a slower growth over the next 12 months [10, 11].

The use of fluoride agents (fluoridated toothpaste, fluoride-containing mouth rinse, gel, varnish, bonding materials, elastic ligature), casein phosphopeptide-amorphous calcium phosphate—nano complexes (CPP-ACP), antiseptics, LASER, tooth whitening, resin infiltration, micro-abrasion

are all recommended for the treatment of white spot lesions [12].

It has been documented that the patients are the one who are responsible for the occurrence and thus prevention of WSL rather than their parents or dentist or orthodontist.

Gingival hyperplasia

Malocclusion has been found to impair periodontal health, and one of the goals of orthodontic treatment is to promote improved dental health and extend the life of the dentition by correcting the occlusion, according to Shiva Kumar *et al*. Thus, periodontics orthodontic interrelationship is a still controversial issue until today.

The use of any orthodontic appliance has been linked to changes in oral hygiene and periodontal health. Chronic infection, inflammatory hyperplasia, irreversible loss of attachment (permanent bone loss), and gingival recession have all been observed clinically. Signs and symptoms that may occur in gingiva during orthodontic treatment: Red irritated swollen gums, slight bleeding after brushing and flossing, tenderness in gums and bad breath.

Gingival changes caused by orthodontic treatment considered to be transient depending on patient's oral hygiene unlike Gingival Hyperplasia that is caused by periodontal diseases resulting in permanent damage to the periodontal tissues. Thus Gingival Hyperplasia will resolve by itself or will respond to plaque removal by scaling, prophylaxis, and/or curettage. The gingival tissue enlargement interferes with tooth movement during Orthodontic treatment; however, it must be surgically removed preferably after the removal of the orthodontic treatment.

The first line of treatment in the management of gingival enlargement is by instructing the patient for proper brushing using orthodontic Interdental brush and flossing thoroughly and regularly, along with the use of mouthwash during the treatment.

Second line of the treatment is nonsurgical periodontal treatment (scaling, root planning, and /or curettage). Laser Gingivectomy recommended as the third line of treatment when hyperplasia is extensive after orthodontic treatment [13].

Root resorption

It is a physiological or pathological process occurring as a result of loss seen in the tooth or surrounding periapical tissues. Root resorption in the deciduous dentition is a normal physiologic process, however, resorption in permanent teeth is a problem that must be addressed.

The stages of analysis differ in different people and between different teeth in one person. They can be classified into:

- **0 degrees:** no root resorption is visible.
- **Grade 1:** Mild resorption, slow rooted, and diffuse.
- **Grade 2:** Moderate resorption, root apex disappears; the apex of the root is more like a semicircle. The contour is sometimes not discontinuous or smooth; the amount of root resorption is about a quarter of the root.
- **Grade 3:** Severe resorption, shows the end of the root is too tight; the contour of the root vertex is most likely discontinuous; root resorption is more than a quarter of the root [14].

One of the consequences of orthodontic treatment problems is apical root resorption. The majority of resorption is clinically minor, but severe root resorption can jeopardize the teeth's lifetime. Multiple factors influence root resorption during orthodontic therapy, according to studies on root resorption and its link with orthodontic treatment [15].

Regardless of the main factors that could accelerate root resorption (Age, gender, nutrition, genetics), There are another factors that may increase the occurrence of resorption during orthodontic treatment such as: the type of appliance utilized, the amount of force used during treatment, whether the case was extracted or not, the length of therapy, and the distance between teeth moved [16].

The incidence of root resorption is more common in extraction cases that have been compared to non-extraction cases; this could be correlated with the treatment duration in orthodontic treatment. Root resorption was found to increase with the presence of predisposing factor such as; multiple treatment, thin root, dilacerated root that are more prevalent in maxillary anterior teeth [17].

Management of root resorption during orthodontic should be discontinued as the root resorption is noticed especially if the resorption is severe and discovered during treatment, but if slight resorption occurs the orthodontic treatment technique must be changed.

Temporomandibular joint dysfunction (TMD)

TMJ disorders are a collection of conditions characterized by pain, clicking, or grating in the jaw joint, as well as difficulty, chewing or opening the jaw [18].

Because of occlusal interferences, class II or III malocclusion, anterior open bite, excessive overjet or posterior cross bite, consequences of the use of intermaxillary elastics, extra oral forces, or functional appliances, it was proven that the relationship between TMD and orthodontic treatment is a controversial issue in which some authors found that there is a strong correlation between them [19].

Other research has found no link between orthodontics and TMD. Others, on the other hand, claimed that establishing a perfect occlusion through orthodontic treatment and/or occlusal modifications could reduce TMD symptoms [20].

The aims of the study is
To determine and asses the clinical knowledge of dental interns and general practitioners towards diagnosis and management of different orthodontic complications and emergencies in daily life dental practice.

Materials and Methods

An online questionnaire of about 13 questions was distributed among dental interns and general practitioners in Riyadh city. Questions were focused on different types of orthodontic complications and emergencies that could occur during daily dental life practice and the proper way of managing them.

Results were collected and analyzed statistically using the software SPSS version 19.

Results and Discussion

Findings were obtained from SPSS, which revealed that the total number of surveys filled were N=160. This sample included 55% females and 45% males **(Figure 1)**, 51% were general practitioners and 59% were dental interns **(Figure 2)**, 81% had 1-5 years of work experience, 11% and 8% had 6-10 and 10+ years of experience respectively **(Figure 3)**. Work sectors were also determined, which reported that 44% worked in government setups, 22% in private and 34% in academic institutes **(Figure 4)**.

Overall responses were presented in **Table 1**, which were also compared on the basis of gender, work designations, work experience and working sectors. In general, there was no statistically significant difference seen among the variables. However, significant difference was seen among genders when inquired about the management of TMJ dysfunction during active orthodontic treatment (p-value: .047). Another significant comparison was made on the basis of work designations when subjects were asked about orthodontic appliances causing TMJ problems (p-value: .001).

As far as the work experience of participants was concerned, statistically significant differences were observed when inquired about the management of labial laceration caused by orthodontic appliance (p-value: .038) and surgical treatment of severe gingival hyperplasia (p-value: .039). Finally, working sectors also revealed a few significant comparisons when asked about the patients presenting to ER clinics with debonded brackets (p-value: .014) and lost removable retainers (p-value: .021).

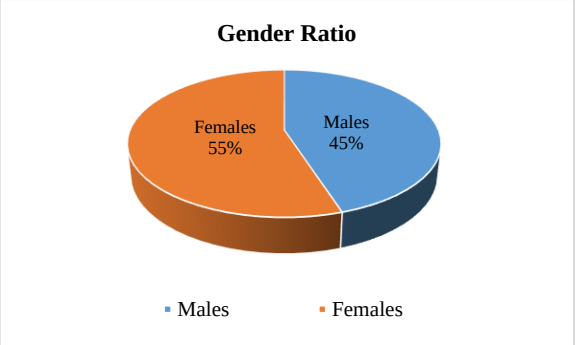

Figure 1. Gender ratio of study participants

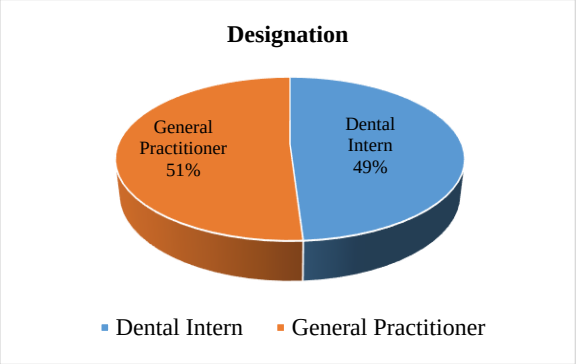

Figure 2. Working designation of the study participants

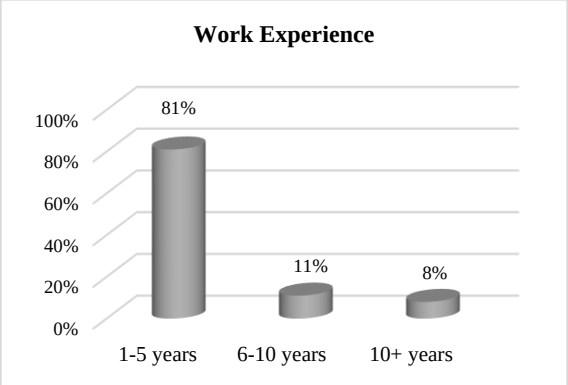

Figure 3. Work experience of the study participants

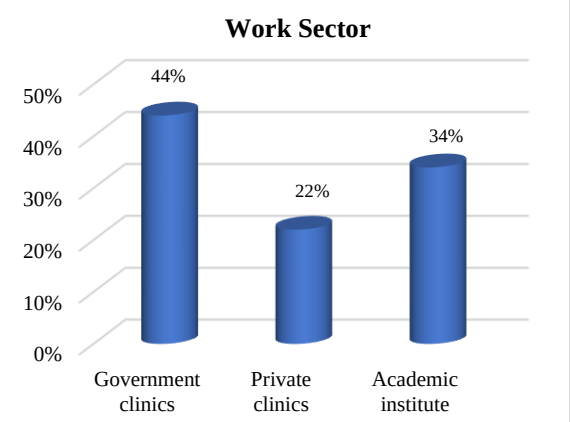

Figure 4. Work sectors of the study participants

Table 1. Description of survey responses with their relationship among gender, work designation, work experience and working sector (** means statistically significant)

Survey Items	Responses	Relationship with Gender (P-value)	Relationship with Work Designation (P-value)	Relationship with Work Experience (P-value)	Relationship with Work Sector (P-value)
Have you dealt with any orthodontic emergencies?	Yes: 49% No: 51%	.201	.132	.296	.703
Did you learn how to manage orthodontic emergencies and complications in your clinic during undergraduate education?	Yes: 28% No: 63% Not interested: 9%	.754	.993	.778	.654
How to manage extended arch wire that causes laceration in the patient cheek?	Option 1: 30% Option 2: 55% Option 3: 15%	.254	.697	.428	.518
If patient presents to ER clinic with debonded bracket, what is the proper management?	Refer to his/her orthodontist: 63% Rebond the bracket: 20% Reassure the patient, no treatment: 17%	.911	.495	.994	.014**
How to manage labial laceration caused by orthodontic appliance?	Dental wax: 77% Reassure the patient, no treatment: 11% NSAI medication: 12%	.101	.214	.038**	.642
Patient presented with lost removable retainer and his follow up appointment with his orthodontist after three months, the proper management in this case is?	Reassure patient until next appointment: 14% Construct new retainer: 56% Refer to another orthodontist: 29%	.748	.507	.805	.021**
During orthodontic treatment, what is the first line of defense against white spot lesions?	Composite restoration: 10% Fluoride application: 83% Discontinue orthodontic treatment: 7%	.937	.761	.904	.247
Is a visible white spot lesion with a rough surface considered on the visual examination scale?	Score 1 (mild): 37% Score 2 (moderate): 55% Score 3 (severe): 8%	.720	.237	.716	.057
Main cause of this case?(Gingival Hyperplasia)	Poor oral hygiene during Ortho Tx: 98% Defective restoration: 1% Diabetic patient: 1%	.158	.200	.952	.293
Severe gingival hyperplasia occurs during orthodontic treatment could be treated surgically?	During Ortho Tx: 30% No surgery required: 29% After Ortho Tx: 41%	.436	.535	.039**	.373
During active orthodontic treatment, which teeth are most usually damaged by root resorption?	Maxillary teeth: 35% Mandibular teeth: 29% Both: 36%	.136	.238	.729	.237
In your opinion, do orthodontic appliances cause TMJ problems?	Yes: 50% No: 38% I don't know: 12%	.062	.001**	.156	.216
TMJ dysfunction during active orthodontic treatment can be managed by?	Patient education by self-care: 85% Arthroscopy surgery: 15%	.047**	.217	.301	.637

The goal of this study was to find out how well dental practitioners knew how to deal with orthodontic difficulties. It was interesting to know that the more than half of the study participants did not have any experience of dealing with above mentioned emergencies. Moreover, no significant association with other variables was observed.

Orthodontic emergencies have been an important part of a hospital's emergency management routine. However, the frequency of these cases remains on the lower side [21]. Similar findings were observed as a result of an investigation conducted in order to measure the percentage of orthodontic related emergencies. These cases have led to an increased awareness among the dental professionals in order to treat such patients during their undergraduate training [22]. However, a large majority of our study participants reported that they did not receive any training on how to manage orthodontic emergencies.

It can be noted from the findings that only 20% of the study participants were willing to manage debonded bracket if they received such cases. It is interesting to know this as immediate management of broken appliance is crucial in maintaining the orthodontic treatment's integrity. Furthermore, relieving patients' discomfort is also an important component of successful orthodontic treatment [23].

It is evident from our findings that majority of the study participants were in the favor of referring the patient to their orthodontist. However, this practice should be discouraged as general practitioners are expected to provide sufficient orthodontic emergency management to these patients in order to provide them with satisfaction. Additionally, these dental professionals should be trained during their clinical practice so that they can manage such emergency patients [24].

There is scope for expansion of data in this study if we can incorporate more participants in order to strengthen the findings.

Conclusion

- No overall significant comparisons were found when compared the responses with gender, work designation, work experience and sector of profession.
- Most common practice on receiving patients with orthodontic emergency was revealed to be specialist referral.
- There is a strong need to include the orthodontic management course during the clinical training of students.

Acknowledgments: We would like to extend our appreciation towards the research center of Riyadh Elm University.

Conflict of interest: None

Financial support: None

Ethics statement: Data from the participants will be kept confidential.

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