



Interproximal Enamel Reduction: A Cross Sectional Study of Moroccan Orthodontists

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Abstract

The aim of our study is to provide an overview of the methods, knowledge and frequency of interproximal enamel reduction of Moroccan orthodontists. We conducted a descriptive cross-sectional study among a sample of 118 orthodontists, using descriptive questionnaire survey of dentists practicing orthodontics in Morocco. 96% of orthodontists asked reported being familiar with stripping, with a predominance of doctors with a university degree in orthodontics. The clinical criteria on which practitioners based their decision to perform stripping were the need for space, enamel thickness, oral hygiene assessment, tooth position and the presence of proximal caries. As for the main indications for stripping: 87% of practitioners used this method to close black triangles, 85% used it to create space, 73% used it to correct a DDD, and 72% used it to resolve overlap problems. 35% used it to improve occlusion and 34% used it to treat dental rotations. Stripping burs are the most commonly used instrument for stripping, with 82% of dentists using them, followed by discs (79%). In our sample, Moroccan orthodontists have good knowledge of the methods, indications, and limitations of stripping. However, it is also evident that they do not systematically follow the guidelines established by the international community regarding the equipment and operating techniques associated with IPR. This highlights a potential gap between local practices and international standards, suggesting the need for ongoing updating and harmonization of clinical protocols with international recommendations.

Subject Areas

Dentistry

Keywords

Orthodontics, Interproximal Enamel Reduction, Knowledge, Techniques

1. Introduction

The major objective of orthodontics is to improve both aesthetics and oral functionality, in order to move teeth into a more optimal position. This involves a careful assessment of various aspects of the patient's face, such as profile and smile, in addition to case-specific aesthetic considerations [1]. Modern orthodontics is based on a wide range of techniques, some more recent than others, all with the common aim of establishing or restoring a stable, functional and aesthetically pleasing occlusion.

To achieve harmony between the dental arches, correct alignment of contact points and optimal occlusion, the orthodontist is faced with lack of space. Three options are available: transverse or sagittal expansion of the arches, tooth extractions [2] or the interproximal reduction of the enamel. These techniques can be combined or used individually.

The choice can only be made following a detailed clinical, radiographic and cephalometric analysis, including a calculation of the patient's space assessment.

From this analytical approach, two therapeutic options can be considered: to extract or not to extract. The conservative choice remains reversible, unlike extractions, which are irreversible [3].

As a therapeutic option, proximal enamel reduction or stripping can become an alternative to dental extractions, provided that the dento-maxillary disharmony (DMD) is less than 8mm, the morphology of the teeth lends itself to it (triangular crowns are the most favorable), and oral hygiene is in order.

Interproximal enamel reduction or stripping (IPR) is defined as the reduction of proximal tooth enamel thickness to correct minor crowding [2].

In 1944, Ballard *et al.* [4] recommended reduction of the proximal surfaces of the mandibular anterior segment to correct a lack of harmony in tooth size. A few years later, Hudson *et al.* [5] described in detail a stripping technique using metal bands, followed by preventive measures of polishing and fluoride. Peck and Peck *et al.* [6] observed that well-aligned mandibular incisors had significantly lower mesio-distal and vestibulo-lingual indices than upper incisors, and recommended proximal grinding to correct dento-dental disharmony.

Orthodontics has evolved considerably in recent years. And to best meet our patients' needs, dentists have become enthusiastic about university or continuing orthodontic training courses that include the data needed to perform orthodontic stripping.

The aim of this work is to provide an overview of the methods and frequency of stripping among Moroccan orthodontists.

2. Materiel and Methods

This is a cross-sectional study, using descriptive questionnaire survey of dentists practicing orthodontics in Morocco. This survey was carried out over a period of eleven weeks.

The study population consisted of a randomly selected group of Moroccan

orthodontists.

2.1. Sample Description

Of the 118 dentists contacted, only 100 correctly completed the questionnaire.

2.1.1. Inclusion Criteria

- Dentists' specialists in orthodontics after residency;
- Dentists' specialists in orthodontics after obtaining a Moroccan or foreign university degree;
- Dentists practicing orthodontics following private training in Morocco or abroad;
- Practitioners in both the private and public sectors.

2.1.2. Exclusion Criteria

- Orthodontists practicing outside Morocco;
- Dentists not practicing orthodontics;
- Dentists who refused to take part in the survey.

2.2. Data Processing

2.2.1. Survey Support

We began with an introduction to present and explain the aim of the study.

We made it clear that all responses would remain confidential, thus guaranteeing the anonymity of the participants. In fact, we did not ask for any information on the identity of the respondents.

The questionnaire is made up of 22 multichotomies closed questions, with single and multiple-choice answers.

The questionnaire was divided into four parts:

- 1) General information about participants;
- 2) Knowledge and practice of stripping;
- 3) Attitudes and opinions about stripping;
- 4) Personal experiences of stripping.

2.2.2. Data Entry and Statistical Analysis

Data was entered into an Excel spreadsheet and analyzed using Jamovi V1.6.15 software.

The first step was to describe the study population, summarizing quantitative variables as means with standard deviations, and qualitative variables as percentages.

Secondly, a univariate analysis was carried out to explore a possible association between doctors' knowledge and practices according to their characteristics, while stratifying according to the gender variable.

The tests used were mainly the Chi² test. In the event of non-compliance with the conditions of application, Fisher's exact test was used.

A significance level of less than 0.05 was used to conclude that the difference was statistically significant.

3. Results

As part of our survey, 118 questionnaires were submitted to dentists practicing orthodontics in Morocco. However, 18 questionnaires were excluded due to non-return or incomplete responses. Thus, our study was based on information collected from 100 participants, equivalent to a response rate of 84.75%.

1) Sample characteristics:

- Participation in our survey showed a gender split among practitioners, with 67 women and 33 men (**Table 1**).

- 39% of the dentists in our sample practiced orthodontics following a university degree in orthodontics, while 35% had national specialty diploma.

- The sample is characterized by the predominance of experienced orthodontists, 65% of them having more than 5 years' experience to their credit.

- As for the orthodontic techniques used, all the dentists in our sample used vestibular orthodontics, 54% used aligners, while only 9% opted for the lingual technique.

2) Individual stripping experience:

- 32% of the dentists in the sample surveyed said they only informed their patients of the possibility of stripping occasionally, 25% informed them most of the time, and 23% said they always informed their patients of the possibility of stripping (**Table 1**).

- 91% of participants said they were open to integrating new alternative techniques (**Table 1**).

- 95% of dentists thought that stripping should be discussed further (**Table 1**).

Table 1. Individual stripping experience.

	Count	Percentage
Frequency of information about the possibility of stripping		
Always	24	24.0
Most of the time	25	25.0
Occasionally	32	32.0
Rarely	12	12.0
Never	7	7.0
Use of new alternative techniques		
Yes	91	91.0
No	9	9.0
Stripping should be further discussed		
Yes	95	95.0
No	5	5.0

3) Correlation between gender, years of practice and type of degree with stripping practices:

The study showed that orthodontists with a university degree were the most familiar.

Statistical comparison according to gender, years of practice and type of degree showed no significant difference.

Our study revealed that female specialists who had been practicing for more than 10 years were the most prone to use stripping frequently.

However, no statistically significant difference was observed in this comparison (**Table 2**).

Table 2. Statistical comparison of stripping frequency by years of practice and type of diploma, stratified by gender.

		Frequently Count (%)	Sometimes Count (%)	Rarely Count (%)	p-value
Years of practice					0.251
	<10	8 (20.0)	25 (62.5)	7 (17.5)	
	≥10	10 (38.5)	12 (46.2)	4 (15.4)	
Female	Type of diploma				0.328
	Specialists	10 (43.5)	10 (43.5)	3 (13.0)	
	Private training courses	4 (18.2)	14 (63.6)	4 (18.2)	
	University diploma	4 (18.2)	14 (63.6)	4 (18.2)	
Years of practice					0.445
	<10	4 (33.3)	8 (66.7)	0 (0.0)	
	≥10	8 (38.1)	10 (47.6)	3 (14.3)	
Male	Type of diploma				0.876
	Specialists	4 (33.3)	6 (50.0)	2 (16.7)	
	Private training courses	2 (50.0)	2 (50.0)	0 (0.0)	
	University diploma	6 (35.3)	10 (58.8)	1 (5.9)	

Our survey on the criteria used by participants to perform orthodontic stripping revealed the following results:

- Female, specialist dentists with more than ten years' practice reported assessing the amount of space required before stripping (**Table 3**).

- Enamel thickness was the criteria most taken into account by specialist orthodontists and those practicing for less than 10 years (**Table 3**).

- The presence of proximal caries was rated higher by female orthodontists with more than ten years' practice and by male orthodontists with a university degree (**Table 3**).

- The position of teeth on the arch was more of a clinical decision criterion for female specialists with less than 10 years' practice (**Table 3**).

No statistically significant difference was observed between the years of practice or type of degree for either sex of dentist, with the exception of oral hygiene, which was rated higher by female specialists than by those with training or university degrees (96% versus 59% for the others, $p = 0.004$) (Table 3).

No significant association between the criteria evaluated and years of practice or type of diploma was noted in men (Table 3).

- Female dental specialists with less than 10 years' practice considered oral hygiene as a clinical decision criterion (Table 3).

Table 3. Clinical decision criteria for the use of stripping according to years of practice and type of diploma in males and females.

		Years of practice			Type of diploma			
		<10 Count (%)	≥10 Count (%)	p-value	University diploma Count (%)	Private course training Count (%)	Specialist Count (%)	p-value
Necessary space								
Male	Yes	10 (83.0)	20 (95.0)	0.538	17 (100)	4 (100)	9 (75.0)	0.073
	No	2 (17.0)	1 (5.0)		0 (0.0)	0 (0.0)	3 (25.0)	
Female	Yes	37 (93.0)	26 (100)	0.3	20 (95.0)	20 (91.0)	23 (100)	0.4
	No	3 (8.0)	0 (0.0)		1 (5.0)	2 (9.0)	0 (0.0)	
Email thickness								
Male	Yes	10 (83.0)	13 (62.0)	0.259	10 (59.0)	3 (75.0)	10 (83.0)	0.438
	No	2 (17.0)	8 (38.0)		7 (41.0)	1 (25.0)	2 (17.0)	
Female	Yes	34 (83.3)	20 (77.0)	0.546	19 (86.0)	16 (73.0)	19 (83.0)	0.549
	No	7 (17.0)	6 (23.0)		3 (14.0)	6 (27.0)	4 (17.0)	
Presence of proximal caries								
Male	Yes	8 (67.0)	10 (48.0)	0.469	11 (65.0)	1 (25.0)	6 (50.0)	0.332
	No	4 (33.0)	11 (52.0)		6 (35.0)	3 (75.0)	6 (50.0)	
Female	Yes	11 (27.0)	13 (50.0)	0.07	8 (36.0)	6 (27.0)	10 (43.0)	0.595
	No	30 (73.0)	13 (50.0)		14 (64.0)	16 (73.0)	13 (57.0)	
Tooth position on the arch								
Male	Yes	7 (58.0)	13 (62.0)	1.00	11 (65.0)	1 (25.0)	8 (67.0)	0.410
	No	5 (42.0)	8 (38.0)		6 (35.0)	3 (75.0)	4 (33.0)	
Female	Yes	20 (49.0)	15 (58.0)	0.617	12 (55.0)	9 (39.0)	14 (61.0)	0.422
	No	21 (51.0)	11 (42.0)		10 (45.0)	13 (59.0)	9 (39.0)	
Oral hygiene								
Male	Yes	8 (67.0)	15 (71.0)	1.0	12 (71.0)	2 (50.0)	9 (75.0)	0.750
	No	4 (33.0)	6 (29.0)		5 (29.0)	2 (50.0)	3 (25.0)	
Female	Yes	29 (71.0)	19 (73.0)	1.0	13 (59.0)	13 (59.0)	22 (96.0)	0.004*
	No	12 (29.0)	7 (27.0)		9 (41.0)	9 (41.0)	1 (4.0)	

Regarding the main indications for stripping, our study showed that:
 Statistical comparison based on gender, years of practice and type of degree showed no significant difference, except for the correction of a DDD, which reported a significant difference in the comparison between lengths of practice in men (Table 4).

Table 4. Main indications for stripping according to years of practice and type of diploma in males and females.

		Years of practice			Type of diploma			
		<10 Count (%)	≥10 Count (%)	p-value	University diploma	Private course training Count (%)	Specialist Count (%)	p-value
Treating tooth rotations								
Male	Yes	4 (33.0)	7 (33.0)	1.0	4 (24.0)	2 (50.0)	5 (42.0)	0.504
	No	8 (67.0)	14 (67.0)		13 (76.0)	2 (50.0)	7 (58.0)	
Female	Yes	13 (32.0)	10 (38.0)	0.308	5 (23.0)	10 (45.0)	8 (35.0)	0.308
	No	28 (68.0)	16 (62.0)		17 (77.0)	12 (55.0)	15 (65.0)	
Creating space for tooth alignment								
Male	Yes	11 (92.0)	19 (90.0)	1.0	16 (94.0)	4 (100)	10 (83.0)	0.701
	No	1 (8.0)	2 (10.0)		1 (6.0)	0 (0.0)	2 (17.0)	
Female	Yes	33 (80.0)	22 (85.0)	0.753	20 (91.0)	19 (86.0)	16 (70.0)	0.202
	No	8 (20.0)	4 (15.0)		2 (9.0)	3 (14.0)	7 (30.0)	
Solving overlap problems								
Male	Yes	7 (58.0)	16 (76.0)	0.433	12 (71.0)	2 (50.0)	9 (75.0)	0.750
	No	5 (42.0)	5 (24.0)		5 (29.0)	2 (50.0)	3 (25.0)	
Female	Yes	28 (68.0)	21 (81.0)	0.397	17 (77.0)	15 (68.0)	17 (74.0)	0.837
	No	13 (32.0)	5 (19.0)		5 (23.0)	7 (32.0)	6 (26.0)	
Improving occlusion								
Male	Yes	4 (33.0)	9 (43.0)	0.719	7 (41.0)	1 (25.0)	5 (42.0)	1.0
	No	8 (67.0)	12 (57.0)		10 (59.0)	3 (75.0)	7 (58.0)	
Female	Yes	11 (27.0)	11 (42.0)	0.286	8 (36.0)	4 (18.0)	10 (43.0)	0.203
	No	30 (73.0)	15 (58.0)		14 (64.0)	18 (82.0)	13 (57.0)	
Correcting dento-dental disharmony (DDD)								
Male	Yes	4 (33.0)	16 (76.0)	0.027*	8 (47.0)	2 (50.0)	10 (83.0)	0.108
	No	8 (67.0)	5 (24.0)		9 (53.0)	2 (50.0)	2 (17.0)	
Female	Yes	30 (73.0)	23 (88.0)	0.217	18 (82.0)	14 (64.0)	21 (91.0)	0.077
	No	11 (27.0)	3 (12.0)		4 (18.0)	8 (36.0)	2 (9.0)	
Closing black triangles								
Male	Yes	8 (67.0)	20 (95.0)	0.047	15 (88.0)	3 (75.0)	10 (83.0)	0.811
	No	4 (33.0)	1 (5.0)		2 (12.0)	1 (25.0)	2 (17.0)	
Female	Yes	35 (85.0)	24 (92.0)	0.469	20 (91.0)	17 (77.0)	22 (96.0)	0.155
	No	6 (15.0)	2 (8.0)		2 (9.0)	5 (23.0)	1 (4.0)	

The main instruments used revealed the following results:

Statistical comparison according to gender, years of practice and type of degree showed no significant difference, with the exception of two specific cases: the use of stripping strips among women according to type of degree ($P = 0.009$) and the use of stripping discs among male dentists according to type of degree ($P = 0.032$) and years of practice ($P = 0.027$).

More experienced practitioners tend to use discs more frequently (**Table 5**).

Table 5. Main instruments used according to years of practice and type of diploma in males and females.

		Years of practice			Type of diploma			
		<10 Count (%)	≥10 Count (%)	p-value	University diploma Count (%)	Private course training Count (%)	Specialist Count (%)	p-value
Stripping burs								
Male	Yes	11 (92.0)	17 (81.0)	0.630	15 (88.0)	3 (75.0)	10 (83.0)	0.811
	No	1 (8.0)	4 (19.0)		2 (12.0)	1 (25.0)	2 (17.0)	
Female	Yes	32 (78.0)	22 (85.0)	0.752	16 (73.0)	19 (86.0)	19 (83.0)	0.549
	No	9 (22.0)	4 (15.0)		6 (27.0)	3 (14.0)	4 (17.0)	
Stripping bands								
Male	Yes	7 (58.0)	18 (86.0)	0.106	13 (76.0)	2 (50.0)	10 (83.0)	0.452
	No	5 (42.0)	3 (14.0)		4 (24.0)	2 (50.0)	2 (17.0)	
Female	Yes	31 (76.0)	23 (88.0)	0.225	19 (86.0)	13 (59.0)	22 (96.0)	0.009*
	No	10 (24.0)	3 (12.0)		3 (14.0)	9 (41.0)	1 (4.0)	
Stripping discs								
Male	Yes	1 (8.0)	10 (48.0)	0.027*	9 (53.0)	1 (25.0)	1 (8.0)	0.032*
	No	11 (92.0)	11 (52.0)		8 (47.0)	3 (75.0)	11 (92.0)	
Female	Yes	9 (22.0)	6 (23.0)	1.0	8 (36.0)	5 (23.0)	2 (9.0)	0.082
	No	32 (78.0)	20 (77.0)		14 (64.0)	17 (77.0)	21 (91.0)	

In terms of the methods used to assess enamel reduction, our study revealed the following results:

Our study revealed no significant differences according to years of practice or type of degree obtained, with the exception of the use of stripping gauges, which was more frequent in male doctors with a length of practice of 10 years or more (62% vs. 17%, $p = 0.027$) (**Table 6**).

- Tooth sensitivity after stripping was observed by orthodontists, especially specialists and dentists with less than 10 years' practice.

- Gingival irritation was observed by dentists with more than 10 years' practice, and also by orthodontists.

- Sensitivity during stripping was mainly observed in female university graduates and male specialists.

- The development of proximal caries was mainly reported by female orthodontic-trained doctors, and by male university-educated dentists.

- Statistical comparison according to gender, length of practice and type of degree showed no significant difference, except for gingival irritation, where the comparison was similar for male practitioners ($P = 0.005$) (Table 7).

Table 6. Methods for assessing the value of enamel reduction according to years of practice and type of diploma in males and females.

		Years of practice			Type of diploma			
		<10 Count (%)	≥10 Count (%)	p-value	University diploma Count (%)	Private course training Count (%)	Specialist Count (%)	p-value
Visually								
Male	Yes	8 (67.0)	12 (57.0)	0.719	9 (53.0)	3 (75.0)	8 (67.0)	0.689
	No	4 (33.0)	9 (43.0)		8 (47.0)	1 (25.0)	4 (33.0)	
Female	Yes	26 (63.0)	14 (54.0)	0.456	16 (73.0)	12 (55.0)	12 (52.0)	0.347
	No	15 (37.0)	12 (46.0)		6 (27.0)	10 (45.0)	11 (48.0)	
Stripping gauges								
Male	Yes	2 (17.0)	13 (62.0)	0.027*	7 (41.0)	1 (25.0)	7 (58.0)	0.554
	No	10 (83.0)	8 (38.0)		10 (59.0)	3 (75.0)	5 (42.0)	
Female	Yes	13 (32.0)	13 (50.0)	0.198	6 (27.0)	7 (32.0)	13 (57.0)	0.105
	No	28 (68.0)	13 (50.0)		16 (73.0)	15 (68.0)	10 (43.0)	
Burs diameter								
Male	Yes	5 (42.0)	4 (19.0)	0.230	5 (29.0)	1 (25.0)	3 (25.0)	1.00
	No	7 (58.0)	17 (81.0)		12 (71.0)	3 (75.0)	9 (75.0)	
Female	Yes	10 (24.0)	11 (42.0)	0.177	6 (27.0)	9 (41.0)	6 (26.0)	0.575
	No	31 (76.0)	15 (58.0)		16 (73.0)	13 (59.0)	17 (24.0)	

Table 7. Undesirable effects of stripping according to years of practice and type of diploma in males and females.

		Years of practice			Type of diploma			
		<10 Count (%)	≥10 Count (%)	p-value	University diploma Count (%)	Private course training Count (%)	Specialist Count (%)	p-value
Tooth sensitivity after stripping								
Male	Yes	6 (50.0)	7 (33.0)	0.465	6 (35.0)	3 (75.0)	4 (33.0)	0.410
	No	6 (50.0)	14 (67.0)		11 (65.0)	1 (25.0)	8 (67.0)	
Female	Yes	15 (37.0)	7 (27.0)	0.439	7 (32.0)	5 (23.0)	10 (43.0)	0.357
	No	26 (63.0)	19 (73.0)		15 (68.0)	17 (77.0)	13 (57.0)	
Gum irritation								
Male	Yes	0 (0.0)	10 (48.0)	0.005*	5 (29.0)	1 (25.0)	4 (33.0)	1.00

Continued

	No	12 (100)	11 (52.0)		12 (71.0)	3 (75.0)	8 (67.0)	
Female	Yes	14 (34.0)	6 (23.0)	0.417	6 (27.0)	6 (27.0)	8 (35.0)	0.842
	No	27 (66.0)	20 (77.0)		16 (73.0)	16 (73.0)	15 (65.0)	
Increased sensitivity during stripping								
Male	Yes	5 (42.0)	7 (33.0)	0.716	5 (29.0)	0 (0.0)	7 (58.0)	0.068
	No	7 (58.0)	14 (67.0)		12 (71.0)	4 (100)	5 (42.0)	
Female	Yes	10 (24.0)	3 (12.0)	0.225	5 (23.0)	4 (18.0)	4 (17.0)	0.929
	No	31 (76.0)	23 (88.0)		17 (77.0)	18 (82.0)	19 (83.0)	
Development of proximal caries								
Male	Yes	2 (17.0)	3 (14.0)	1.00	3 (18.0)	1 (25.0)	1 (8.0)	0.660
	No	10 (83.0)	18 (86.0)		14 (82.0)	3 (75.0)	11 (92.0)	
Female	Yes	4 (10.0)	3 (12.0)	1.00	2 (9.0)	5 (23.0)	0 (0.0)	0.027
	No	37 (90.0)	23 (88.0)		20 (91.0)	17 (77.0)	23 (100)	
None								
Male	Yes	1 (8.0)	1 (5.0)	1.00	2 (12.0)	0 (0.0)	0 (0.0)	0.614
	No	11 (92.0)	20 (95.0)		15 (88.0)	4 (100)	12 (100)	
Female	Yes	7 (17.0)	8 (31.0)	0.235	4 (18)	6 (27.0)	5 (22.0)	0.820
	No	34 (83.0)	18 (69.0)		18 (82.0)	16 (73.0)	18 (78.0)	

4. Discussion

Stripping or interproximal tooth reduction (IPR) is a common orthodontic procedure. Its main purpose is to create the space needed to correct dental crowding. Other indications proposed in the literature include the correction of inter-dental black triangles linked to gingival defects, the correction of DDD, or as part of orthodontic finishing for better stabilization of the dental alignment obtained.

This is a descriptive cross-sectional study, the first of its kind carried out among Moroccan orthodontists. The literature search for similar studies revealed two studies by Donovan J. [7] in Ireland, who carried out a similar survey of orthodontists and patients, and Barcoma [8] in Italy, who compared the opinions of orthodontists with those of general dentists regarding stripping. Other published studies focused mainly on stripping techniques [9], the consequences of stripping on proximal enamel, gingival health [10] or predisposition to proximal carious lesions [11] [12].

The aim of this work is to describe practitioners' knowledge of stripping in orthodontics and their technical preferences, as well as the methods used to carry it out.

Our main findings on stripping showed that 96% of practitioners are familiar with stripping, with only 14% saying they rarely use it. 93% of practitioners

chose the space required in the arches to correct malocclusions as the main clinical requirement for stripping.

The main indications for stripping in orthodontics are crowding [2] [13], when the lack of space in the dental arch is 4 to 8 mm [4], the DDD [4] [14] [15], followed by normalization of gingival contours and elimination of black triangles [9] [10].

In our sample, lack of space and black triangles come in first place, with rates of 85% and 87% respectively.

We found that 33% of the orthodontists included used a retro alveolar radiography and 60% of practitioners did not use gauges to assess the amount of stripping, preferring visual assessment.

The use of radiographic images to determine the exact amount of enamel, although recommended by various authors [16] [17], may not be feasible for routine clinical application.

In his study of 105 Irish orthodontists, Joey Donovan [7] noted that 98% of orthodontists used stripping, including 59% who used aligners, and 33% who used the pre-adjusted Edgewise technique. Manual stripping was used by 37% of Irish orthodontists. Here again, and in line with our study, correction of crowding and closure of black triangles are the main indications for stripping.

Statistical comparison of our results according to gender, years of practice and type of degree showed that only oral hygiene as a clinical decision criterion for stripping was given greater consideration by specialist who had completed a university residency program.

One of the main concerns regarding IPR is the possible increase in caries risk due to plaque accumulation on rough enamel surfaces. Based on Elvi Barcoma *et al.* [8], IPR is a minimally invasive procedure with little risk of interproximal caries development, according to the majority of general dentists and orthodontists. On the other hand, general dentists were more likely than orthodontists to apply topical fluoride and perform post-IPR polishing ($P < 0.0001$).

A retrospective investigation examined a sample of 61 cases who had received IPR on all six mandibular anterior teeth at least 10 years previously [11]. The results confirmed that there was no increased susceptibility to caries on treated enamel surfaces. This was studied again, but with a shorter follow-up period, in patients who had received an IPR only four to six years earlier [18]. Of the 278 surfaces reduced in this study, only seven showed new carious lesions (2.5%), and of the 84 untreated (control) surfaces, two showed new carious lesions (2.4%).

According to Danesh *et al.* [19], IPR treated and polished enamel in general showed a reduced surface roughness compared to untreated enamel before IPR. Proper polishing of IPR-treated surfaces is thus advisable irrespective of the IPR procedure used, to minimize caries susceptibility.

Koretsi *et al.* [20], conclude that because of the variety of studies, it was challenging to reach evidence-based conclusions on enamel roughness following IPR. On the other hand, caries occurrence on tooth surfaces that had previously

received IPR treatment was statistically equal to that of intact surfaces. Furthermore, it is anticipated that there will be a statistically equal number of carious lesions on treated and untreated teeth, suggesting that interproximal enamel reduction does not raise the risk of caries on treated teeth.

Many patients have a difference in tooth size that can influence treatment goals and outcomes. Freeman *et al.* [21] found that 30.6% of orthodontic patients had a significant difference in anterior tooth size.

Mesiodistal enamel reduction is performed by either manual or mechanical methods.

Metal strips may be more suitable than discs for rotated teeth. Diamond discs must be used correctly so as not to leave undercuts on the enamel or come into contact with the patient's soft tissues. When using burs, it is advisable to square the tips so that they do not leave grooves. Burs also tend to produce a rough finish on the enamel surface [12].

A significant difference was noted with the use of stripping bands among practitioners who had a residency program using them more than their university-qualified or privately-trained colleagues. Stripping discs were used significantly more by practitioners with over 10 years' experience and by dentists with a university degree.

Stripping gauges are used significantly more by experienced orthodontists than by young ones. One might have thought the opposite, that younger practitioners should be more cautious about the amount of stripping, and that only gauges provide an objective assessment of the amount of enamel reduced.

Orthodontists should proceed with caution when considering the disadvantages of IPR.

First, sensitivity could develop following IPR as a result of the reduced enamel. Second, excessive space may result from over stripping brought on by negligent pre-treatment planning. Inadequate planning may also have an impact on overbite, overjet, posterior intercuspation, and appearance. However, because of the grooves that remain on the enamel surface following reduction, it is thought that more plaque is retained [22].

In terms of the risks associated with periodontal diseases, it is acknowledged that IPR won't increase bone loss in the absence of gingival inflammation. On the other hand, when inflammation was present with nearly approximated roots, bone loss progressed more quickly. IPR is therefore not recommended for patients who have poor oral hygiene.

5. Conclusions

We can conclude that Moroccan orthodontists are well informed about the methods, indications and limitations of stripping in orthodontics.

However, despite this undeniable mastery, a significant discrepancy was observed between local practices and established international standards with regard to the choice of material and techniques for stripping.

We noted differences in protocol and instruments used between the orthodontists included in our sample. Our aim is to ensure safe stripping practice for our patients, while preserving their dental and periodontal health in the long term. This requires a precise and careful approach to minimize the risks associated with this orthodontic technique.

Conflicts of Interest

The authors declare no conflicts of interest.

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