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Treatment Concepts for Restoration of Endodontically Treated Teeth: A Survey among Dentists in Ahvaz and Abadan.

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Abstract

Statement of problem: The concept concerning the restoration of endodontically treated teeth has long been a subject of debate and remains controversial to this day. Statistical analysis revealed that philosophies and techniques regarding restoration of endodontically treated teeth varied with dentist's location, age, specialty status and dental school faculty status.

Purpose: The purpose of this study was to evaluate the opinions and the knowledge of general dentists of Ahvaz and Abadan about current strategies to restore endodontically treated teeth (ETT).

Materials and Methods: A certain kind of questionnaire included 18 multiple-choice questions reviewed techniques of restoring endodontically treated teeth was given to 197 registered dentists of Ahvaz and Abadan. Only questionnaires from dentists who had restored more than 30 endodontically treated teeth annually are included in the analysis. About 100% dentists reported restoring more than 30 ETT annually. Data were evaluated in terms of dentists' occupational experience and the frequency of post placement. Descriptive statistics were used for data analyses.

Results: The results showed that 50% of dentists believed that every endodontically treated tooth must receive a post, but 50% did not. The majority of dentists (60%) believed that a post reinforce an ETT. The majority of the dentists (76%) were familiar with the concept of the 'ferrule effect'. According to frequency of post placement, 28.9% of respondents seldom used post per year, 29.1% used post frequently per year and 21.2% usually used post per year. More than half of the respondents (62.2%) used cast post and core in daily practice. The tapered post types were used more than other prefabricated post system (57.6%). 87.8% of the respondents used cast post and core in single crown in restoration of endodontically treated single-rooted teeth. Amalgam was the most material used in the core build and modified glass ionomer cement was rarely used. The most uses of cement were zinc phosphate.

Conclusion- The treatment philosophy of Ahvaz and Abadan cities were not in complete agreement with recommendations found in literature. The majority of the respondents misunderstood the purpose of the post.

Keywords: ETT, Ahvaz and Abadan, zinc phosphate.

Introduction

The restoration of endodontically treated teeth is one of the topics more studied and controversial in dentistry. Endodontically treated teeth should have a good prognosis. It can resume full function and serve satisfactorily as an abutment for a fixed dental prosthesis (FPD) or a removable partial dental prosthesis. However, special techniques are needed to restore such a tooth. Usually, a considerable amount of tooth structure has been lost because of caries, endodontic treatment, and the placement of previous restoration. The loss of tooth structure makes retention of subsequent restoration more problematic and increase the likelihood of fracture during functional loading. Two factors influence the choice of technique: the type of tooth (whether it is an incisor, canine, premolar, or molar) and the amount of remaining coronal tooth structure.

In a retrospective analysis[21]involving 638 patients, investigators evaluated 788 post and cores, 456 custom-cast posts and cores and 322 foundations with Paraposts. Four to five years after cementation, failure rates reported in male patients which were significantly higher than in female patients, and failure rates after age 60 were three times higher than the younger patients. Maxillary failure rates (15%) were three times as high as mandibular failure rates (5%) and more prevalent in lateral incisors, canines, and premolars than in central incisors and molars. Failure rate under a fixed dental prosthesis (FPD) was significantly lower than under single crown prosthesis. The latter finding may have been caused by load reduction resulting from bracing by the FDP. No correlation was apparent between failure and reduced marginal height of the encasing bone. Custom cast post and cores exhibited slightly higher failure rates than amalgam foundations. This observation was also made by Sorensen and Martinoff.[22] However, Torbjorner *et al.*[21]suggested that custom cast post and cores tend to be used more often in teeth that already have considerably weakened root structure. Thus, regardless of the technique selected for subsequent restoration, the teeth themselves are already more prone to failure. Distal cantilevers appear to contribute to post and core failure in endodontically treated abutment teeth that support the cantilever.

Most of the failures just discussed are influenced by load. Generally, as loading increases, failure rates appear to increase, concomitantly. Failure has been shown to occur at lower loads as teeth are loaded less parallel to their long axes[23]which suggests that clinical failure occurs more readily under lateral loading. In the planning of the restoration of endodontically treated teeth, the practitioner must account for the strength of the remaining tooth structure and the load to which the restored tooth will be subjected.

Statistical analysis revealed that philosophies and techniques varied significantly with the dentist's geographic location, age, specialty status, and dental school faculty status.[5] These findings suggest that each dentist develops his/her own experience-based treatment concept.

Some dentists adhered to outdated ideologies, i.e. despite substantial scientific evidence 50% of the respondents in Morgano *et al.*,'s study believed that a post or dowel would reinforce a pulp less tooth.[9]A post provides intraradicular retention for a core reconstruction for a structurally compromised pulpless tooth, and is utilized whenever there is insufficient remaining tooth structure to retain the core .[8]

There are few subjects in dentistry that have been studied more than the restoration of endodontically treated teeth. Yet, many practical questions and controversies remain in this clinically important element of the treatment plan.[1] Thus, surveys are important tools to assess and to understand treatment approaches in postendodontic restoration. Several surveys have been performed in various countries to elucidate which treatment concepts and materials for endodontic and postendodontic restoration are favored by dental practitioners.[2,3,4,5,6&7]

With this tremendous expansion of knowledge concerning dental materials and clinical techniques, it is impractical to simply update ones idea or thought. On the contrary, one has to generate this idea or thought in order to make decisions on the best treatment that can benefit the patient. One of the widening arrays of dental materials is the restoration of tooth through trauma or dental caries. Then, improve the appearance of an individual by replacing the missing tooth structure without compromising the general health of the patient.

The objective of this study is to determine current opinions, applied techniques and materials for the restoration of endodontically treated teeth in Ahvaz and Abadan cities.

Materials and Methods

A questionnaire concerning the techniques of restoring endodontically treated teeth was developed according to the questionnaire previously used by Morgano *et al*.[5] The questionnaire were distributed to 197 registered dentists in Ahvaz and Abadan, 24 dentists from Abadan and 173 dentists from Ahvaz cities. The researcher identified 184 general dentists, nine prosthodontists/restorative dentists, two endodontists and two other dental specialists who were available to complete the survey. The questionnaire was containing 22 multiple-choice questions. The first section was general data about the responders; the second section concerned the treatment concept for endodontically treated teeth and the third section questions related to the materials and methods used for the treatment. Only questionnaires from dentists who had restored more than 30 ETT annually are included in the analysis. Dentists were divided into groups according to their clinical practice experience: less than five years in practice, six to ten years, 11 to 20 years, 21 to 30 years, and more than 30 years. Data were analyzed using SPSS Ver. 17.

Results

A total of 197 questionnaires regarding the treatment concepts for restoration of ETT were completed in Ahvaz and Abadan cities. The majority (100%) of dentists stated that they had more than 30 ETT, annually. A total of 151 (76.6%) of the responders were men, 46 (23.4%) were women. 184 of surveys, or 93.4% of the total, were collected from general dentists, 9 (4.6%) from prosthodontists, 2 (1.0%) from endodontists, and the remaining 2 (1.0%) were from other dental specialists.

Regarding to treatment concept, 100of dentists (50.8%) did not believe that every endodontically treated tooth must receive a post. 32 (16.2%) of dentists seldom placed a post, 49 (24.9%) frequently placed the post and 15 (7.6%) usually placed a post.0.5% did not provide this information (Table one).

Table 1:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	100	50.8	51.0	51.0
	Seldom	32	16.2	16.3	67.3
	Frequently	49	24.9	25.0	92.3
	Usually	15	7.6	7.7	100.0
	Total	196	99.5	100.0	
Missing	System	1	.5		
Total		197	100.0		

80 (40.6%) of respondents did not believe that a post reinforce an ETT and reduce the fracture probability. 20.8% of respondents reported seldom, 19.8% reported frequently and 17.8% of respondents believed that a post usually reinforce an ETT.1.0% did not provide this information (Table 2).

Table 2:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	80	40.6	41.0	41.0
	Seldom	41	20.8	21.0	62.1
	Frequently	39	19.8	20.0	82.1
	Usually	35	17.8	17.9	100.0
	Total	195	99.0	100.0	
Missing	System	2	1.0		
Total		197	100.0		

Regarding to the Ferrule effect, 76.5% of respondents were familiar with the concept of the 'ferrule effect' and 23.5% of the respondents were not familiar with the concept. Dentists with less than 5 years of experience were more familiar with the concept than the other groups.

Regarding the method of development of the ferrule, 36.2% of the respondents believed in the use of a bevel as a component of the cast core for developing a ferrule, 13.4% indicated that the ferrule should come from the cemented artificial crown.48.0% reported that they believe in incorporating both approaches and 2.4% had 'no opinion'. According to their experience, all the groups believed more in incorporating both approaches.

A total of 175 (89.3%) of respondents used rotary reamers to remove the obturating material for establishing a post space.

According to the length of the post, 4.6% of respondents expressed that the post should be as long as practical. 8.1% specified that the length of the post should equal to the length of the clinical crown. 6.6% reported that the post should correspond to one half length of the root in bone. 27.9% pointed outthat the post should equal to two-thirds length of the root in bone. 31.5% stated that preserving 3 mm of obturating material should serve as a guideline, while 48.7% indicated that 5 mm of obturating material should serve as the guideline.

According to frequency of post placement, 28.9% of respondents seldom used post per year, 29.1% used post frequently per year and 21.2% usually used post per year.

Table 3: EXP * SEVEN Cross tabulation

			SEVEN				
			NO	Seldom	Frequently	Usually	Total
EXP	less than 5 years	Count	18	12	8	1	39
		% within EXP	46.2%	30.8%	20.5%	2.6%	100.0%
	5-10 years	Count	11	25	23	14	73
		% within EXP	15.1%	34.2%	31.5%	19.2%	100.0%
	11-20 years	Count	11	14	16	22	63
		% within EXP	17.5%	22.2%	25.4%	34.9%	100.0%
	30-21 years	Count	1	2	7	2	12
		% within EXP	8.3%	16.7%	58.3%	16.7%	100.0%
	More than 30 years	Count	0	0	1	1	2
		% within EXP	.0%	.0%	50.0%	50.0%	100.0%
Total		Count	41	53	55	40	189
		% within EXP	21.7%	28.0%	29.1%	21.2%	100.0%

32.6% of the respondents used prefabricated posts, more than half of the respondents (62.2%) used cast post and core in daily practice and 5.2% usedfiber post (Table 4).

Table 4: EXP * NINE Cross tabulation

			NINE			
			Prefabricated	Cast post	Fiber post	Total
EXP	Less than 5 years	Count	16	22	2	40
		% within EXP	40.0%	55.0%	5.0%	100.0%
	5-10 years	Count	25	46	4	75
		% within EXP	33.3%	61.3%	5.3%	100.0%
	11-20 years	Count	20	41	4	65
		% within EXP	30.8%	63.1%	6.2%	100.0%
	30-21 years	Count	2	9	0	11
		% within EXP	18.2%	81.8%	.0%	100.0%
	More than 30 years	Count	0	2	0	2
		% within EXP	.0%	100.0%	.0%	100.0%
Total		Count	63	120	10	193
		% within EXP	32.6%	62.2%	5.2%	100.0%

According to the type of the prefabricated metal post, the tapered post types are used more than other prefabricated post system, 57.6% of respondents. 8.6% used parallel-sided post design, 32.5% used combined parallel-sided/tapered post design and 1.3% used the screw type design (Table5).

Table 5: EXP * TEN Cross tabulation

			TEN				
			Parallel-	Tapere	Combine parallel-	Screw type	Total
EX	less than 5	Count	5	21	7	0	3
		% within	15.2	63.6%	21.2	.0%	100.0
	5-10	Count	3	40	2	1	6
		% within	4.6	61.5%	32.3	1.5%	100.0
	11-20	Count	5	23	1	0	4
		% within	11.1	51.1%	37.8	.0%	100.0
	30-21	Count	0	3	4	0	7
		% within	.0	42.9%	57.1	.0%	100.0
	More than 30	Count	0	0	0	1	1
		% within	.0	.0%	.0	100.0	100.0
Tota		Count	1	87	4	2	15
		% within	8.6	57.6%	32.5	1.3%	100.0

Most frequent failure was due to the loss of retention, 35.4% of the respondents. 3.7% due to endodontic failure, 14.3% caused by Crown fracture, 14.8% as result of root fracture, 29.1% withno failures, and 2.6% was due to other causes.

There were multiple answers for type of post used in restoration of endodontically treated single-rooted teeth. 87.8% of the respondents used cast post and core in single crown. 61.9 % used in FPD, 39.1% used in RPD, so the cast post and core is more used in single crown in restoration of endodontically treated single-rooted teeth. In terms of the use of prefabricated post in single rooted teeth, 21.8% of the respondents used prefabricated post in single crown, 14.7% used in FPD and 6.6% used in RPD. In regard to fiber post in single rooted teeth, 14.7% of the respondents used fiber post in single crown. 6.6% used in FPD and 8.1% used in RPD.

Multiple answers for type of post applied in restoration of endodontically treated multi-rooted teeth, as well. 58.9% of the respondents used cast post and core in single crown, 38.1% used in FPD and 26.9% used in RPD. In terms of the use of prefabricated post in multi-rooted tooth, 50.8% of respondents used prefabricated post in single crown. 36.5% used in FPD, 15.7% used in RPD. The cast post and core as well with prefabricated post in single crown are more used in restoration of endodontically treated multi-rooted teeth. In regard to the use of fiber post in multi-rooted teeth, 6.6% of the respondents used fiber post in single crown, 2.0% used in FPD and 2.0% used in RPD.

Post design and material used for prefabricated and post-and-core restoration. In terms of the use of prefabricated post metal, 37.6% of the respondents used screw type, 28.4% used the tapered type, 7.6% used parallel-sided type, 13.2% used combined parallel sided/tapered type, 2.0% used treaded type and 11.2% did not provide this information. The screw post designs are used more frequently than other prefabricated post system. Concerning the use of nonmetal post, 27.9% of the respondents used tapered type, 10.7% used parallel-sided type, 19.3% used combined parallel sided/tapered type, 4.6% utilized other type of design and 37.6% did not provide this information.

In regard to material use for a core build up - 41.1% of the respondents used composite resin, 7.6% used glass ionomer cement, 3.6% used modified glass ionomer cement, 82.7% used amalgam for a core build up. Amalgam was the most uses in core build.

Concerning the type of cast post and core - 4.1% of the respondents used gold cast, 75.6% used non precious alloy, 1.0% used titanium, 8.6% used all ceramic, and 10.7% did not provide this information. Therefore, non precious alloy was the most uses.

In terms of cement type - 53.3% of the respondents use zinc phosphate to cement a post, 39.1 % use polycarboxylate, 16.2% use glass ionomer and 6.1% use resin cement. The most uses of cement were zinc phosphate.

Discussion

The result concerning the treatment concept of Iranian dentists in Ahvaz and Abadan cities showed that the majority of dentists 100 (50.8%) did not believe that every endodontically treated tooth must receive a post. 32 (16.2%) of dentists seldom placed a post, 49 (24.9%) used so frequently and 15 (7.6%) usually placed a post. 18 (40.6%) of respondents did not believe that a post reinforce an ETT and reduce the fracture probability. In a study by German survey[27]it is found that the majority of dentists (55%) indicate that a post reinforces an ETT. The belief that a post would reinforce an ETT might explain the high frequency of post placements. Due to the partially inconsistent responses, it is difficult to derive a generalized treatment concept, and yet a majority of those (65%) believe that not every ETT must receive a post. However, one third of the dentists in Germany placed a post in every ETT.[27]In survey of contemporary philosophies and techniques of restoring endodontically treated teeth in Kuwait almost 60% of dentists in the survey involved in the treatment of endodontically treated teeth believed a post would reinforce the tooth.[26] The current opinions among general dental practitioners and board-certified prosthodontists in Sweden on how to restore root-filled teeth, 29% of the responding general practitioners and 17% of the prosthodontists were of the opinion that a post reinforces a root-filled tooth. Only a few clinicians used posts "always" or "most of the time" when restoring endodontically treated teeth with fillings, while the vast majority used posts when restoring such teeth with crowns or fixed partial dentures. A high proportion of both general practitioners and prosthodontists believe that a post reinforces an endodontically treated tooth. This is one probable explanation for the almost ubiquitous application of posts when teeth are restored with crowns or fixed partial dentures.[25]In another study, 423 general dentists restored 1,199 teeth after root canal therapy, 10 to 15% of teeth received posts without the subsequent crown restorations in contrast to published recommendations.[24]

In this study regarding to the Ferrule effect, 76.5% of respondents were familiar with the concept of the ‘ferrule effect’.In the method of development of the ferrule 48.0% reported that they believe in incorporating both approaches, one as component of a cast core by placing a bevel for the core and the other by cementing an artificial crown that extends 1.5-2mm apical to the finish line for the core. Dentists with less than 5 years of experience were more familiar with the concept than other groups. In the other studies one third of the respondents were not familiar to the concept of a ferrule effect, and only 16% of the respondents were familiar to the ferrule and stated that the ferrule effect was derived from the cemented crown that extends 1.5–2mm apical to the margin of the core.[26]

In this study more than half of the respondents 62.2% used cast post and core in daily practice, the tapered post designs are used more than other prefabricated post system, 57.6% of respondents. In nationwide survey of dentists in German, Both cast posts and cores are used by the majority of German dentists (55%), whereas one third (34%) used prefabricated posts, exclusively. Screw designs are the post chose by half of the surveyed dentists (47%).[27]According to dental practitioners and board-certified prosthodontists in Sweden, cast posts were most commonly used. Despite the present knowledge that parallel-sided posts have a significantly higher success rate than tapered cast posts, only a minority of Swedish dentists used parallel-sided posts.[25]

In the material used for a core build up, 82.7% of the dentists in Ahvaz and Abadan cities used amalgam for a core build up. Amalgam was the most uses in core build. In German dentists, composite resin cores (51%) are preferred by more than half of the dentists, followed by GIC (26%) and RMGIC (17%) andamalgam is rarely used.[27]In other study they used silver fillings four times as often as composite restorations, although composites are preferred in literature reports.[24] In Manchester, composite resin was the most popular choice of material for core build-up procedures in anterior teeth. Amalgam tended to be favored for core build-ups in posterior teeth.[2]

In this study concerning the cement type used for a post, 53.3% of the respondents used zinc phosphate to cement a post. The most uses of cement were zinc phosphate. In German, adhesive post placement plays a small role (15%); conventional post placement with zinc phosphate cement is popular (51%), followed by the use of GIC (38%).

Conclusion

1. Almost 50% of dentists believed that every endodontically treated tooth must receive a post and 50% did not. The majority of dentists 60% believed that a post reinforce an ETT.

2. The majority of the dentists 76% were familiar with the concept of the ‘ferrule effect’. Almost half of the respondents have combined both approaches: 1.They believed in the use of a bevel as a component of the cast core for developing a ferrule. 2. They believed that the ferrule should come from the cemented artificial crown that extends 1.5-2mm apical to the finish line for the core.
3. More than half of the respondents 62.2% usedthe cast post and core in daily practice. The tapered post types are used more than other prefabricated post system, 57.6% of respondents.
4. Amalgam was the most uses in core build; modified glass ionomer cement was rarely used. The most uses of cement were zinc phosphate.
5. The cast post and core with prefabricated post in single crown were more used in restoration of endodontically treated multi-rooted teeth.

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