

# Current Status and Opinions of Post Graduate Residents in Gujarat Towards Regenerative Endodontics: A Survey

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## Abstract

**Aim:** The objective of this survey was to study the level of awareness, current state of knowledge and opinions towards regenerative endodontic treatments amongst the post graduate residents in Gujarat state.

**Materials and Methods:** Questionnaire based survey was designed. After approval from the institutional ethical committee, 125 copies of the questionnaire about regenerative endodontic procedures were circulated amongst the post graduate residents in various colleges across the state. The survey included profile of the respondents and consisted of 28 questions about their knowledge, attitude and opinions regarding use of these procedures as part of future dental treatment.

**Results:** The survey showed that about one third of the participants (37%) had received continued education in stem cells and/or regenerative dental treatments. The majority of participants were of the opinion (91%) that regenerative therapy should be incorporated into dentistry, and most of them (88%) were willing to acquire training in learning this new treatment strategy. The results indicated that more than half of the participants (58%) were already using some type of regenerative therapy in their clinical practice; however, with a majority of these limited to use of membranes, scaffolds or bioactive materials.

**Conclusions:** Although these results reflect that post graduate residents are optimistic about the use of regenerative endodontic procedures; however, it appears to them that it will take at least half a decade before it comes into clinical practice. Also, a need for more research and training in this field was felt.

**Keywords:** Regenerative endodontics; Stem cells; Tissue engineering; Survey

## Introduction

Amongst all the recent advances in the field of dental sciences, regenerative therapies have caught the attention of clinicians as well as researchers. Given the advances in regenerative endodontic research, the regeneration of the dental tissues will not be a far future. This field of research applies the concept of tissue engineering in an attempt to regenerate dental tissues. The creation and delivery of new tissues to replace diseased, missing, or traumatized pulp is referred to as regenerative endodontics [1]. Possible future technologies for delivering regenerative endodontic therapy may include scaffold implant, injectable scaffold and gene therapy, root canal revascularization, three dimensional cell printing, pulp implant, post-natal stem cell therapy [2]. The possibility for regeneration of dental tissues within the pulp space and continued root development in teeth with necrotic pulps and open apexes is supported by many scientific evidences that are too strong to be called as anecdotal. Recent literature in the form of numerous case reports from multiple authors support the clinical success and feasibility of the regenerative endodontic therapies [3-10]. The evidence based application of these regenerative procedures into the clinical dentistry holds massive potential for fulfilling various patient needs [11].

The research in the next decade of dentistry will continue to offer unprecedented advances in the field of regenerative endodontic therapies. However, the research results are yet to transfer their usefulness and clinical applicability. This will require not only exceptional research but also team work between clinicians and researchers [2]. On the clinicians' part, they must have detailed knowledge of regenerative therapies and must be competent enough to carry out such procedures on patients. To understand the attitude of the dental practitioners towards regenerative procedures, Epelman et al. conducted a survey [12]. However, their study included only a small section of endodontic specialists who were the members of the college of diplomats of the American Board of Endodontics. Manguno et al. carried out another similar survey amongst the US dentists training in different specialties [13]. There is a need to survey health-care providers in other areas of the globe that would help in gauging the international awareness on the topic. Since the regenerative aspects of endodontic procedures is mostly limited to research in the laboratories, scarce evidence in the literature exists that enlightens us about the current attitudes, knowledge and expectations of post graduate residents in India regarding the clinical applications of regenerative endodontic procedures. Hence, this survey was designed similar to the earlier ones and was carried out on a much larger scale amongst the post graduate residents studying across institutions in Gujarat. The respondents of this survey, the residents, are the budding dental clinicians, future researchers in the years to come. Therefore, it

is imperative to comprehend their suggestions, knowledge and their acceptance towards regenerative endodontics. This will also help us lay guidelines about the introduction and alterations pertaining to regenerative endodontics in post graduate curriculum. The residents' opinions might also be helpful in reconstructing the safety norms for carrying out regenerative endodontic therapies *in vivo*.

## Materials and Methods

After approval from the organizing committee, 125 copies of the questionnaire were circulated amongst dental colleges in Gujarat. The survey consisted of two parts. The first part contained questions regarding profile of respondents including year of study, age, sex, and

contact information. The second part contained 23 questions regarding knowledge and opinions about the use of Regenerative endodontic procedures and their application in a clinical scenario. The questionnaire data was analyzed by the number of responses as a percentage of the total responses to gain an insight into the majority opinions of the participants for each question. The data were cross-tabulated and chi-square test (with  $p < 0.05$  as significant value) was applied to find out significance for various responses.

## Results

The questionnaire with responses and results are shown in Table 1.

Question	Response	% (n)
Which is your field in Dentistry?	Endodontics	24 (30)
	Pedodontics	9.6 (12)
	Oral diagnosis	6.4 (8)
	Orthodontics	9.6 (12)
	Periodontics	24 (30)
	Prosthodontics	4.8 (6)
	Oral surgery	16 (20)
	Community dentistry	5.6 (7)
How many years have you been into practice?	0-5 years	83.2 (104)
	5-10 years	16 (20)
	>10 years	0.8 (1)
What is your gender?	Male	36 (45)
	Female	64 (80)
What is your age group?	20-25 years	68.8 (86)
	25-30 years	31.2 (39)
	30-35 years	0 (0)
	>35 years	0 (0)
How frequently do you read scientific dental journals?	Every week	43.2 (54)
	Every fortnight	16 (20)
	Every month	28.8 (36)
	Never	12 (15)
Have you received continued education in stem cells and/or regenerative dental treatment?	Yes	37.6 (47)
	No	62.4 (78)
Should regenerative therapy be included into dentistry?	Yes	91.2 (114)
	No	8.8 (11)
Have you or any of your relatives used any type of stem cell banking?	Yes	33.6 (42)
	No	66.4 (83)

Do you think that dental stem cell banking will be useful to be able to regenerate dental tissues?	Yes	88 (110)
	No	12 (15)
How many years do you think it will take for some regenerative stem cells therapies to be used in dentistry?	0-5 years	24.8 (31)
	5-10 years	40 (50)
	10-20 years	28.8 (36)
	>21 years	6.4 (8)
How many years do you think it will take before dentists are able to implant new teeth grown in a laboratory?	0-5 years	20 (25)
	5-10 years	24 (30)
	10-20 years	32 (40)
	>21 years	24 (30)
Would you be willing to attend a training course and/or continuing education courses to apply regenerative dental treatment?	Yes	88 (110)
	No	12 (15)
What do you think would be the biggest obstacle to a patient accepting regenerative dental treatment?	Higher cost	87.2 (109)
	Fear of stem cell	7.2 (9)
	Other reasons	5.6 (7)
Would you be willing to save teeth and dental tissues for regenerative dental treatment?	Yes	91.2 (114)
	No	8.8 (11)
Do you think that regenerative dental treatment will be a better treatment option than tooth implant placement?	Yes	81.3 (102)
	No	18.4 (23)
Are you concerned about any potential hazards regarding the use of stem cell as part of regenerative dentistry?	Yes	53.6 (67)
	No	46.4 (58)
Do you believe that dental professional association should regulate the use of stem cells and regenerative dentistry?	Yes	89.6 (112)
	No	10.4 (13)
Would you be willing to deliver dental treatments that involve embryonic stem cell sourced from a human fetus?	Yes	80.8 (101)
	No	19.2 (24)
Do you use any type of regenerative procedures in your practice, such as membranes, scaffolds, or bioactive materials?	Yes	58.4 (73)
	No	41.6 (52)
What is your assessment of regenerative dental treatment outcomes?	Successful	51.2 (64)
	Failure	4 (5)
	Don't know	44.8 (56)
After non-surgical root canal treatment, would healing of periapical tissues be enhanced by tissue engineering?	Yes	60 (75)
	No	8.8 (11)
	May be	31.2 (39)
Which of the following regenerative endodontic treatment is the most valuable?	Healing of periradicular bone	30.4 (38)
	Continued root development in immature teeth	23.2 (29)
	Pulp tissue revascularization within root canal	35.2 (44)

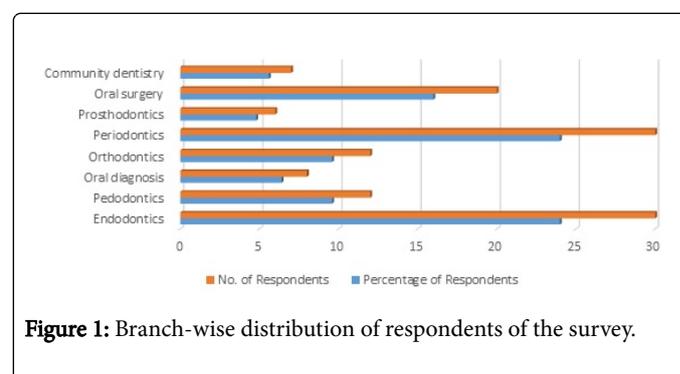
	Tooth re-implantation	11.2 (14)
What do you consider to be optimal treatment option for necrotic immature teeth?	Calcium hydroxide apexification	20.8 (26)
	Calcium hydroxide apexification followed by MTA apical plug and back filling obturation material	33.6 (42)
	MTA apical plug and back fill with obturation material	28.8 (36)
	Triple antibiotic paste and pulpal regeneration	16.8 (21)
Would the financial incentive be the only motive for providing regenerative treatment?	Yes	38.4 (48)
	No	61.6 (77)
In a case where you can't provide a regenerative treatment, would you be willing to refer your patient to a stem cell treatment center?	Yes	81.6 (102)
	No	18.4 (23)
Would you willing to collect dental tissue from your patients for stem cell banking?	Yes	83.2 (104)
	No	16.8 (21)
Do you believe there is a risk that stem cell clinics will deliver future dental treatments?	Yes	52.8 (66)
	No	47.2 (59)
What would be the most likely reason to recommend stem cell and regenerative dental treatments to your patients?	Most effective treatment option	52.8 (66)
	Safe and reliable	28.8 (36)
	Most cost effective	12 (15)
	Profitable	6.4 (8)
	Not recommendable	0 (0)

**Table 1:** A survey of opinions of post graduate residents towards Regenerative endodontic procedures.

Age group for the participants was between 20-30 years. Almost two thirds of the respondents were females. Out of all the participants of the survey, endodontic and periodontic residents were each 24% with majority of them (84.61%) having training of less than 5 years in their respective fields.

62.4% of the respondents had not received some form of education and training in regenerative endodontics. Most endodontic (89%) and periodontic (80%) residents were positive in their response while responses of the other branches' residents varied between 0-50%. This difference was statistically significant. ( $\chi^2=167.023$ ,  $df=16$ ,  $p<0.001$ ) Majority of the participants (91.2%) were of the opinion that regenerative therapy should be incorporated into dentistry. Almost third of the respondents had some relative/s who used umbilical cord or some other type of stem cell banking and most (88%) were optimistic about the prospect of dental tissue regeneration from the stem cells in the future. Those participants whose relative had used stem cell banking were more eager to use regenerative procedure in their practice. ( $\chi^2=129.316$ ,  $df=4$ ,  $p<0.001$ ) However, they responded that it may take a decade or two before the regenerative stem cell therapy can be used in dentistry. Most of them (88%) were willing to get a training course on regenerative endodontics. One factor that may come out as an obstacle to widespread application of Regenerative endodontic procedures is high cost according to 87.2% participants. Half the respondents were fearing professional hazards from Regenerative endodontic procedures and most (89.6%) believed that a professional body should regulate stem cells' use in regenerative dentistry. 58.4 % of the participants use some form of regenerative

therapy into their practice and about half of all respondents felt the outcome of this therapy to be successful while 44.8% were confused about the outcome of Regenerative endodontic procedures. majority were in favor of delivering future regenerative dental treatments to their patients and refer them to the facility for collection of stem cells if need arises. More than half (52.8%) felt that Regenerative endodontic procedures would most likely be recommended because it is the most effective treatment option for their patients (Figure 1).



**Figure 1:** Branch-wise distribution of respondents of the survey.

## Discussion

The use of stem cells of dental origin for tissue engineering is an interesting possibility after the discovery of stem cells in the pulp of permanent and deciduous teeth [14]. Recent research work in the field

of stem cells especially of dental, pulpal, and periodontal origin suggest that tissue engineering may be used successfully to regenerate dental and periodontal tissues [11]. Before this becomes a practical possibility, sufficient interest and knowledge supported by research and evidences by the commercial service providers is must. Hence, this survey was carried out to collect information about the awareness, understanding and current clinical scenario about regenerative procedures amongst the residents in India.

Overall this survey showed positive response from the respondents most of whom showed eagerness to have regenerative therapy being incorporated into the dental practice. According to three fourths of the participants felt that in the next decade or two, the regenerative approach would be able to provide the clinicians a treatment option of implanting laboratory grown teeth for their patients. The overwhelmingly positive response from the residents may be attributed to the increasing amount of scientific discussions, symposiums, and papers published in the dental and allied journals on regenerative therapeutic possibilities [15,16].

Although majority of the residents were willing to save natural teeth and dental tissues through regenerative procedures and gave it preference over implants as a treatment option for their patients, almost all showed a desire to equip themselves with some training to carry out regenerative procedures, indicating an underlying lack of knowledge to practice these procedures. Another concern that surfaced through this questionnaire survey was that of the appropriate ethical regulation by the regional professional authorities. Importance of implementing stringent regulations have also been stated by Epelman et al. [12]. Before the regenerative procedures become centerpiece of dental treatment options, sound scientific data needs to be laid down by research. Amongst all the optimism surrounding regenerative therapy, only about the third of the respondents had used stem cell banking for themselves or relatives, although this may be due to unavailability to such options and, lack of knowledge and awareness in this part of the world. The only barrier that they felt for regenerative therapy to be accepted widely would be higher cost.

More than half of the postgraduate residents were been doing some type of regenerative therapies in their department clinics, mostly limited to use of membranes, scaffolds or bioactive materials. Almost half of the residents were in dilemma about results of regenerative procedures. Almost two thirds of the residents felt that regenerative procedures are valuable especially in pulp tissue revascularization within root canal and healing of periradicular bone. One thirds of the participants voted the application of calcium hydroxide followed by MTA apical plug and backfilling with obturation material to be the optimum treatment for necrotic immature teeth. This reflects the fact that the postgraduate resident trainees are not trained efficiently in performing advanced regenerative endodontic techniques. Thus, there is a requirement for continuing education and training programs related to all treatments that address various regenerative treatment procedures as and when they are deemed as a clinically feasible treatment option.

Safety norms have to be in place to protect research participants receiving stem cell transplants, and patients at large from receiving unproven stem cell therapies. Guidelines related to stem cell research in India have been laid down by Indian Council of Medical Research that were revised in March 2012 [17]. These apply to all including independent researchers, institutions, corporate research departments, and monitoring ethical committees, researching on human stem cells and/or their derivatives. However, as the research progresses and facts

unfold unto us, more extensive and detailed guidelines need to be formed and implemented, especially in fields like medicine and dentistry that deals with practical applications of the research.

## Conclusion

The postgraduate respondents, although showed through their answers general optimism, at the same time they also expressed unanimously the need for more research and practical training for them. Participants also felt an imminent necessity for ethical regulation of regenerative procedures carried out in clinical practice. To understand the true awareness on this topic on a global scale, more survey research like this needs to be carried out amongst clinicians, academicians and residents in other locations. Present data along with future survey research will guide the clinicians and researchers alike.

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