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Retrospective Study of Retention Detachments after Orthodontic Treatment at the CHU-CNOS of Bamako: About 26 Cases

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Abstract **Original Research Article**

Introduction: The objective of this study is to evaluate the factors favoring the detachment of bonded retainers after multi-band orthodontic treatment, ***Method:*** This was a descriptive retrospective study of 26 cases of retention detachments recorded in the dentofacial orthopedics department of the CHU-CNOS in Bamako over a period of 1 year from January 2, 2020 to December 31. 2020. The retainers were all bonded using the direct method using two types of composite. Two types of wires were used in patients. The data collection was made from the files of the patients followed in the service. ***Results:*** We counted 19 maxillary and 7 mandibular retainers. 19 retainers (73.1%) were bonded with fluid composite retainer and 7 retainers (26.9%) were bonded with normal restorative composite. The type of yarn used is solid yarn in 15 restraints and braided yarn was used in 11 restraints. There is less disbondment with the flowable bonding composite than with the dental restorative composition. ***Conclusion:*** The type of suture and the type of composite used seem to have an impact on the durability of the bonded retainer, without significant results.

Keywords: Bonded retainer – Orthodontics – Detachment – Retention wire – CHU-CNOS.

INTRODUCTION

Orthodontic retainers are used to maintain the dental alignment obtained after orthodontic treatment [1-6]. This is the set of "passive" orthodontic devices that facilitate the stabilization and maintenance of the position of the teeth over a period long enough to allow the reorganization of the supporting tissues after the active phase of dental movement [7]. They are put in place the day the patient is unbanded – in order to avoid dental movements that can occur only two hours after removal of the device [1]. They are necessary because post-orthodontic treatment movements are not predictable, even if certain factors have been identified in their occurrence. These factors include soft tissues, the periodontal ligament, physiological growth and aging, occlusal and neuromuscular factors [2].

Splinting is an integral part of orthodontic treatment [3]. Indeed, the Lyotard 4 study in 2010 showed the need to set up a retainer in order to maintain dental alignment and maintain functional occlusion.

Two types of retainers have been described in the literature: bonded retainers and removable retainers. It is quite common to see the association of the two types in some practitioners. The type of contention depends on the initial malocclusion [1, 3, 5, 7, 8, 9].

Lai's study [6] on the types of restraints used by orthodontists in Switzerland showed that 47.8% of the latter use a combination of the 2 types of restraints in the event of extraction and 34.6% when necessary. Close the anterior diastemas [5].

In the USA, Pratt demonstrated the importance of using removable retainers such as the Hawley plate and splints in the maxilla and bonded retainers in the mandible [10].

Bonded retainers are now preferred to removable retainers because they offer many advantages: they are aesthetic, comfortable, do not cause soft tissue irritation and phonation is not disturbed [11].

Bonded retainers consist of braided or solid metal wires bonded to the enamel with an orthodontic composite resin. Polyethylene fibers and glass fibers reinforced with composite resin covered with orthodontic composite are also used [3, 4]. These fiber retainers are highly appreciated for their comfort and aesthetics. They are biocompatible and have good tensile strength [1].

The bonding protocol varies according to the number of teeth bonded (all six anterior teeth or only the canines), the bonding material (the composite restorative resin or the fluid orthodontic bonding composite), the type of wire (solid or multi-strand) and the wire size [1]. The bonding of the retention threads can be done by the direct method in one session, or by the indirect method requiring a laboratory step [1, 3].

Glued retainers can, however, peel off or break. These splinting failures may be secondary to fracture of the splinting wire, detachment between the splinting wire and the bonding composite, or detachment between the bonding composite and the enamel surface [5, 12].

The detachment remains a clinical complication and remains a reality for the orthodontist who must manage the consequences. Several studies have shown that in the failures of the retainers there were more detachments of the retainer than breakage of the retainer [1, 9, 12].

The objective of this study is to evaluate the risk factors for detachment of retainers in 26 patients at the CHU-CNOS in Bamako.

METHODOLOGY

- **Setting and type of study**

This was a descriptive, retrospective study carried out from January 2, 2020 to December 31, 2020 in the dentofacial orthopedics department of the National Center for Odontostomatology, Bamako University Hospital Center.

It concerned the clinical records of 26 patients who came for consultation following a detachment of a bonded retainer at the end of an active orthodontic treatment.

All retainers were bonded by the direct method by the same practitioner.

Two types of composite were used

- Flowtain composite light-curing
- 3M Dental Restorative Composite

Two types of retention wire were used

- An 8 strand braided flat steel wire with a diameter of .011 x .027 in
- A single strand titanium wire with a diameter of .011x.027 in

- **Selection criteria**

Were included all the files of the patients received for a detachment of retention posed in direct method at the end of an active treatment of orthodontics in the CHU-CNOS.

- **Sample size**

The study collected 26 records of patients with compression detachment.

- **Data collection and processing**

Collection tools are patient medical records

The variables studied are

- Socio-demographic: age, sex
- Variables related to the retainer: the location of the retainer, the number of bonded teeth, the type of wire, the type of composite, the type of detachment, the loosened tooth, etc.

Data processing was performed with SPSS 18.0.0 software.

Table-I: Criteria for evaluating variables related to restraint

Variables studied	Evaluation criteria
Location of contention	According to the maxillary or mandibular arch
Type of restraint	23 to 13 / 33 to 43: The 6 maxillary or mandibular anterior teeth 22 to 12: The 4 maxillary anterior teeth
composite type	Flow: fluid orthodontic composite Normal: dental restorative composite
Type of contention wire	Solid: flat solid titanium wire .011x.027 Stressed: .011x.027 multi-strand steel wire
Loose tooth	Intermediate tooth: tooth in the middle of contention Terminal tooth: tooth at the end of the retainer all teeth
Restraint age	Less than 1 year: less than 1 year 1: 1 year to 1 year 11 months 2: 2 years to 2 years 11 months

Variables studied	Evaluation criteria
	3: 3 years to 3 years to 11 months 4: 4 years and over
Consultation period	1 week after removal of the retainer 2 weeks after detachment 3 weeks after detachment 4 weeks: 4 weeks or more
Tooth displacement	Presence or not of displacement of loose teeth

RESULTS

A total of 26 records of patients aged 13 to 43 were retained. There were 11 female patients (42.3%) and 15 males (57.7%).

Of the 26 loosened retainers, 19 were bonded to the maxilla and 7 to the mandible. According to the type of retainer, 21 retainers (80.8%) were bonded from the canine to the canine, 4 (15.4%) were bonded to the four maxillary incisors and 1 (3.8%) retainer was extended to the premolars.

Depending on the composite used, 19 retainers (73.1%) were bonded with fluid retainer composite and 7 retainers (26.9%) were bonded with normal restorative composite.

According to the detached tooth, 12 teeth were terminal, 7 teeth were intermediate and the detachment was total in 7 cases.

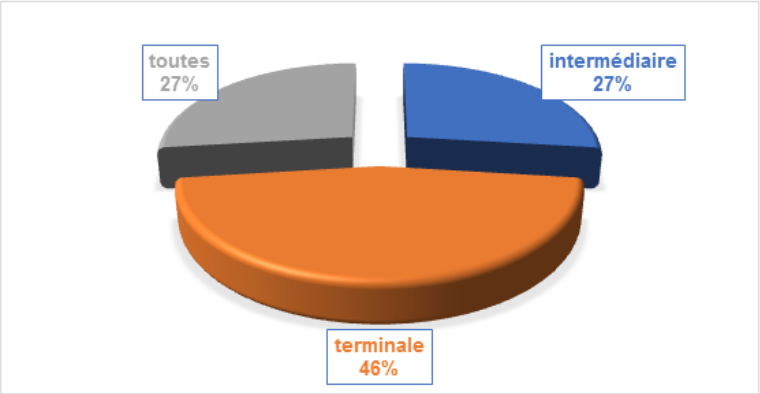

Fig-I: Breakdown of the workforce according to the loosened tooth

According to the age of the retainer 4 (15.4%) retainers were less than a year old, 6 (23.1%) were between 12 and 23 months old, 5 (19.2%) were between 24 and 35 months old and 11 (42.6%) were over 3 years old.

The type of yarn used is solid yarn in 15 restraints and braided yarn was used in 11 restraints.

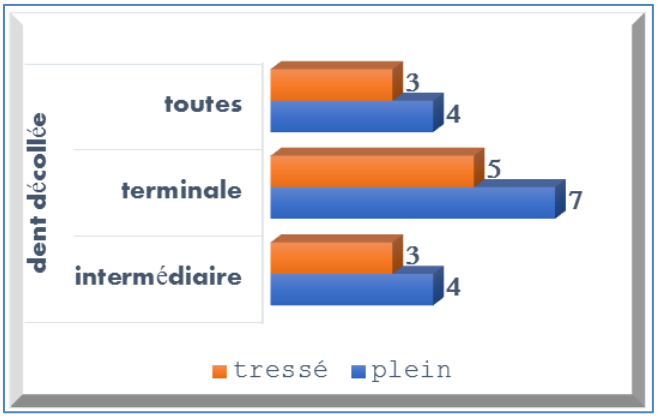

Fig-II: Distribution of loosened teeth according to the type of wire used

Tooth displacement was observed in 9 patients, ie 34.6 of the total.

Table-II: Distribution of the workforce according to tooth movement

Tooth displacement		
Shift	Workforce	Percentage
Nope	17	65.4
Yes	9	34.6
Total	26	100.0

According to the consultation period, 15 patients came for consultation in the first week following the detachment of the retainer, 2 came in the second week, 2 in the third week and 7 presented after 4 weeks.

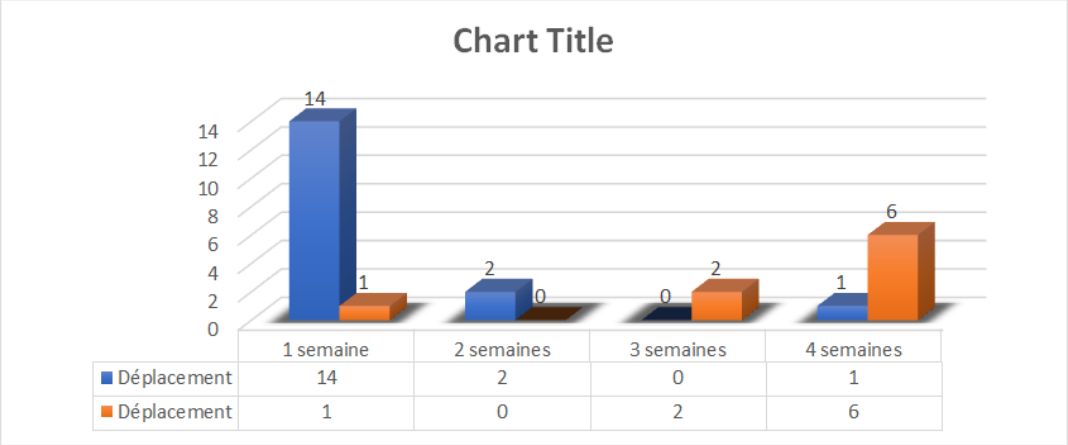

Fig-III: Distribution of tooth displacement according to consultation time

DISCUSSION

We conducted a cross-sectional study on retention detachments after multi-band treatment at the CHU-CNOS in Bamako over a period of 1 year. It appears from this study that the location of the retainer (maxillary or mandibular), the type of wire (solid or braided), the type of composite (normal or fluid) and the age of the retainer play a role in the success of the retainer.

In the present study there are more detachments at the level of the maxilla than at the level of the mandible without significant difference.

Bolla's study [12] found 22.22% detachment in the maxilla for 15.62% detachment in the mandible with retainers made with twisted steel wire. Jedlinski [9] in the conclusions of his study on the causes of bonded retention failures showed that there is more retention failure in the maxilla than in the mandible.

This general trend of maxillary detachment of bonded retainers could be explained by the occlusal relationships that expose the maxillary retainers to occlusal contacts of the mandibular incisors.

According to the type of composite: We observed more debonding with normal viscosity restorative composites than with flowable composites, without significant results.

This result is confirmed by the studies of Jedlinski [9] and Nagani [11]. Indeed, the two authors found that detachment was more frequent with retainers bonded with conventional restorative composites than with retainers made with flowable composite.

The low viscosity of the fluid composite would allow better diffusion on the enamel surface and better retention and adhesion to the retention thread.

According to the type of yarn: In the present study, there is more detachment with the solid yarn than with the braided multi-strand yarn without significant difference. In fact, 15 of the 26 retainers were made with single-strand thread. Braided stranded yarn seems to have better stability than solid strand yarn. Indeed Gunay [13] found 13.2% detachment with the braided yarn and 18.9% with the non-braided yarn. Nagani [11] found superior retention with braided yarn compared to fiber-reinforced composite yarn. Rose [14] found a similar result in her comparative study of 20 patients.

The possible causes of detachments could be contamination of the enamel surface during bonding, faulty or insufficient etching of the surface to be bonded, lack of drying or even the wrong bonding procedure [15, 16].

Age of the retainer: In our series, 61.53% of detachments occur 24 months after the placement of the retainer. This result is superior to that of Jedlinski [9] who found that 7.3 to 50% of splinting or splinting

fracture occurs during the first 3 to 6 months of splinting. Dahl and Zachrisson cited by Bolla [12] found that 60-95% of detachments occur in the first year of retention.

Kenneth [17] on a sample of 200 retainer failures found 21.5% retainer breakage between 1 and 19 months. This disparity between the different results can be explained by the bonding method on the one hand and the types of wire and composite used.

Of the 9 dental displacements observed, 6 appeared more than 4 weeks after the detachment of the retainer. The consultation time seems to have an impact on the appearance of the recurrence [1]. Dental stability after multiband treatment would be compromised over time even with the presence of retainer [13].

CONCLUSION

Retention after the active phase of orthodontic treatment is a necessary step to preserve the results achieved. The bonded retainer is now popular to prevent recidivism. The durability and stability of this contention depends on several factors including the site of the contention, the type of wire used, the type of composite, the protocol for setting up the contention. Our study showed a slight detachment of retainers located in the mandible, made with braided wire bonded with fluid composite for orthodontic use. These results encourage us to make a prospective comparison to better study the various factors incriminated in the present study.

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