



Survey about a dentist's proposal for tooth autotransplantation: Pilot study

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Abstract

According to the patient record database from 2010 to 2020, in the Faculty of Dentistry, Chulalongkorn University, there were just 40 cases that received a tooth autotransplantation (AT). The dentist plays a significant role in offering patients appropriate and alternative treatments. The small number of AT cases may come from a dentist who does not offer AT to patients as one of the options. Factors influencing their decision-making should be identified, hence there is a paucity of relevant research. The objective of this pilot study is to primarily survey the dentist's reasons and trends in deciding to offer an AT option to the patient for replacing the single edentulous area. A cross-sectional online questionnaire via Google Form was divided into 6 sections: 1) demographic characteristics, 2) dentist's decision with two case scenarios about dental substitution, 3) background in AT and the types of proposal style of participants, 4) reasoning of decisions, 5) eight facts about AT with choosing a Likert scale of 1-10 (strongly disagree to strongly agree), and 6) recommendations and feedback. Descriptive statistics were used to explain the results. 31 practicing dentists working outside the Faculty of Dentistry, Chulalongkorn University, answered the survey. The participants comprised 21 females and 10 males, with a mean age of 33.77 ± 9.79 years. Of the participants, 29 general dentists and 2 specialists (board qualification) had a mean of clinical experience of 9.65 ± 10.21 years. When compared with other options, the percentage of dentists who offered an AT as one of the treatment options was found to be only 13% and 12% in both case scenarios, respectively. AT was found to be the least popular treatment option even though it has many advantages. Besides, the reasons why dentists would or would not propose AT to patients were found and grouped into 3 main factors: dentist-related factors (i.e., knowledge of AT, experience and confidence in AT, expertise in AT, and facility of the environment), patient-related factors (i.e., patient's affordability, patient's behavior, and patient's impression of AT), and treatment-related factors (i.e., outcome and procedure of AT). From the results, the data showed a distribution, and this questionnaire was satisfactory in content validity index (CVI = 0.972) and reliability assessment (Cronbach alpha values = 0.822). Finally, this outcome can be used to determine factors that impact the dentist's decision about AT proposal and the reasons why the dentist would propose or not propose AT. Additionally, they can be shown in the further questionnaire as choices of selection.

Keywords: Tooth autotransplantation, Decision-making, proposal, Questionnaire development

1. Introduction

One of the most common oral health issues around the world is tooth loss (Kassebaum et al., 2017). Dental caries, periodontitis, and other factors contribute to tooth loss (Cahen, Frank, & Turlot, 1985; Gonnissen et al., 2010; Isa-Kara et al., 2011; Kristerson & Lagerstrom, 1991; McCaul, Jenkins, & Kay, 2001; Plakwicz, Wojtowicz, & Czochrowska, 2013). The percentage of samples with dental caries in all age groups increased in Thailand (Bureau of Dental Health. Department of Health, 2018). There are various methods for replacing a single edentulous area in the mouth, and recent studies have shown that tooth autotransplantation (AT) is one of the potential options (Andreasen, 1992). Even though the overall success rate of AT has lately been reported to be greater than 90% (Almpiani, Papageorgiou, & Papadopoulos, 2015; Atala-Acevedo et al., 2017; Chung, Tu, Lin, & Lu, 2014; Krassnig & Fickl, 2011; Park, Tai, & Hayashi, 2010; Rohof, Kerdijk, Jansma, Livas, & Ren, 2018; Tsukiboshi, 2002), which is comparable to dental implants, the number of patients opting for this procedure has been noted to be lower. In terms of function, aesthetics, and cost-effectiveness, AT has a lot of advantages (Andreasen, 1992; Andreasen & Kristerson,



1981; Andreasen, Paulsen, Yu, & Bayer, 1990; Andreasen, Paulsen, Yu, Bayer, & Schwartz, 1990; Atkinson, 1978; Park et al., 2010). However, AT also has drawbacks including a delicate method, the need for a donor's tooth, and the dentist's ability (Park et al., 2010). Many innovative developments are now being deployed to improve the chances of favorable results and lessen the difficulties associated with AT (Abella, Ribas, Roig, González Sánchez, & Durán-Sindreu, 2018; Jakse et al., 2018; Keightley, Cross, McKerlie, & Brocklebank, 2010; Sartaj & Sharpe, 2006; Shahbazian et al., 2013; Shahbazian et al., 2010). However, statistics from the Faculty of Dentistry, Chulalongkorn University, show that just 40 patients have had AT in the last ten years. When compared to other options, AT was chosen by fewer patients.

Furthermore, based on the patient's information, the dentist plays a significant role in offering patients appropriate and alternative treatments. The small number of AT cases may come from dentists who do not offer AT to patients as one of the options. Factors influencing their decision-making should be identified, hence there is a paucity of relevant research. From previous studies, several clinical and non-clinical factors can impact the dentist's decision to use alternative treatment (i.e., patient-related factors and clinician-related factors) (Bernheim, Ross, Krumholz, & Bradley, 2008; EISENBERG, 1979; D. Grembowski, Milgrom, & Fiset, 1988; McKinlay, Potter, & Feldman, 1996). Nonetheless, due to disparities in treatment options, specific assessment of the meaningful importance of any element may be difficult (Bernheim et al., 2008; Chassin et al., 1986; EISENBERG, 1979, 1986; D. Grembowski et al., 1988; David Grembowski, Milgrom, & Fiset, 1991; McKinlay et al., 1996; Pasley, Vernon, Gibson, McCauley, & Andoh, 1987).

To date, no studies and no tools about the factors that influence the dentist's decision to offer AT have been undertaken, hence there is a paucity of relevant research. As a result, the goal of this study is to survey the dentist's reasons and trends in deciding to offer an AT option to the patient for replacing the single edentulous area. Besides, the questionnaire will be tested and ensured that it is available to analyze factors influencing a dentist's decision to offer an AT option to a patient before using it in the further study.

2. Objectives

To survey the dentist's reasons and trends in deciding to offer an AT option to replace the single edentulous area

3. Materials and Methods

The samples were thirty-one dentists who had not been working in the Faculty of Dentistry, Chulalongkorn University, and could propose treatment options for replacing missing teeth to restore occlusion or for aesthetic purposes, with proficiency in the Thai language and sufficient skills and knowledge to access the questionnaire via Google Forms. The link to the questionnaire was randomly sent to groups of dentists in the Line application. The data collected from all respondents was done after sending the link for one month.

The initial questionnaire was created and modified before being subjected to tests of reliability and validity. The questionnaire was developed based on feedback from three experts to ensure a valid questionnaire design. Ethical approval and informed consent should be given by the participants before attending this research.

A cross-sectional online questionnaire via Google Form was divided into 6 sections: 1) demographic characteristics included gender, age, graduation year of bachelor's degree of dentistry, level of education, specialist branches, main workplace, and monthly salary, 2) two case scenarios with important patients' records with details of chief complaint, medical history, clinical examination, and radiographic examination. The participants were asked to rank the three most proper treatment options for replacing the single edentulous by using their clinical decision-making as a real situation with an open-end answer, 3) The background in AT and the types of proposal style of participants, 4) reasoning of dentist's decisions-making, 5) exploration of knowledge about AT concerning 8 facts of AT such as indications, procedures, and outcomes, with choosing a Likert scale of 1-10 (strongly disagree to strongly agree), and 6) recommendations and feedback.



The results were explained using descriptive statistics. SPSS (IBM SPSS® Statistics, version 22.0) was used to analyze all of the data.

4. Results and Discussion

4.1 Results

Two analyzing steps: content validity and reliability assessment

First, three experts calculated the content validity index (CVI) to build and improve each portion of the primary questionnaire. This method yielded a value of 0.972, which indicates that the content is considered valid when adopting an industry-standard value of 0.8 (Polit & Beck, 2008). Before participating in this study, the subjects need to grant their ethical approval and informed consent.

Second, for reliability assessment (Bland & Altman, 1997), the 0.822 Cronbach alpha value of the questionnaire was satisfactory ($\alpha > 0.70$).

Descriptive analysis

There were thirty-one dentists (respond rate = 25.8%) working outside the Faculty of Dentistry, Chulalongkorn University, responding to the survey.

Section 1 Demographic data

Gender, age, year of graduation from a bachelor's degree in dentistry (experience), level of education, specialty branches, primary workplace, and monthly remuneration are all included in the demographic data of the participants in Table 1.

Table 1 Demographic data

Variables	Data	n (31)	%
Gender	Male	10	32.26
	Female	21	67.74
Age <i>Mean 33.77 ± SD 9.8</i>	<30 years	18	58.06
	≥30 years	13	41.94
Experience <i>Mean 9.65 ± SD 10.21</i>	<10 years	21	67.74
	≥10 years	10	32.26
Level of education	General dentists	29	93.55
	Specialist (Board)	2	6.45
Main workplace	Private dental clinics	7	22.58
	Dental school	6	19.35
	Public hospital	17	54.84
	Private hospital	1	3.23
Salary	< 50,000 baht	10	32.26
	≥ 50,000 baht	21	67.74

Thirty-one practicing dentists working outside the Faculty of Dentistry, Chulalongkorn University answered the survey. The participants comprised 21 females (32.26%) and 10 males (67.74%), with a mean age of 33.77 ± 9.8 years. Of the participants, there were 29 general dentists (93.55%) and 2 specialists with board qualifications (6.45%) with a mean of clinical experience of 9.65 ± 10.21 years. The main workplace, where participants worked, comprised 17 public hospitals (54.84%), 7 private dental clinics (22.58%), 6 dental schools (19.35%), and 1 private hospital (3.24%), respectively. Twenty-one participants (67.74%) obtained salaries greater than 50,000 baht per month.

Section 2 Two case scenarios

The first options that the participants offered to the patients in both case scenarios are shown in Figures 1 and 2, respectively.

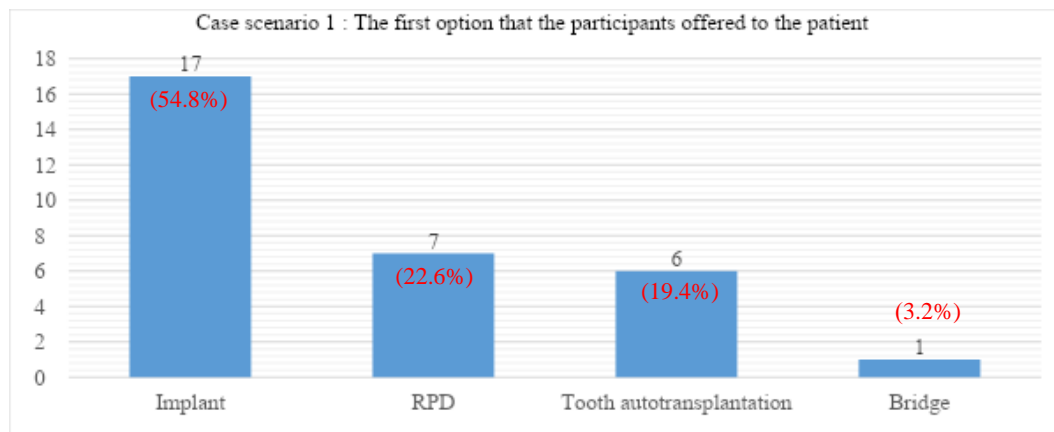


Figure 1 The first option that the participants offered to the patient in case scenario 1

In the questionnaire's proposed case scenario 1, 54.8% of participants chose implant as their first choice, followed by a removable partial denture (RPD) at 22.6%, AT at 19.4%, and bridge at 3.2%, respectively.

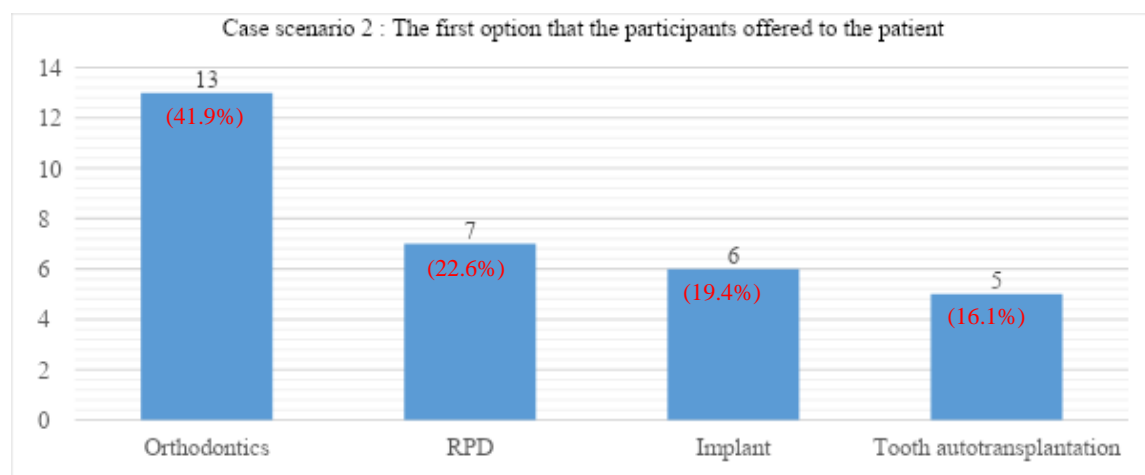


Figure 2 The first option that the participants offered to the patient in case scenario 2

In the questionnaire's proposed case scenario 2, 41.9% of participants chose orthodontic treatment as their first choice, followed by a removable partial denture (RPD) at 22.6%, implant at 19.4%, and AT at 16.1 %, respectively.

From all of the options offered by dentists in both case scenarios, the comparison between AT and other choices is shown in Figure 3.

When compared with other options, the percentage of dentists who offered an AT as one of the treatment options was found to be only 13% and 12% in both case scenarios, respectively.



Section 3 The background in AT and types of proposal style of participants are shown in Table 2.

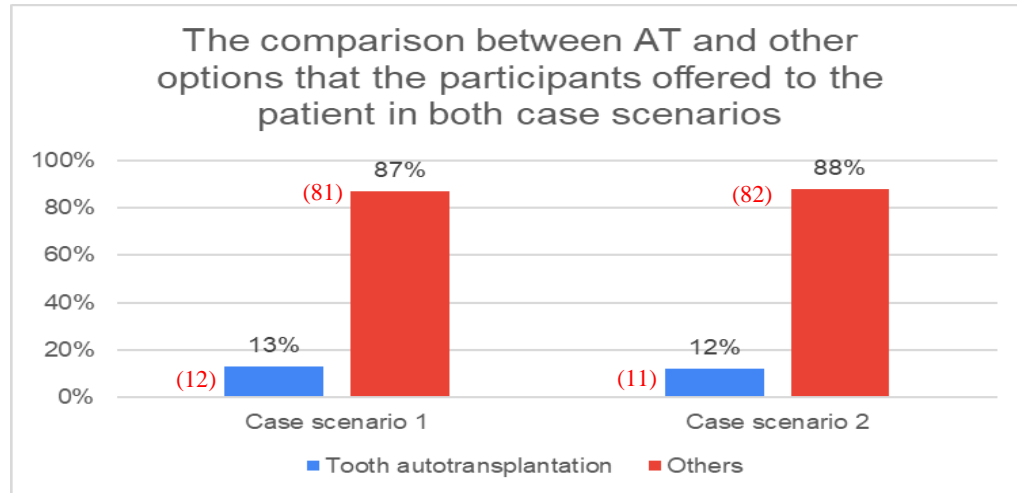


Figure 3 The comparison between AT and other options that the participants offered to the patient in both case scenarios

Table 2 The background in AT and types of proposal style of participants

No.	Variables	Data	n (31)	%
1	Experience about AT*	Yes	25	80.6
		No	6	19.4
	Seen	Yes	13	41.9
		No	18	58.1
	Done	Yes	4	12.9
		No	27	87.1
	Propose	Yes	14	45.2
		No	17	54.8
2	Proposal style	Deliberative model	12	38.7
		Informative model	17	54.8
		Interpretative model	1	3.2
		Paternalistic model	1	3.2

Twenty-five participants (80.6%) had learned about AT, while 6 people (19.4%) claimed they hadn't. According to the responses, 13 people (41.9%) had seen AT, whereas 18 people (58.1%) had not. In a clinical setting, only four participants (12.9%) had done AT on patients. A total number of 14 participants (45.2%) indicated that they had offered AT, while 17 (54.8%) had not offered this treatment to patients.

Table 2 shows that 12 participants (38.7%) use the deliberative model as a proposal style, 17 participants (54.8%) use the informative model, 1 person (3.2%) uses the interpretative model, and 1 participant (3.2%) uses the paternalistic model.

Section 4 Reasoning of the dentist's decision-making with open-end answers

The reasons why dentists would or would not propose AT to patients with open-end answers can be grouped into 3 main factors: dentist-related factors, patient-related factors, and treatment-related factors.

The reasons for AT in terms of dentist-related factors consisted of knowledge of AT, experience and confidence in AT, expertise in AT, and the facility of the environment.



The indicated responses that the dentist was concerned about in terms of patient-related factors were patient's affordability, patient behavior, and patient impression of AT.

In terms of treatment-related factors, the outcome and procedure of AT concerned the participants.

Section 5 Exploration of knowledge about AT to 8 facts such as indications, procedures, and outcomes with choosing a Likert scale of 1-10 (strongly disagree to strongly agree) is shown in Table 3.

Table 3 Exploration of knowledge about AT to 8 facts

No.	Facts	Mean	SD
1	Dental implants are more expensive than AT.	7.55	2.219
2	AT necessitates a patient-donor tooth that is compatible with the recipient site.	9.00	1.414
3	The donor's tooth has a chance to revascularize after transplantation without the need for root canal treatment.	5.61	2.654
4	The transplanted tooth has a success rate of over 90% and a survival rate of over 90%.	6.16	2.067
5	Atraumatic extraction and preparation of the recipient site to accommodate the donor's tooth necessitate a high level of surgical skill in AT.	8.87	1.384
6	Any non-functional natural tooth can be used as an AT donor.	9.13	1.455
7	Only young patients are eligible for AT.	6.65	2.678
8	The patient must follow up frequently after the transplant.	8.84	1.319

The mean Likert score of facts no. 3, 4, and 7 were less than 7. The others were more than 7.

Section 6 Recommendations and feedback

From these sections, there are three feedbacks about the questionnaire. The first one said that the questions are easy to understand. However, the other two feedback complained that there were some leading questions and some questions in section 6 were not clear enough and not specific to which questions they concern. Hence, a further questionnaire will be developed based on their feedback from this study to ensure a valid questionnaire design.

4.2 Discussion

According to the outcome of this study, approximately 10 percent of AT was offered when compared with other treatment options. However, the data from the Faculty of Dentistry, Chulalongkorn University show that only 40 AT cases were found, which is less than 1 percent, so this small number of AT cases may occur for more than 1 cause. There are three possible causes, for example, dentists do not offer AT as one of the treatment options to patients, patients do not choose AT option as a final treatment, and in fact, there are few appropriate cases that can do AT. So, the others should be continuously studied in the future.

The previous studies found that there are 3 main factors comprising of dentist-related factors (i.e., knowledge of AT, experience and confidence in AT, expertise in AT, and facility of environment), patient-related factors (i.e., patient affordability, patient behavior, and patient's impression of AT), and treatment-related factors (i.e., outcome and procedure of AT) associated with the dentist's decision-making to recommend treatment options to the patient such as a dental implant, root canal treatment, and orthodontic treatment (Cosyn et al., 2012; Junges, Zitzmann, Walter, & Rösing, 2014; M. Kronström, Palmqvist, & Söderfeldt, 2000; Mats Kronström, Palmqvist, Söderfeldt, & Carlsson, 2000; Torabinejad & Goodacre, 2006; Zitzmann, Zemp, Weiger, Lang, & Walter, 2011). AT is no exception to this norm, as various factors were determined to provide possibilities linked to the dentist's decision to offer AT, as shown in the study's results section. However, this is a pilot study for preliminarily surveying and testing the questionnaire, the comparison of influencing among factors cannot be analyzed because of the small number of participants.

There are three good parts to this questionnaire. First, the part of this questionnaire is the 'tooth autotransplantation' word that was sealed from the title and other parts before section 3 to reduce the bias in decision making in case scenario to make a situation like a clinical situation. The participants can be guided

[354]



or induced by this word and affect the results. Besides, the participants were informed that they cannot return to the previous section to change or reply to the answer to prevent the participants from changing their decision after they know that AT may be one of the treatment options for both cases. Second, the design of case scenarios in section 2, is modified from the previous associated studies (Bigras, Johnson, BeGole, & Wenckus, 2008; Junges et al., 2014; Mats Kronström et al., 2000; Lang-Hua, McGrath, lo, & Lang, 2014), makes the participants propose treatment options to the patient like a clinical situation. Third, the data showed that this questionnaire was satisfactory for content validity (Polit & Beck, 2008) and reliability assessment (Bland & Altman, 1997). Therefore, this tool can be usable and useful to survey in the future after modifying and improving some sections for the convenience of response.

On the other hand, some parts should be modified and improved to make the questionnaire easier and more comfortable to answer and analyze. First, the result in section 4 was found that there are 3 main factors associated with the dentist's decision-making to offer AT, but it cannot analyze or compare among factors. Due to no studies and no tools, this study surveys and pools all the reasons that influence the dentist's decision. Thus, in the further study, this section should be designed by separating each factor to compare and analyze among factors, which one more influences the dentist's decision-making to offer AT. Moreover, if the comparison can be done, the cause of this problem will be clearly indicated and solved. Also, the characteristic of answers in section 4 should be added to closed-end choices by using the grouped factors from the collected reasons in section 4 as a choice because closed-end choices make a participant comfortable and reduce the time to do the questionnaire (Stephen B. Hulley, 2013). Second, the 8 facts of AT in section 6 should be written in the same direction (true or false) because it will be easy to analyze in the future.

However, there are some limitations to this study. First, the limitation is that it cannot estimate a population because of the small number of participants. However, a further study should be surveyed with a larger number of participants to gain more data. Second, the distribution of demographic data, such as level of education and main workplace, is not normal and may stem from individual line groups. Thus, the accessibility to the questionnaire should be made easier for all general dentists by sending the link to the questionnaire on the dentist's famous Facebook page. Also, the increased response rate will be solved by giving some rewards to attract the participants to answer the questionnaire (Stephen B. Hulley, 2013).

Finally, after modifying this questionnaire, it can be effectively used in further study to analyze factors influencing the dentist's decision to offer an AT option to patients. The outcome will illustrate how the dentist's decision is influenced by the perceived benefits and cons of AT. Such weaknesses, if present, can be identified and improved upon across many fields of use. On the other hand, strengths will be encouraged and stand to support increased usage of tooth autotransplantation by general dentists as a treatment for replacing missing teeth in the future. It is important as such gaps in knowledge inevitably stem from outdated forms of dental practice instruction in dental curricula, which may need to be modified to incorporate effective and efficient practices. The effect of having up-to-date knowledge was also observable in the mean of scores, where respondents with an understanding of fact No. 3 were found to be on the least average than others. It is suggested that the participants did not agree with a chance to revascularize after transplantation without the need for root canal treatment. Therefore, having access to up-to-date information is important. Also, fact No. 4 was observed to have a mean of less than 7. It is suggested that some dentists are unaware of recent evidence about the success and survival rates of AT, which shows that overall success rates of tooth autotransplantation are greater than 90% according to recent studies (Atala-Acevedo et al., 2017; Rohof et al., 2018). Nowadays, CBCT, CARP, virtual surgical planning technology, apicoectomy procedures, and Bioteeth have all helped to alleviate some of the earlier limits of dental (Keightley et al., 2010; Shahbazian et al., 2013; Shahbazian et al., 2010). Furthermore, such recommendations are consistent with practicing the dentists' core responsibility to use an evidence-based approach to treatment rather than relying on experience (Ismail & Bader, 2004).



5. Conclusion

This questionnaire can be used to determine the factors in the further study which factors impact the dentist's decision to recommend AT and the reasons why the dentist would propose or not propose AT. The tool will be simplified and developed from this pilot feedback. Further research will reveal which factors influenced the dentist's decision to recommend AT and highlight current information gaps that could influence whether the dentist's decision was limited.

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