

## Orthodontic Retention And Relapse Protocol Followed Among Orthodontists – A Questionnaire Study

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### **Abstract:**

#### **Background:**

Retention plays a vital role in maintaining the obtained results after orthodontic treatment. Despite the utilization of various retention methods, studies suggest that a significant portion of patients who have undergone orthodontic treatment show insufficient dental alignment few years later. The lack of scientific guidelines dictating retention, relapse, and retreatment procedures implies a reliance on clinicians' preferences in current practices. Thus, the purpose of this study was to identify the most common orthodontic retention, relapse and retreatment protocols prescribed in the Southern states of India by members of the Indian Orthodontic Society.

#### **Method:**

A questionnaire consisting of 22 questions was framed and validated. An electronic version of the questionnaire link was created using the Google Forms and was sent to the orthodontists in Tamil Nadu, Kerala, Karnataka & Andhra Pradesh through emails and various social media platforms. The collected data were entered into Microsoft Office Excel and analyzed.

#### **Results:**

Of the 234 responses received, 51.3% were men. There were mixed responses, but majority suggested the use of combination of fixed and removable retainers in maxillary arch and fixed retainers in mandibular arch.

#### **Conclusion:**

Major type of relapse observed was space reopening in the extraction sites and anterior crowding in the maxillary and mandibular arches respectively. Majority of orthodontists preferred to retreat the arch, if relapse occurs. Thus, this study was helpful in analysing the current retention, relapse and retreatment protocols prescribed by the orthodontics in southern states of India.

**Key Word:** Retainer failure, Relapse, Retreatment

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## I. INTRODUCTION

Orthodontic relapse typically refers to the phenomenon where teeth, previously aligned through orthodontic treatment, gradually shift back towards their original positions.<sup>1,2</sup> This poses a significant challenge for both clinicians and patients following orthodontic interventions. Factors contributing to relapse include post-correction growth, eruption of third molars, patient-specific elements, and mechanical issues. Recognizing the need to prevent relapse, the significance of post-treatment retention has escalated.

In orthodontics, the primary objective of retention is to enhance the stability of the corrected dentition. A range of retention devices, comprising removable and fixed retainers, is employed to preserve the achieved dental alignment. Despite the diverse array of retention methods in use today, research indicates that a considerable percentage—ranging from 40% to 90%—of orthodontically treated patients exhibit unacceptable dental alignment a decade after their initial treatment.<sup>3</sup> The absence of clear scientific guidelines for retention and retreatment protocols suggests that current practices are largely influenced by clinicians' preferences.<sup>4,5,6,7</sup>

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Upon reviewing the literature, only a limited number of studies were identified that assessed the retention protocols employed by orthodontists and general practitioners in Australia, New Zealand, the United Kingdom, and the Netherlands.<sup>8,9,10</sup> These studies revealed notable variations in the preferred retention methods across these countries. In Australia and New Zealand, orthodontists favored vacuum-formed retainers for the maxillary arch and fixed retention for the mandibular arch. Private practitioners in the United Kingdom, on the other hand, showed a preference for a combination of fixed and vacuum-formed retainers. In the Netherlands, orthodontists leaned towards utilizing fixed retention for both the arches.

Consequently, the aim of this investigation is to delineate the retention protocols, predominant types and causes of relapse observed in clinical practice, and the strategies employed following retainer failure, as practiced by orthodontists.

## II. MATERIALS AND METHOD

The procedures and protocol for the study were approved by the Institutional Review Board at RVS Dental College and Hospital, Coimbatore. A questionnaire consisting of 22 questions was framed. Questionnaire was formulated in three sections involving the demographic details, retainers & retention, relapse protocols. The questionnaire was validated by 10 orthodontists from different regions of South India to ensure that the questions were simple, clear and relevant to the retention procedures, relapse & retreatment protocols. An electronic version of the questionnaire link was devised using the Google Forms. Then the questionnaire link was sent to orthodontists in Tamilnadu, Kerala, Karnataka and Andhra Pradesh who were part of Indian Orthodontic Society through emails and various social media platforms. Informed consent was taken from all the participants before solving the questionnaire. The study concluded approximately 3 months after the initial mailing, when all the responses had ceased. The collected data were entered into Microsoft Office Excel and analysed.

### Statistical analysis

All statistical analyses were done using the Statistical Package for Social Sciences (SPSS), Version 25, IBM Statistics, USA. Background information on the individual orthodontist was described in frequencies and the other results were mentioned in percentages using bar chart and tables. All tests for the relationship between two items in the questionnaire were based on the chi-square test. Level of significance will be set at 5% ( $P < 0.05$  = Statistically Significant).

## III. RESULTS

A total of 234 orthodontic practitioners answered this questionnaire. Of the 234 respondents, 51.3% were men. Demographic details were not enquired much except for their name, gender and experience in the field of orthodontics. Based on clinical experience in the field of orthodontics, majority of respondents 62% belonged to less than 5 years' experience, followed by 28.2% respondents in >15 years category and then 9.8% respondents in 5-15 years' experience.

Table 1 describes the sample characteristics (questions 1-3) and provides the name of the orthodontist, sex, number of years with clinical experience in the field of orthodontics.

**Table 1: Summary of demographic details**

Variable	Response	N	%
Gender	Female	114	48.7
	Male	120	51.3
CLINICAL EXPERIENCE IN THE FIELD OF ORTHODONTICS	< 5 years	145	62.0
	>15 years	66	28.2
	5-15 years	23	9.8

Table 2 is a summary of surveyed retainer and retention protocol variables (questions 4-11). The results of the present investigation revealed the most commonly preferred retainer type in maxilla in the southern areas of India was a combination of fixed and removable retainers (67.1%) whereas in mandible, it was fixed retainers (67.9%).

**Table 2: Summary of retention devices and protocol**

Variable	Response	N	%
WHICH TYPE OF MAXILLARY RETAINER DO YOU PREFER THE MOST?	Combination of any two of the Above	157	67.1
	Fixed	20	8.5
	Removable acrylic retainers	15	6.4
	Removable clear retainers	42	17.9
WHICH TYPE OF MANDIBULAR RETAINER DO YOU PREFER THE MOST?	Combination of any two of the Above	54	23.1
	Fixed	159	67.9
	Removable acrylic retainers	8	3.4

	Removable clear retainers	13	5.6
FOR REMOVABLE RETAINERS, DO YOU INSTRUCT YOURS PATIENTS THAT THEY CAN STOP WEARING THEIR REMOVABLE RETAINERS AT A SPECIFIC TIME?	No, wear retainers forever	31	13.2
	Yes, 5 years after debonding	16	6.8
	Yes, after 3rd molars are extracted	6	2.6
	Yes, <= 2 years after debonding	181	77.4
WHEN DO YOU INSTRUCT YOUR PATIENTS TO REMOVE THE FIXED LINGUAL RETAINER?	< 2 years after debonding	41	17.5
	>5 years after debonding	107	45.7
	2-5 years after debonding	61	26.1
	After 3rd molars are extracted	25	10.7
PERCENTAGE OF PATIENTS REPORTING TO YOUR CLINIC WITH BROKEN RETAINERS:	< 20	155	66.2
	> 40	8	3.4
	21- 40	71	30.3
BROKEN RETAINERS ARE COMMONLY OBSERVED IN WHICH JAW?	Both of the above	19	8.1
	Mandible	68	29.1
	Maxilla	147	62.8
IN CASES WITH FIXED LINGUAL RETAINERS, WHERE DOES THE BREAKAGE HAPPEN MOST COMMONLY?	Around the canine region	151	64.5
	Around the incisor region	43	18.4
	Around the premolar region	40	17.1
WHAT DO YOU PREFER TO DO AFTER DETECTION OF BROKEN RETAINERS?	Change the retainer	139	59.4
	Change the type of retainer	22	9.4
	Repair the broken retainer	73	31.2

Table 3 summarizes the relapse and retreatment protocol variables (questions 12-22). Considering orthodontic relapse, 69.2% orthodontists reported that the most common reason for relapse was found to be all of the above factors which included growth after treatment, third molar eruption, persistence of habits, improper posttreatment occlusion and irregular use of retainers, 16.7% orthodontists reported either of the above factors could be a major cause for relapse.

**Table 3:** Summary of relapse and retreatment protocol

Variable	Response	N	%
MAIN CAUSE FOR RELAPSE	All of the above	162	69.2
	Either of the above	39	16.7
	Growth after orthodontic treatment	2	.9
	Improper post treatment occlusion	9	3.8
	Irregular use of retainers	12	5.1
	Persistence of oral habits	6	2.6
	Third molar eruption	4	1.7
THE MOST COMMON TYPE OF RELAPSE IN MAXILLA: (after failure of retainers)	All of the above	49	20.9
	Anterior crowding	5	2.1
	Arch constriction	4	1.7
	Diastemas	46	19.7
	Rotations	12	5.1
THE MOST COMMON TYPE OF RELAPSE IN MANDIBLE: (after failure of retainers)	Space reopening in extraction sites	118	50.4
	All of the above	28	12.0
	Anterior crowding	153	65.4
	Diastemas	6	2.6
	Rotations	22	9.4
IF RELAPSE OCCURS, WHAT DO YOU DO?	Space reopening in extraction sites	25	10.7
	Modify the retainer	44	18.8
	Retreatment of both the arches	43	18.4
AFTER CORRECTION OF ROTATED TEETH, AT WHAT PERCENTAGE OF RELAPSE, DO YOU RETREAT THE CASE?	Retreatment of that arch only	147	62.8
	< 15% relapse	43	18.4
	>20% relapse	56	23.9
IN CASES WITH RELAPSE OF LOWER ANTERIOR CROWDING, WHEN DO YOU RETREAT THE CASE?	16-20% relapse	135	57.7
	> 6mm of horizontal discrepancy	35	15.0
	with 3mm of horizontal discrepancy	40	17.1
IN CASES WITH RELAPSE OF UPPER ANTERIOR CROWDING, WHEN DO YOU RETREAT THE CASE?	with 5mm of horizontal discrepancy	159	67.9
	> 6mm of horizontal discrepancy	24	10.3
	with 3mm of horizontal discrepancy	65	27.8
WHEN DO YOU RETREAT A CASE WITH RELAPSE OF CORRECTED OVERBITE?	with 5mm of horizontal discrepancy	145	62.0
	>5mm of relapse	43	18.4
	3.5 - 5mm of relapse	168	71.8
WHEN DO YOU RETREAT A CASE WITH RELAPSE OF CORRECTED OVERJET?	Up to 3mm of relapse	23	9.8
	>9mm of relapse	4	1.7
	3.5 - 6mm of relapse	179	76.5
	6.5 -9mm of relapse	34	14.5
	Upto 3mm of relapse	17	7.3

HOW MUCH PERCENTAGE OF PATIENTS RETURN FOR FOLLOW-UP AFTER GIVING RETAINERS?	10-25%	150	64.1
	26-50%	61	26.1

Figure 1: Percentage of responses regarding the procedures followed after relapse

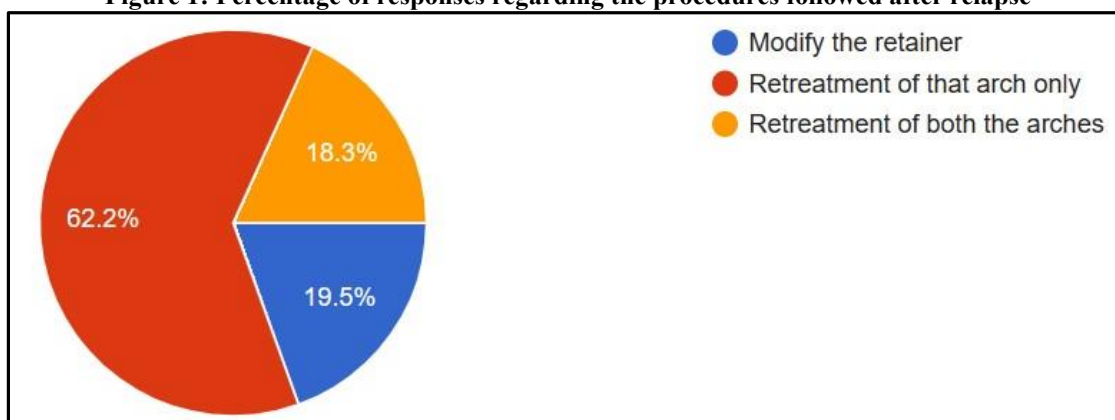


Table 4: Summarizes chi-square test

Variable	Response	< 5 years		>15 years		5-15 years		P value
		N	%	N	%	N	%	
WHICH TYPE OF MAXILLARY RETAINER DO YOU PREFER THE MOST?	Combination of any two of the Above	93	64.1	52	78.8	12	52.2	0.206
	Fixed	15	10.3	3	4.5	2	8.7	
	Removable acrylic retainers	10	6.9	2	3	3	13	
	Removable clear retainers	27	18.6	9	13.6	6	26.1	
WHICH TYPE OF MANDIBULAR RETAINER DO YOU PREFER THE MOST?	Combination of any two of the Above	41	28.3	7	10.6	6	26.1	0.015
	Fixed	89	61.4	56	84.8	14	60.9	
	Removable acrylic retainers	4	2.8	3	4.5	1	4.3	
	Removable clear retainers	11	7.6	0	0	2	8.7	
FOR REMOVABLE RETAINERS, DO YOU INSTRUCT YOURS PATIENTS THAT THEY CAN STOP WEARING THEIR REMOVABLE RETAINERS AT A SPECIFIC TIME?	No, wear retainers forever	25	17.2	5	7.6	1	4.3	0.004
	Yes, 5 years after debonding	9	6.2	2	3	5	21.7	
	Yes, after 3rd molars are extracted	3	2.1	1	1.5	2	8.7	
	Yes, ≤ 2 years after debonding	108	74.5	58	87.9	15	65.2	
WHEN DO YOU INSTRUCT YOUR PATIENTS TO REMOVE THE FIXED LINGUAL RETAINER?	< 2 years after debonding	19	13.1	22	33.3			0.002
	>5 years after debonding	72	49.7	23	34.8	12	52.2	
	2-5 years after debonding	41	28.3	14	21.2	6	26.1	
	After 3rd molars are extracted	13	9	7	10.6	5	21.7	
PERCENTAGE OF PATIENTS REPORTING TO YOUR	< 20%	96	66.2	43	65.2	16	69.6	0.423
	> 40%	7	4.8			1	4.3	

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CLINIC WITH BROKEN RETAINERS:	21- 40%	42	29	23	34.8	6	26.1	
BROKEN RETAINERS ARE COMMONLY OBSERVED IN WHICH JAW?	Both of the above	13	9	3	4.5	3	13	0.003
	Mandible	54	37.2	11	16.7	3	13	
	Maxilla	78	53.8	52	78.8	17	73.9	
IN CASES WITH FIXED LINGUAL RETAINERS, WHERE DOES THE BREAKAGE HAPPEN MOST COMMONLY?	Around the canine region	87	60	48	72.7	16	69.6	0.26
	Around the incisor region	30	20.7	11	16.7	2	8.7	
	Around the premolar region	28	19.3	7	10.6	5	21.7	
WHAT DO YOU PREFER TO DO AFTER DETECTION OF BROKEN RETAINERS?	Change the retainer	85	58.6	46	69.7	8	34.8	60
	Change the type of retainer	18	12.4	3	4.5	1	4.3	
	Repair the broken retainer	42	29	17	25.8	14	60.9	
WHAT DO YOU THINK IS THE MAIN CAUSE FOR RELAPSE?	All of the above	89	61.4	57	86.4	16	69.6	0.006
	Either of the above	30	20.7	7	10.6	2	8.7	
	Growth after orthodontic treatment			2	3			
	Improper post treatment occlusion	8	5.5			1	4.3	
	Irregular use of retainers	9	6.2			3	13	
	Persistence of oral habits	5	3.4			1	4.3	
	Third molar eruption	4	2.8					
THE MOST COMMON TYPE OF RELAPSE OBSERVED IN MAXILLA: (after failure of retainers)	All of the above	31	21.4	12	18.2	6	26.1	0.012
	Anterior crowding	4	2.8			1	4.3	
	Arch constriction	4	2.8	5	7.6	4	17.4	
	Diastemas	37	25.5	3	4.5	3	13	
	Rotations	6	4.1	46	69.7	9	39.1	
	Space reopening in extraction sites	63	43.4					
THE MOST COMMON TYPE OF RELAPSE OBSERVED IN MANDIBLE: (after failure of retainers)	All of the above	19	13.1	4	6.1	5	21.7	0.01
	Anterior crowding	90	62.1	54	81.8	9	39.1	
	Diastemas	6	4.1					
	Rotations	14	9.7	3	4.5	5	21.7	
	Space reopening in extraction sites	16	11	5	7.6	4	17.4	
IF RELAPSE OCCURS, WHAT DO YOU PREFER TO DO?	Modify the retainer	31	21.4	5	7.6	8	34.8	0.001
	Retreatment of both the arches	35	24.1	5	7.6	3	13	
	Retreatment of that arch only	79	54.5	56	84.8	12	52.2	
	< 15% relapse	32	22.1	5	7.6	6	26.1	0.001

AFTER CORRECTION OF ROTATED TEETH, AT WHAT PERCENTAGE OF RELAPSE, DO YOU RETREAT THE CASE?	>20% relapse	34	23.4	11	16.7	11	47.8	
	16-20% relapse	79	54.5	50	75.8	6	26.1	
IN CASES WITH RELAPSE OF LOWER ANTERIOR CROWDING, WHEN DO YOU RETREAT THE CASE?	> 6mm of horizontal discrepancy	25	17.2	3	4.5	7	30.4	0.002
	with 3mm of horizontal discrepancy	29	20	5	7.6	6	26.1	
	with 5mm of horizontal discrepancy	91	62.8	58	87.9	10	43.5	
IN CASES WITH RELAPSE OF UPPER ANTERIOR CROWDING, WHEN DO YOU RETREAT THE CASE?	> 6mm of horizontal discrepancy	17	11.7	3	4.5	4	17.4	0.052
	with 3mm of horizontal discrepancy	40	27.6	15	22.7	10	43.5	
	with 5mm of horizontal discrepancy	88	60.7	48	72.7	9	39.1	
WHEN DO YOU RETREAT A CASE WITH RELAPSE OF CORRECTED OVERBITE?	>5mm of relapse	26	17.9	7	10.6	10	43.5	0.001
	3.5 - 5mm of relapse	100	69	57	86.4	11	47.8	
	Up to 3mm of relapse	19	13.1	2	3	2	8.7	
WHEN DO YOU RETREAT A CASE WITH RELAPSE OF CORRECTED OVERJET?	>9mm of relapse	4	2.8					0.001
	3.5 - 6mm of relapse	106	73.1	60	90.9	13	56.5	
	6.5 -9mm of relapse	25	17.2	2	3	7	30.4	
	Upto 3mm of relapse	10	6.9	4	6.1	3	13	
HOW MUCH PERCENTAGE OF PATIENTS RETURN FOR FOLLOW-UP AFTER GIVING RETAINERS?	10-25%	99	68.3	44	66.7	7	30.4	0.001
	26-50%	31	21.4	17	25.8	13	56.5	
	51-75%	14	9.7	1	1.5	3	13	
	76-100%	1	0.7	4	6.1			
FOR HOW LONG DO YOU KEEP THE PATIENT UNDER FOLLOW-UP?	< 1 year	10	6.9	2	3	2	8.7	0.056
	>5 years	12	8.3	3	4.5	1	4.3	
	1 - 2 years	88	60.7	49	74.2	9	39.1	
	Greater than 2 but less than 5 years	35	24.1	12	18.2	11	47.8	

#### IV. DISCUSSION

Orthodontists practising in the United States have shown a strong inclination towards utilizing Hawley retainers in the upper arch compared to their counterparts in other countries.<sup>11</sup> The utilization of fixed retention in the maxillary arch differs significantly across various nations. This lack of uniformity in retainer selection among clinicians emphasizes the necessity for well-defined protocols and guidelines concerning retention, relapse, and post-orthodontic treatment practices.

The results of the present investigation revealed the most commonly preferred retainer type in maxilla in the southern areas of India was a combination of fixed and removable retainers (67.1%) whereas in mandible, it was fixed retainers (67.9%).

Among all countries studied, fixed retainers are at least part of the preferred option for the lower arch. Similarly, in this study, the most commonly used mandibular retainers were fixed lingual retainers (67.9%) followed by combination of removable and fixed retainers (23.1%), clear retainers (5.6%), and removable acrylic

retainers (3.4%). The popularity of fixed lingual retainers might be due to minimal need for patient cooperation, practitioners' concerns about an area being highly susceptible to relapse, and also for esthetic purposes.<sup>12, 13</sup>

Most of the orthodontists (77.4%) recommend that their patients could stop wearing the removable retainers at less than or equal to 2 years after debonding and in cases with fixed lingual retainers, 45.7% recommend removing the retainers at approximately greater than 5 years after debond. This correlates with the findings of Valiathan and Hughes *et al*, where they reported that the duration of retainer wear depends on the type of retainer prescribed.

Majority of responses (66.2%) revealed that percentage of patients reporting to clinic with broken retainers was < 20%. Also, that 62.8% of respondents revealed that retainer breakage was most common in maxilla. In cases with fixed lingual retainer, 72.7% of the orthodontists with greater than 15 years' experience, 69.6% orthodontists with 5-15 years work experience and 60% orthodontists with < 5 years' experience suggested that the breakage was mainly around the canine region. After detection of broken retainers, 59.4% of the orthodontists preferred to change the retainer. Among them, orthodontists belonging to < 5 years and > 15 years' experience preferred to change the retainer. Whereas, orthodontists with 5-15 years' experience preferred to repair the broken retainer.

The existing data available up to now primarily focuses on retainers and retention protocols. However, none of the studies delve into comprehensive discussions regarding relapse, retreatment protocols, or the procedures implemented following retainer failure. This current research addresses and documents these previously unexplored areas.

After failure of retainers, majority of respondents noted that the most common type of relapse observed in maxilla was space reopening in the extraction site (50.4%), and in mandible it was anterior crowding (65.4%) with the *P* values of 0.012 and 0.010 respectively.

This is the first study to evaluate the relapse protocols followed among clinicians. If relapse occurs, most of the orthodontists under all the three categories of work experience preferred to retreat that arch only. (Figure 1) In cases with relapse after rotation correction, most of the respondents (57.7%) preferred to retreat the case at 16 – 20 % relapse. Similarly in cases with relapse of lower anterior crowding, 67.9% orthodontists preferred to retreat a case with 5mm of horizontal discrepancy. In upper anterior crowding, 62% respondents preferred retreating with 5mm of horizontal discrepancy. Likewise, majority (76.5%) preferred to retreat a case with 3.5 - 6mm of overjet relapse and 71.8% of respondents preferred to retreat with 3.5 - 5mm of overbite relapse.

This study demonstrates that 64.1% of orthodontists reported that only 10 – 25% of patients returned for follow-up. Most of the orthodontists with less than 5 years and greater than 15 years' work experience preferred to keep their patients under follow-up for 1-2 years. However, respondents between 5-15 years of work experience preferred to keep their patients under follow-up for greater than 2 years but less than 5 years (*P* = 0.056).

The limitations of the study arise from its dependence on the perspectives of a specific group of orthodontists in India, which may limit its generalizability on a global level. Additionally, the perception and experience are closely related to the individual skills of orthodontists, a factor that cannot be underestimated.

## V. CONCLUSION

- [1]. The Most Commonly Prescribed Retainers Were A Combination Of Fixed And Removable Retainers In Maxillary Arch And Fixed Retainers In The Mandibular Arch.
- [2]. Major Type Of Relapse Observed Was Space Reopening In The Extraction Sites And Anterior Crowding In The Maxillary And Mandibular Arches Respectively.
- [3]. Majority Of Orthodontists Preferred To Retreat The Arch, If Relapse Occurs.
- [4]. Most Of The Orthodontists Prescribed To Retreat A Case With Relapse Of 5mm Of Anterior Crowding, 16-20% Rotation.

Thus, this study was helpful in analysing the current retention, relapse and retreatment protocols prescribed by the orthodontics in southern states of India.

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