Factors Influencing the Dentist's Decision to Propose a Tooth Autotransplantation in the Faculty of Dentistry, Chulalongkorn University

Thunchanok Sinprasurdsook* Kanit DhanesuanSunisa Rochanaibhata****
Kiti Siriwatana Issarapong Kaewkamnerdpong*****

Abstract

Objectives: To study factors which influence a dentist's decision to propose the Tooth Autotransplantation (AT).

Material and methods: A cross-sectional study was conducted among 99 dentists between January and March 2021. A questionnaire comprised demographic characteristics, unguided scenario, guided scenario, reasoning behind decisions, experience, and knowledge of AT. Data were analyzed using the Chi-square test, and multiple logistic regression.

Results: The respondents comprised 73 females and 26 males with a mean age of 30.84 ± 6.238 years. In the unguided scenario, there were significant associations between fields of expertise, experience, knowledge of current indications, outcomes, and the benefits of AT with the dentists' decision to propose AT, whereas in the guided scenario, experience in proposing AT, knowledge of follow-ups, and outcomes were significant. After each associated factors were analyzed with multiple logistic regression, the result showed that dentists who indicated that they have proposed AT to patients were 9.592 times more likely to propose AT in the unguided scenario, and a value were 27.97 times in the guided scenario.

Conclusions: Dentist's experience of proposal AT is significantly associated with the dentist's decision to propose AT. Hence, dentist is an important part for increasing number of AT cases. To lessen the extent to which AT is disregarded or misunderstood, future educational initiatives should incorporate more experiential and observational opportunities for dental students and post-graduate professionals.

Keywords: Tooth Autotransplantation, Decision-making, Proposal

Received Date: Nov 03, 2021
Revised Date: Nov 24, 2021
Accepted Date: Aug 19, 2022

**Master of Science Program in Oral and Maxillofacial Surgery, Faculty of Dentistry, Chulalongkorn University 34 Henri Dunant Wang Mai, Pathum Wan, Bangkok 10330, Thailand.*
***Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Chulalongkorn University 34 Henri Dunant Wang Mai, Pathum Wan, Bangkok 10330, Thailand.*
****Department of Community Dentistry, Faculty of Dentistry, Chulalongkorn University 34 Henri Dunant Wang Mai, Pathum Wan, Bangkok 10330, Thailand.*

Introduction

Tooth loss is one of the most common oral health problems globally (1). The causes of tooth loss consist of dental caries, periodontitis, and etc.(2-7) In Thailand (8), it was found that the percent of samples with dental caries in all subjects aged increased. There are many options for dental substitutions of a single missing tooth and recent studies have indicated that Tooth Autotransplantation (AT) is a promising option (9). Despite the overall survival rate of AT was being recently reported to be more than 90% (10-19), which a value similar to dental implants, the number of patients choosing this method was observed to be less. There are many superior advantages to AT with regards to function, aesthetic, and cost-effectiveness (9,13,19-23). However, AT also has limitations such as sensitive technique, requirement of donor tooth, and dentist's skill (13). Nowadays, there are many new innovations used to increase the likelihood of successful outcomes and reduce the complications of AT (24-30).

According to Tsukiboshi et al., the data revealed that more than 1000 patients were performed AT over the previous 30 years in private practice (18). Moreover, the other paper revealed that 637 AT cases were collected from 1990 to 2010 (31). In Thailand, one hundred and thirty-six patients were received a tooth transplantation from Faculty of Dentistry, Mahidol University between 1995 and 2004 (32). However, according to data from the Faculty of Dentistry, Chulalongkorn University over the last ten years, the number of patients who underwent AT was only 60 cases. Fewer patients opted for AT when compared with other institutes.

Furthermore, the dentist plays an important role in planning and proposing patient alternative and appropriate treatments based on the patient's information. The dentist's decision to incorporate alternative treatment can be influenced by several clinical and non-clinical factors (i.e., patient-related factors and physician-related factors) (33-36). Nevertheless, it is possible that concrete determination of the relevant importance of either factor is being challenged due to differences in treatment options (33-40).

To date, no studies regarding factors related to the dentist's decision to propose AT have been conducted, and as a result, relevant research is deficiency. Hence, this study seeks to investigate why such a small number of patients were treated with AT in this department and which factor influenced dentist's decision to propose AT option. The association and the relationship between the related factors and dentist's unprimed and primed decisions will be analyzed. To engage these aims, this study will identify factors relevant to the dentist's decision so that these can be further enhanced and developed to incorporate better treatment options for patients in appropriate settings and increase the likelihood of dentist's recommending this treatment. This is important, as it is the patients themselves who stand to benefit from a more informed decision reached by a dental professional.

Materials and Methods

An online questionnaire-based survey via Google Forms was randomly distributed among 250 dentists from all departments in the Faculty of Dentistry, Chulalongkorn University from January to March 2021. The link of questionnaire

was sent to staffs in relevant departments of the Faculty of Dentistry, who were then randomly sent this to the targeted sample group. The questionnaire's content was designed based on previous related studies and documents which surveyed and analyzed factors affecting the dentist's decision to propose treatment options and obtained a content validity score of 0.972 (41). Ethical approval and participant informed consent were obtained (HREC-DCU-P 2020-002, HREC-DCU 2020-118). Based on significant findings from a pilot study, a sample size of 100 was found by employing the Two Independent Proportions Formula (42,43).

The questionnaire consisted of 7 parts: 1) demographic characteristics involving age, gender, graduation year of bachelor's degree of dentistry, level of education, specialist branches, main workplace, and income; 2) an unguided scenario with necessary details, where respondents were enquired to rank the three most appropriate treatment options with open-end answer for replacing the space after extracting the first molar tooth, based on their clinical judgment; 3) closed-end questions probing whether dentists propose AT for patients when presented with the opportunity to do so (guided scenario); 4) a dropdown of reasons behind decision in relation to responses in section 3; 5) closed-end questions about experience with AT and participant's proposal style; 6) exploration of perceptive concerning 10 aspects of AT such as the advantages, indications, and limitations with answers being indicated by a Likert scale of 1-10 (strongly disagree to strongly agree); and 7) recommendations and feedback.

Four types of analysis were used for this research, including descriptive statistics, Chi-square Test of Independence, McNemar test, independent T-test, and multiple logistic regression. In addition, data were grouped or subdivided in order to achieve the assumptions of various statistical tests, (e.g., grouping to achieve normal distribution), or categorized into positive and negative responses prior to analysis. Statistical significance is set at $p < 0.05$. All data analysis was performed using SPSS (IBM SPSS® Statistics, version 22.0)

Results

One hundred and four participants (response rate = 41.6 percent) responded the questionnaire. There are 5 excluded participants comprising of one duplicate and four inconsistent responses. A total of ninety-nine respondents comprised 73 females (73.7%) and 26 males (26.3%) with a mean age of 30.84 years (SD 6.238). Average clinical experience was found to be 7.22 years (SD 6.426). Fields of expertise were found to be General Dentistry (24.2%), Oral and Maxillofacial Surgery (22.2%), and others (53.6%). In addition, it was found that 94 respondents (94.9%) have learned about AT in their courses of study. A total number of 44 respondents (44.4%) indicated that they have seen AT. Fifty-three participants (53.5%) indicated that they have proposed AT to patients in clinical settings. Overall, 57.6% of respondents proposed AT as a potential treatment option in the unguided scenario. The number of respondents choosing to propose AT changed once guided, such that after being guided and notified that AT was a viable treatment option, a 25.2% increase was observed. The groups by dentist's decision to propose AT in both unguided and guided scenarios were showed in Table 1.

Table 1. Groups by Dentist's Decision to Propose AT in Both Unguided and Guided Scenarios.

	Dentist's decision to propose AT			
Group	**Unguided**	**Guided**	**Amount (%)**	**Most common reasons**
1	No	Propose	28 (28.3%)	50% There is an appropriate donor tooth that can be used in AT.
2	No	No	14 (14.1%)	57.2% Insufficient Experience or Confidence to perform AT
3	Propose	No	3 (3%)	66.7% Lack expertise to perform AT
4	Propose	Propose	54 (54.5%)	68.5% There is an appropriate donor tooth that can be used in AT.

Dentist's demographic and experience

In the unguided scenario, having "seen" and "proposed" tooth autotransplantation were significantly associated with the dentists' decision to propose AT (Seen: $\chi 2$ (1, n = 99) = 7.444, p-value = 0.006; Propose: $\chi 2$ (1, n = 99) = 25.913, $p < 0.001$). In addition, a significant association was found between field of expertise and the dentist's decision in only the unguided scenario ($\chi 2$ (2, n = 99) = 10.440, p = 0.005). Having proposed AT was also significantly associated with the respondents' decisions to propose AT in the guided scenario (Propose: $\chi 2$ (1, n = 99) = 18.736, $p < 0.001$). Other variables were not significantly associated with decisions to propose AT in either scenario.

The association between dentist's characteristics and decision to propose AT were showed in Table 2.

Table 2. Association Between Dentist's Characteristics and Decision to Propose AT.

Characteristics		n	%	Unguided (% Propose)	p-value	Guided (% Propose)	p-value
1 Gender	Male	26	26.3	14 (53.8%)	0.654	21 (80.8%)	0.746
	Female	73	73.7	43 (58.9%)		61 (83.6%)	
2 Age (Mean 30.84 yr., SD 6.238),	< 30 years	61	61.6	38 (62.3%)	0.229	50 (82.0%)	0.773
	≥ 30 years	38	38.4	19 (50%)		32 (84.2%)	
3 Postgraduate experience (Mean 7.22 yr., SD 6.426)	< 7 years	66	66.7	41 (62.1%)	0.196	55 (83.3%)	0.851
	≥ 7 years	33	33.3	16 (48.5%)		27(81.8%)	
4 Postgraduate qualification	General dentists	79	79.8	47 (59.5%)	0.443	66 (83.5%)	0.743
	Specialist (Board)	20	20.2	10 (50%)	16 (80%)		
	≥ 50,000 baht	41	41.4	21 (51.2%)		34 (80.5%)	
5 Field of expertise	General Dentistry	24	24.2	10 (41.7%)	0.005***	18 (75.0%)	0.165
	Oral and Maxillofacial Surgery	22	22.2	19 (86.4%)		21 (95.5%)	
	Others	53	53.5	28 (52.6%)		43 (81;1%)	
6 Main workplace	Dental school	34	34.3	21 (61.8%)	0.777	30 (88.2%)	0.567
	Public hospital	33	33.3	19 (57.6%)		27 (81.3%)	
	Private hospital and dental clinics	32	32.3	18 (53.1%)		26 (78.8%)	
7 Groups of income	< 50,000 baht	58	58.6	36 (62.1%)	0.282	49 (84.5%)	0.604
	≥ 50,000 baht	41	41.4	21 (51.2%)		34 (80.5%)	
8 Experience of AT							
Learn	Yes	94	94.9	54 (57.4%)	0.910	78 (83.0%)	0.863
	No	5	5.1	3 (60%)		4 (80%)	
Seen	Yes	44	44.4	32 (72.7%)	0.006***	39 (88.6%)	0.171
	No	55	55.6	25 (45.5%)		43 (78.2%)	
Done	Yes	5	5.1	3 (60%)	0.910	5 (100%)	0.296
	No	94	94.9	54 (57.4%)		77 (81.9%)	
Propose	Yes	53	53.5	43 (81.1%)	<	52 (98.1%)	<
	No	46	46.5	14 (30.4%)	0.001***	30 (65.2%)	0.001***
9 Proposal Style	Deliberative model	27	27.3	13 (48.1%)	0.245	22 (81.5%)	0.828
	Informative model	73	72.7	44 (61.1%)		60 (83.3%)	

Note(s): *** indicates $p < 0.05$ (Chi-square test)

The mean Likert score in both "propose" and "not propose" groups' responses concerning 10 facts about AT are shown in Table 3. Specifically, 'Success rates and survival rates of the transplanted tooth are more than 90%.' (Fact no. 9) was observed to have a significant and strong association in both unguided and guided case scenarios (Propose: M = 7.53, SD = 1.691; Not Propose: M = 6.10, SD = 2.218, t (97) = -3.644, p < 0.0001; and Propose: M = 7.34, SD = 1.604, Not Propose: M = 4.88, SD = 2.713, t (18.384) = -3.609, p = 0.002, respectively).

The dentist's decision to propose AT significantly changed after being guided ($\chi 2$ (1, n = 99) = 18.581, p < 0.0001).

Table 3. Results of Independent t-test between facts about AT in unguided and guided case scenarios.

No.	Facts	Groups	Unguided				Guided			
			n	Mean	SD	p-value	n	Mean	SD	p-value
1	Both incomplete and complete root formation can be transplanted.	Propose	57	7.53	2.331	< 0.001***	82	6.80	2.701	0.151
		No	42	5.24	3.207		17	5.35	3.807	
2	Not only young patient but also older patients are eligible for AT.	Propose	57	6.47	2.414	0.052	82	6.16	2.589	0.267
		No	42	5.40	2.988		17	5.35	3.239	
3	Not only the third molars but also any non-functional natural tooth is an eligible donor for AT.	Propose	57	7.95	2.371	0.349	82	7.87	2.557	0.351
		No	42	7.38	3.320		17	6.94	3.816	
4	AT requires a donor tooth from the patient that fits the recipient site.	Propose	57	8.77	2.018	0.981	82	8.82	1.988	0.595
		No	42	8.76	2.034		17	8.53	2.183	
5	AT costs less than dental implants.	Propose	57	7.86	2.474	0.077	82	7.68	2.610	0.055
		No	42	6.88	2.965		17	6.29	3.037	
6	The procedure is lengthy and is complicated.	Propose	57	6.33	2.911	0.236	82	6.22	2.902	<0.001***
		No	42	7.02	2.763		17	8.59	1.543	
7	AT requires a high level of surgical skill for atraumatic extraction and preparation of the recipient site to fit donor tooth.	Propose	57	9.51	0.889	0.580	82	9.44	0.904	0.545
		No	42	9.40	0.964		17	9.59	1.004	

Table 3. (Next Page)

No.	Facts	Groups	Unguided				Guided			
			n	Mean	SD	p-value	n	Mean	SD	p-value
8	After transplantation, the patient has to follow up frequently.	Propose	57	8.91	1.672	0.960	82	8.87	1.639	0.470
		No	42	8.93	1.520		17	9.18	1.425	
9	Success rates and survival rates of the transplanted tooth are more than 90%.	Propose	57	7.53	1.691	0.001***	82	7.34	1.604	0.002***
		No	42	6.10	2.218		17	4.88	2.713	
10	After transplantation, the donor tooth has a chance to revascularize without using a root canal treatment.	Propose	57	5.95	2.682	0.007***	82	5.45	2.663	0.335
		No	42	4.50	2.412		17	4.76	2.635	

Note(s): *** indicates $p < 0.05$ (independent T-test)

Table 4. Logistic Regression Models for The Association Between Variables and Dentist's Decision to Propose AT in Unguided Scenario.

Variables (Unguided)		Dentist's decision to propose AT (Propose)	
		Crude odds ratio (95% CI)	Adjusted odds ratio (95% CI)
Postgraduate experience			
< 7 years		1	1
> 7 years		0.574 (0.247-1.336)	0.289 (0.080-1.046)
Field of expertise			
General Dentistry		1	1
Oral and Maxillofacial Surgery		8.867 (2.052-38.305)**	5.588 (0.976-33.132)
Others		1.568 (0.592-4.154)	2.199 (0.622-7.780)
Dentist's experience of AT			
Seen	No	1	1
	Yes	3.200 (1.368-7.484)**	1.034 (0.313-3.418)
Propose	No	1	1
	Yes	9.829 (3.872-24.951)***	9.592 (2.927-31.432)***

Table 4. (Next Page)

Variables (Unguided)		Dentist's decision to propose AT (Propose)	
		Crude odds ratio (95% CI)	Adjusted odds ratio (95% CI)
Knowledge about			
Fact No.1 Indication	Score < 8	1	1
	Score ≥ 8	4.431(2.017-11.570)***	4.035 (1.262-12.901)*
Fact No.5 Costs	Score < 8	1	1
	Score ≥ 8	2.000(0.883-4.532)	1.391(0.448-4.319)
Fact No.9 Outcome	Score < 8	1	1
	Score ≥ 8	4.730(1.951-11.468)***	1.171(0.278-4.940)
Fact No.10 Benefit	Score < 8	1	1
	Score ≥ 8	3.415(1.150-10.139)**	1.345(0.221-8.166)

Note(s): *** indicates $p < 0.001$; ** indicates $p < 0.01$; * indicates $p < 0.05$; CI: confidence interval

Fact No.1 'Both incomplete and complete root formation can be transplanted.'

Fact No.5 'AT costs less than dental implants.'

Fact No.9 'Success rates and survival rates of the transplanted tooth are more than 90%.'

Fact No.10 'After transplantation, the donor tooth has a chance to revascularize without using a root canal treatment.'

Further multivariate analysis revealed that dentists who have previously proposed AT were 9.592 times more likely (95% C.I., 2.927–31.432) to propose AT as a possible treatment in the unguided scenario. Similarly, dentists who provided scores higher than 8 on the 10-point Likert scale of fact no. 1 were found to be 4.035 times more likely (95% C.I., 1.262–12.901) to propose AT than those who provided lower scores.

Table 5. Logistic Regression Models for The Association Between Variables and Dentist's Decision to Propose AT in the Guided Scenario.

Variables (Guided)		Dentist's decision to propose AT	
		Crude odds ratio (95% CI)	Adjusted odds ratio (95% CI)
Field of expertise			
General Dentistry		1	1
Oral and Maxillofacial Surgery		7.000 (0.769-63.723)	2.834 (0.203-39.590)
Others		1.433 (0.453-4.536)	2.448 (0.516-11.605)
Dentist's experience of AT			
Seen	No	1	1
	Yes	2.177 (0.703-6.737)	0.465 (0.089-2.442)
Propose	No	1	1
	Yes	27.733 (3.501-219.706)**	27.967 (2.754-284.040)**
Knowledge about			
Fact No.5 Costs	Score < 8	1	1
	Score > 8	2.476 (0.853-7.185)	2.454 (0.627-9.600)
Fact No.6 Procedure	Score < 8	1	1
	Score > 8	2.943 (0.943-9.039)	2.175 (0.540-8.771)
Fact No.8 Frequently	Score < 8	1	1
	Score > 8	0.401 (0.107-1.496)	0.413 (0.065-2.615)
Fact No.9 Outcome	Score < 8	1	1
	Score > 8	7.875 (1.692-36.647)**	5.637 (0.883-35.983)

Note(s): *** indicates $p < 0.001$; ** indicates $p < 0.01$; * indicates $p < 0.05$; CI: confidence interval

Fact No.5 'AT costs less than dental implants.'

Fact No.6 'The procedure is lengthy and is complicated.'

Fact No.8 'After transplantation, the patient has to follow up frequently.'

Fact No.9 'Success rates and survival rates of the transplanted tooth are more than 90%.'

In the guided scenario, multiple logistic regression revealed several significant likelihoods. Dentists who indicated that they have proposed AT to patients, were 27.967 times more likely (95% C.I., 2.754–284.040) to propose AT in this scenario.

Discussion

A vast array of literature supports the fact that certain dentist-related (i.e., field of expertise, experience, and environment), patient-related (i.e., affordability, and behavior), and treatment-related factors(i.e., outcome, and procedure) influence a dentist's decision to propose treatment

options for a patient (44-49). As can be seen in the results section of this study, tooth autotransplantation is no exception to this given that several factors were identified to produce statistically significant likelihoods relating to the dentist's decision.

Priming respondents had a clear effect on respondents' decisions to propose AT as a possible treatment. These 4 divisions (Table1) are useful as they allow for more granular consideration of tendencies and trends in responses.

Group 1 respondents provided indication that the case scenario was a suitable candidate for AT only after being guided and reminded of AT as a possible treatment. This provides further stock to the assumption that this group may have been largely unaware of AT and were made aware through the priming process.

Sharply contrasting with the above Group 1 is Group 2, which despite priming, selected to not propose this option due to concerns about experience and confidence in performing this procedure. Despite their opposition to proposing AT, as can be inferred from the aforementioned reasoning, it is clear that experience and confidence were of greatest concern to this group.

Group 3, despite comprising only 3 individuals, unanimously selected to change their responses to not propose AT after being guided. The authors of this study assume that this was due to questionnaire fatigue or even possibly a misapprehension in the prompt of the guided case study. The reasons provided for this decision were based on reasoning similar to that provided in Group 2 which was concerned with experience.

The final major group, Group 4, correctly selected to propose AT in both the unguided and guided case scenarios, and the main reasons adopted in this group oriented around the donor tooth assessment. This should be adopted in future educational promotions so that more dentists are aware of when a patient has an appropriate donor tooth.

From the results of the Chi-square analysis, it was revealed that a significant proportion of respondents with backgrounds in oral and maxillofacial surgery (OMFS) consistently proposed AT as one of the treatment options. These respondents have garnered sufficient experience in closely observing and employing this treatment and are therefore more confident in their ability to successfully manage AT in the dental school setting employed in this study. Having proposed AT prior to the case study was the only significant variable observed in both the unguided and guided case scenarios. This may indicate that experience with AT is an important factor, as if an individual has proposed or performed a procedure before and is informed that this procedure is an applicable treatment option, it is more likely that they will do so in subsequent cases.

Brigitte et al. (50) findings support this observation, and found that dentists with specializations in respective fields are more likely to propose treatment options consistent with their field of specialization. Similar research conducted by Junges, et al. (49) recommended that dentists' decision-making process may not have incorporated evidence present in the case, but was more closely associated with factors such as professional expertise and patients' preferences. Put simply, their findings indicate that different areas of specialization corresponded to different considerations of factors regarding decision making. Further support of these

findings is found in studies conducted by Zitzmann et al. (45,49) and Cosyn et al. (48). Both studies posit strong correlations between dentist-related factors such as experience and specialization with the dentist's decision to propose treatment options.

On the other hand, research conducted by Lang-Hua et al. (51) found an opposing tendency in a group of specialists who had undertaken training in dental implants, such that postgraduate practitioners with implant training were three times more likely not to propose dental implants. The authors posit that this tendency may be due to familiarity with various better alternative methods of treatment, thus comprising dentist-related factors.

Such conclusions were apparent in studies conducted by Kronstorm et al. (44,45), whose findings indicate that dentist-related factors had little bearing on the dentist's decision to propose fixed and removable partial dentures in a cohort of Swedish dentists. This discrepancy among findings may stem from several factors, as the discussed cohorts may have varying levels of preference and experience with different treatments (33). Form this, it is possible that the decision to propose AT may be more susceptible to dentist-related factors, (e.g., specialization, experience, etc.), when compared with other treatments.

In the unguided case, dentists with experience in proposing AT were nearly ten times more likely to propose AT, and this likelihood tripled once guided. As one of the central questions this study seeks to engage relates to dentists' abilities to provide comprehensive treatment options to patients, this particular finding may indicate that further training and awareness around this treatment option may stand to benefit both practitioners and patients alike.

In the unguided regression analysis, respondents who responded correctly to fact no. 1 were over 4 times more likely to propose AT. This did not carry over to the regression analysis. After being guided, respondents knew that AT was a possible treatment. In addition, no knowledge-related factors were significantly associated with the decision to propose this treatment in the guided scenario.

Ultimately, the results of this study indicate that the dentist's knowledge, experience, and confidence significantly affect their decision to propose AT. Therefore, it is reasonable to conclude that when presented with low instances of this treatment, faculty may need to consider methods of increasing dentists' knowledge, experience, and confidence in AT. One way to do so could be to create media about AT for dentists. As was observed, knowledge pertaining to AT was deficiency in some participants. Specifically, questions probing knowledge of success rates, indications, and benefits of the treatment were found to be closely associated with the decisions to propose or not to propose AT. This indicates that these topics are germane concerns which may still be misunderstood by a significant proportion of the cohort.

In addition, given that a statistical significance was observed between unguided and guided decisions to propose, a screening checklist concerning the applicability of AT can be a desirable method to increase the likelihood that AT will be proposed in appropriate cases.

The results of this study indicate that AT was not a last resort choice for many practitioners; in fact, it was proposed as a treatment option in 20% of all responses. This recommends that the low prevalence of cases in this faculty may be due to other factors aside from dentists not

proposing this treatment. To examine this, further studies ought to consider additional factors in order to identify true causal factors. Such factors may include the patient's decision-making process, as well as consideration of the total number of applicable cases.

This study was limited by several factors. First, this was a study concerned with addressing the low prevalence of AT procedures observed in the Faculty of Dentistry, Chulalongkorn University. As the faculty comprises a wide range of specialists and facilities, and so as to avoid institutional biases (52), only practicing dentists from the faculty were invited to respond. Due to this restricted sampling technique, it is possible that differences between the sample and the general population of dentists may exist.

Furthermore, this study may have been limited in adopting an unguided-guided approach to elucidate changes in proposal style. As the names of the authors of this research were made known to practicing faculty members, it is possible that some respondents may have known that AT was a central topic of the survey before being guided. This, in turn, may have inflated the number of responses choosing to propose AT in unguided responses.

A final limitation stems from the mean age of respondents, which was found to be 30.84 years. As this research considered all treatments of AT from the past 10 years, it is possible that the respondents may not provide an ideal representation of the collected data as the majority would not have been practicing dentists capable of making proposals during the time period under investigation.

Conclusion

Despite scarce research considering this topic, the results of this study indicate that the dentist's experience with AT, one of dentist-related factors, is significantly associated with the dentist's decision to propose AT. Especially, dentists who have proposed AT to patients were more likely to propose AT than who haven't proposed. Hence, dentist is an important part for increasing number of AT cases. To lessen the extent to which AT is disregarded or misunderstood, future educational initiatives should incorporate more experiential and observational opportunities for dental students and post-graduate professionals. To increase dentist's experience in proposing AT will enhance and develop to incorporate better treatment options for patients in appropriate settings and increase the likelihood of dentist's proposing AT.

Acknowledgement

The authors would like to acknowledge all individuals, faculties, professors, and researchers whose collaboration made this study possible.

References

1. Kassebaum NJ, Smith AGC, Bernabé E, Fleming TD, Reynolds AE, Vos T, et al. Global, Regional, and National Prevalence, Incidence, and Disability-Adjusted Life Years for Oral Conditions for 195 Countries, 1990-2015: A Systematic Analysis for the Global Burden of Diseases, Injuries, and Risk Factors. J Dent Res. 2017;96(4):380-7.

2. Kristerson L, Lagerstrom L. Autotransplantation of teeth in cases with agenesis or traumatic loss of maxillary incisors. Eur J Orthod. 1991;13(6):486-92.

3. Gonnissen H, Politis C, Schepers S, Lambrichts I, Vrielinck L, Sun Y, et al. Long-term success and survival rates of autogenously transplanted canines. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2010;110(5):570-8.

4. Isa-Kara M, Sari F, Emre-Coskun M, Kustarci A, Burak-Polat H, Ozdemir H, et al. Stabilization of autotransplanted teeth using thermoplastic retainers. Med Oral Patol Oral Cir Bucal. 2011;16(3):e369-75.

5. Plakwicz P, Wojtowicz A, Czochrowska EM. Survival and success rates of autotransplanted premolars: a prospective study of the protocol for developing teeth. Am J Orthod Dentofacial Orthop. 2013;144(2):229-37.

6. McCaul LK, Jenkins WM, Kay EJ. The reasons for extraction of permanent teeth in Scotland: a 15-year follow-up study. Br Dent J. 2001;190(12):658-62.

7. Cahen PM, Frank RM, Turlot JC. A survey of the reasons for dental extractions in France. Journal of dental research. 1985;64(8): 1087-93.

8. Bureau of Dental Health. Department of Health MoPH. The 8th Thailand National Oral Health Survey Report 2017. Bangkok: Bureau of Dental Health; 2018.

9. Andreasen JO. Atlas of replantation and transplantation of teeth. Philadelphia: W.B. Saunders; 1992.

10. Atala-Acevedo C, Abarca J, Martinez-Zapata MJ, Diaz J, Olate S, Zaror C. Success Rate of Autotransplantation of Teeth With an Open Apex: Systematic Review and Meta-Analysis. J Oral Maxillofac Surg. 2017;75(1):35-50.

11. Rohof ECM, Kerdijk W, Jansma J, Livas C, Ren Y. Autotransplantation of teeth with incomplete root formation: a systematic review and meta-analysis. Clin Oral Investig. 2018;22(4):1613-24.

12. Tsukiboshi M. Autotransplantation of teeth: requirements for predictable success. Dent Traumatol. 2002;18(4):157-80.

13. Park JH, Tai K, Hayashi D. Tooth auto-transplantation as a treatment option: a review. J Clin Pediatr Dent. 2010;35(2):129-35.

14. Krassnig M, Fickl S. Congenitally missing lateral incisors--a comparison between restorative, implant, and orthodontic approaches. Dent Clin North Am. 2011;55(2):283-99, viii.

15. Chung WC, Tu YK, Lin YH, Lu HK. Outcomes of autotransplanted teeth with complete root formation: a systematic review and meta-analysis. J Clin Periodontol. 2014;41(4):412-23.

16. Almpani K, Papageorgiou SN, Papa-dopoulos MA. Autotransplantation of teeth in humans: a systematic review and meta-analysis. Clin Oral Investig. 2015;19(6):1157-79.

17. Tsuji K, Imai M, Ikenaga H, Nakama H, Kotaki S, Kakudo M, et al. Questionnaire after autotransplantation of teeth at Osaka Dental University Hospital. Journal of Osaka Dental University. 2022;56(1):121-6.

18. Tsukiboshi M, Yamauchi N, Tsukiboshi Y. Long-term Outcomes of Autotransplantation of Teeth: A Case Series. Journal of Endodontics. 2019;45(12, Supplement):S72-S83.

19. Akhlef Y, Schwartz O, Andreasen JO, Jensen SS. Autotransplantation of teeth to the anterior maxilla: A systematic review of survival and success, aesthetic presentation and patient-reported outcome. Dental Traumatology. 2018; 34(1):20-7.

20. Atkinson ME. Histopathological and immunological aspects of tooth transplantation. J Oral Pathol. 1978;7(2):43-61.

21. Andreasen JO, Kristerson L. Repair processes in the cervical region of replanted and transplanted teeth in monkeys. Int J Oral Surg. 1981;10(2):128-36.

22. Andreasen JO, Paulsen HU, Yu Z, Bayer T. A long-term study of 370 autotransplanted premolars. Part IV. Root development subsequent to transplantation. Eur J Orthod. 1990;12(1):38-50.

23. Andreasen JO, Paulsen HU, Yu Z, Bayer T, Schwartz O. A long-term study of 370 autotransplanted premolars. Part II. Tooth survival and pulp healing subsequent to transplantation. Eur J Orthod. 1990;12(1):14-24.

24. Shahbazian M, Jacobs R, Wyatt J, Denys D, Lambrichts I, Vinckier F, et al. Validation of the cone beam computed tomography-based stereolithographic surgical guide aiding autotransplantation of teeth: clinical case-control study. Oral Surg Oral Med Oral Pathol Oral Radiol. 2013;115(5):667-75.

25. Shahbazian M, Jacobs R, Wyatt J, Willems G, Pattijn V, Dhoore E, et al. Accuracy and surgical feasibility of a CBCT-based stereolithographic surgical guide aiding autotransplantation of teeth: in vitro validation. J Oral Rehabil. 2010;37(11):854-9.

26. Keightley AJ, Cross DL, McKerlie RA, Brocklebank L. Autotransplantation of an immature premolar, with the aid of cone beam CT and computer-aided prototyping: a case report. Dent Traumatol. 2010;26(2):195-9.

27. Sartaj R, Sharpe P. Biological tooth replacement. Journal of anatomy. 2006;209(4):503-9.

28. Abella F, Ribas F, Roig M, González Sánchez JA, Durán-Sindreu F. Outcome of Autotransplantation of Mature Third Molars Using 3-dimensional-printed Guiding Templates and Donor Tooth Replicas. J Endod. 2018;44(10):1567-74.

29. Jakse N, Ruckenstuhl M, Rugani P, Kirnbauer B, Sokolowski A, Ebeleseder K. Influence of Extraoral Apicoectomy on Revascularization of an Autotransplanted Tooth: A Case Report. J Endod. 2018;44(8):1298-302.

30. Abella Sans F, Ribas F, Doria G, Roig M, Durán-Sindreu F. Guided tooth autotransplantation in edentulous areas post-orthodontic treatment. Journal of Esthetic and Restorative Dentistry. 2021;33(5):685-91.

31. Yoshino K, Kariya N, Namura D, Noji I, Mitsuhashi K, Kimura H, et al. Comparison of prognosis of separated and non-separated tooth autotransplantation. J Oral Rehabil. 2013; 40(1):33-42.

32. Waikakul A, Punwutikorn J, Kasetsuwan J, Korsuwannawong S. Alveolar bone changes in autogenous tooth transplantation. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2011; 111(3):e1-7.

33. Grembowski D, Milgrom P, Fiset L. Factors influencing dental decision making. J Public Health Dent. 1988;48(3):159-67.

34. EISENBERG JM. Sociologic Influences on Decision-Making by Clinicians. Annals of Internal Medicine. 1979;90(6):957-64.

35. McKinlay JB, Potter DA, Feldman HA. Non-medical influences on medical decision-making. Soc Sci Med. 1996;42(5):769-76.

36. Bernheim SM, Ross JS, Krumholz HM, Bradley EH. Influence of patients' socioeconomic status on clinical management decisions: a qualitative study. Annals of family medicine. 2008;6(1):53-9.

37. Chassin MR, Brook RH, Park RE, Keesey J, Fink A, Kosecoff J, et al. Variations in the use of medical and surgical services by the Medicare population. N Engl J Med. 1986;314(5):285-90.

38. Eisenberg JM. Doctors' Decisions and the Cost of Medical Care: The Reasons for Doctors' Practice Patterns and Ways to Change Them. Health Administration Pr; 1986.

39. Pasley B, Vernon P, Gibson G, McCauley M, Andoh J. Geographic variations in elderly hospital and surgical discharge rates, New York State. Am J Public Health. 1987;77(6):679-84.

40. Grembowski D, Milgrom P, Fiset L. Dental decisionmaking and variation in dentist service rates. Social Science & Medicine. 1991; 32(3):287-94.

41. Polit DF, Beck CT. Nursing Research: Generating and Assessing Evidence for Nursing Practice. Wolters Kluwer Health/lippincott Williams & Wilkins; 2008.

42. Rosner B. Fundamentals of biostatistics. 7thed. Boston: Brooks/Cole, Cengage Learning; 2011.

43. Ngamjarus C, Chongsuvivatwong V, McNeil E. n4Studies: Sample Size Calculation for an Epidemiological Study on a Smart Device. Siriraj Medical Journal. 2016;68:160-70.

44. Kronström M, Palmqvist S, Söderfeldt B. Prosthodontic Decision Making among General Dentists in Sweden. III: The Choice between Fixed Partial Dentures and Single Implants. The International journal of prosthodontics. 2000;13:34-40.

45. Kronström M, Palmqvist S, Söderfeldt B, Carlsson GE. Dentist-related factors influencing the amount of prosthodontic treatment provided. Community Dentistry and Oral Epidemiology. 2000;28(3):185-94.

46. Torabinejad M, Goodacre CJ. Endodontic or dental implant therapy: The factors affecting treatment planning. The Journal of the American Dental Association. 2006;137(7):973-7.

47. Zitzmann NU, Zemp E, Weiger R, Lang NP, Walter C. Does a clinician's sex influence treatment decisions? Int J Prosthodont. 2011; 24(6):507-14.

48. Cosyn J, Raes S, De Meyer S, Raes F, Buyl R, Coomans D, et al. An analysis of the decision-making process for single implant treatment in general practice. J Clin Periodontol. 2012;39(2):166-72.

49. Junges R, Zitzmann NU, Walter C, Rösing CK. Dental care providers' decision making regarding maintenance of compromised teeth and implant therapy indication: an analysis of gender and enrollment in teaching positions. Clinical Oral Implants Research. 2014;25(9):1027-33.

50. Bigras BR, Johnson BR, BeGole EA, Wenckus CS. Differences in clinical decision making: a comparison between specialists and general dentists. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2008;106(1):139-44.

51. Lang-Hua BH, McGrath CPJ, Lo ECM, Lang NP. Factors influencing treatment decision-making for maintaining or extracting compromised teeth. Clinical Oral Implants Research. 2014;25(1): 59-66.

52. Aryanpour S, Van Nieuwenhuysen JP, D'Hoore W. Endodontic retreatment decisions: no consensus. Int Endod J. 2000;33(3):208-18.

Corresponding author:
Dr.Thunchanok Sinprasurdsook
Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Chulalongkorn University 34 Thanon Henri Dunant Wang Mai, Pathum Wan District, Bangkok 10330
Tel. (668) 9011 4455
E-mail: Thunchanok6492@gmail.com