Misconceptions Regarding Autogenous Tooth Transplantations: A Survey

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Abstract

Aim The aim of this cross-sectional study was to assess knowledge regarding autogenous tooth transplantation among oral and maxillofacial surgery (OMFS) residents in India.

Study Design The sample of the survey consisted of Indian OMFS post-graduate residents attending the “1st Asian Oral and Maxillofacial Surgery PG Convention” held from 29th to 31st August, 2013 at Mangalore, India. Questions were asked regarding the participant’s preferred tooth replacement modality, the transplantation procedure (socket preparation and stabilization of transplanted tooth); fate of the transplanted tooth (pulpal and periodontal fate) and the possibility of replacing second molars with such procedure, cross-arch transplantation and transplantation after new-socket preparation. The responses of 1st, 2nd and 3rd year residents were assessed for statistical significant difference using Fishers exact test.

Results Out of 434 residents surveyed using a pre-tested self-administered questionnaire, 287 residents responded (response rate 66 %). 74 % were aware of the possibility of autogenous third molar transplantation. Only 24 % believed a new periodontal ligament would form around the transplanted tooth. Misconceptions regarding pulp healing, socket preparation and tooth stabilization and new alveolus transplantation were also seen. 44 % had never seen the procedure and 74 % had never performed it themselves. No statistical significant difference was seen

among the responses classified according to the year of training.

Conclusion OMFS residents were found to have inadequate knowledge regarding autogenous tooth transplantation. Tooth transplantation needs to be included in the dental curriculum and standard OMFS textbooks with practical training in post-graduation period.

Keywords Autotransplantation · Tooth · Dental residency · Knowledge · Curriculum

Introduction

Autogenous third molar transplantation is a well-established procedure to replace grossly carious first or second molars. Hale [1] has described his technique of autogenous third molar transplantation far back in 1956. Thereafter the works of Tsukiboshi and Andreasen [2] have expanded our understanding of the biological principles behind autogenous tooth transplantation. A transplanted third molar provides probably the best replacement of the missing molar by forming a viable periodontal ligament (PDL); which provides for proprioception and thermal feedback like any other natural tooth. Additionally, they preserve alveolar bone; have improved aesthetics, long term survival, and continued eruption with age [3]. Such advantages are not offered by osseointegrated dental implants. Nonetheless, implants have made significant strides in dentistry in a relative short period of time. It is an industry driven modality and has enjoyed high success over the years. With widespread clinical use and high patient acceptance the science of dental implants has become an important part of dental curriculum in most countries. The need for its inclusion in undergraduate curriculum has also

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been stressed [4]. Removable partial dentures (RPD) and fixed partial dentures (FPD) on the other hand have traditionally been the most basic treatment procedures taught at a dental school.

Exodontia and surgical extraction of third molars remain one of the most fundamental procedures taught to an oral and maxillofacial surgeon during the training period. While being involved with these procedures, the basic knowledge of autogenous tooth transplantation is necessary so as to provide patients with such a replacement option and to carry out the procedure successfully. Reich [8] has opined regarding the existence of misconceptions about tooth transplantation among clinicians. However, no survey has been conducted to assess these misconceptions and the level of knowledge regarding tooth transplantation among oral and maxillofacial surgery trainees or clinicians. With not so widespread use of tooth transplantation as a treatment option, we hypothesised that certain misconceptions and inadequate knowledge regarding the procedure might be precluding its routine use. The purpose of this study was therefore to evaluate the basic knowledge about autogenous third molar transplantation among oral and maxillofacial surgery residents in India.

Materials and Methods

The sample of the survey consisted of Indian oral and maxillofacial post-graduate residents attending the “1st Asian Oral and Maxillofacial Surgery PG Convention” held from 29th to 31st August, 2013 at Mangalore, India. The convention was the first of its kind which prompted large attendance of oral and maxillofacial residents from all over India, thereby providing an opportunity for a pan-country survey. The survey form was provided at the registration counter on the first day with an instruction of the purpose of the study. Residents were asked to voluntarily fill and submit the form in the tea-break on the same day so as to avoid distraction and minimize influence on results.

The survey form had been pre-tested on 10 oral and maxillofacial surgery residents who did not attend the conference to assess for ease of understanding and response categories of the questionnaire. It consisted of 14 closed questions assessing the basic knowledge regarding autogenous third molar transplantation. Questions were asked regarding the participant's preferred tooth replacement modality, the transplantation procedure (socket preparation and stabilization of transplanted tooth); fate of the transplanted tooth (pulpal and periodontal fate) and the possibility of replacing second molars with such procedure, cross-arch transplantation and transplantation after new-socket preparation. They were also asked whether the procedure was demonstrated to them or if they had

performed the procedure themselves. No personal or institutional information was collected except for the year of post-graduation of the participant. Responses were tabulated in Microsoft Office Excel 2010 and subjected to statistical analysis using STATA version 11. The responses of 1st, 2nd and 3rd year residents were assessed for statistical significant difference using Fishers exact test. Level of significance was set at 5 %. The study was exempted for ethical clearance from the institutional review board.

Results

Out of 434 residents who were provided with the survey form, 324 responded. Thirty-seven forms were incompletely filled and therefore excluded from the study yielding a final response of 287 residents (66 %). The survey form with responses classified according to the year of residency is presented in Table 1. No statistical significant difference was seen in the responses according to the year of training. Majority of the residents (74 %) were aware of the possibility of autogenous third molar transplantation as a tooth replacement option, while 17 % were unaware of such a procedure and 9 % did not know about it. However, dental implant emerged the preferred tooth replacement modality (60 %) while only 31 % preferring autogenous tooth transplantation (Fig. 1). Majority (63 %) were of the opinion that at least 2/3rd root formation of third molar should be completed for it to be transplanted while 16 % were of the opinion that 1/3rd root development is sufficient. Socket preparation was deemed necessary by only 51 % of the residents. Out of 101 responses on the reason of non-preparation of socket; the answers were distributed between; damage to socket periodontal ligament (PDL) (36 %), damage to adjacent teeth (30 %), and future bone loss in the area (33 %) (27 residents who had answered ‘Don’t know’ to socket preparation, had also responded to this question, and were included). 47 % felt suture and splint would always be necessary to stabilize the third molar in its new position, while 7 % believed only suture would be sufficient. 28 % believed splint may be required in some cases along with sutures. Only half of the residents (50 %) answered that the pulp of transplanted 3rd molar would necrose in case of complete root formation, and it would revascularize (57 %) in case of incomplete root formation (Fig. 2). Majority of the residents believed that finally the transplanted tooth would either be ankylosed (38 %) or the roots would undergo resorption (30 %) while 24 % were of the opinion that new PDL will form (Fig. 3). Close to half of the residents believed that cross-arch transplantation was not possible (26 %) or did not know (23 %) about it. Similarly more than half of them believed that second molars could not be replaced by such transplantation (21 %) or did not know

Table 1 Survey form with responses classified according to year of post-graduate residency

	1st year N = 63 (22 %)	2nd year N = 130 (45 %)	3rd year N = 94 (33 %)	<i>p</i> value*	Total N = 287
If a young adult patient reports to you for 1st molar extraction, and a caries free retrievable 3rd molar present in the same quadrant, can the third molar be transplanted to replace the 1st molar?					
a. Yes	44 (70 %)	92 (71 %)	76 (81 %)	0.29	212 (74 %)
b. No	14 (22 %)	25 (19 %)	10 (11 %)		49 (17 %)
c. Don't know	5 (8 %)	13 (10 %)	8 (9 %)		26 (9 %)
In a 25 year old, with good general oral health and decent financial background, and with 1st molar indicated for extraction, what would be your preferred tooth replacement modality?					
a. RPD	0	0	0	0.75	0
b. All-metal FPD	0	0	0		0
c. Metal ceramic FPD	2 (3 %)	6 (5 %)	4 (4 %)		12 (4 %)
d. All-ceramic FPD	4 (6 %)	4 (3 %)	6 (6 %)		14 (5 %)
e. Immediate dental implant	22 (35 %)	33 (25 %)	25 (27 %)		80 (28 %)
f. Delayed dental implant	20 (32 %)	45 (35 %)	28 (30 %)		93 (32 %)
g. Autogenous tooth transplantation	15 (24 %)	42 (32 %)	31 (33 %)		88 (31 %)
If such a tooth transplantation procedure is carried out, should the extraction socket of 1st molar be prepared so as to allow the 3rd molar to fit?					
a. Yes	30 (48 %)	67 (52 %)	50 (53 %)	0.95	147 (51 %)
b. No	18 (29 %)	34 (26 %)	22 (23 %)		74 (26 %)
c. Don't know	15 (24 %)	29 (22 %)	22 (23 %)		66 (23 %)
If your answer was 'No' for the above question, the reason is?					
a. It will damage PDL fibres of socket	8 (13 %)	15 (12 %)	13 (14 %)	0.31	36 (36 %)
b. It will damage adjacent teeth	12 (19 %)	11 (8 %)	7 (7 %)		30 (30 %)
c. It will cause bone loss in the area	6 (10 %)	18 (14 %)	9 (10 %)		33 (33 %)
d. Other	0	2 (2 %)	0		2 (2 %)
If such a transplantation procedure is carried out, how would you stabilize the third molar in its new position?					
a. Suture only	5 (8 %)	8 (6 %)	6 (6 %)	0.93	19 (7 %)
b. Suture but splint may be required	17 (27 %)	38 (29 %)	24 (26 %)		79 (28 %)
c. Suture and splint will always be required	29 (46 %)	56 (43 %)	50 (53 %)		135 (47 %)
d. Third molar won't be stable	6 (10 %)	15 (12 %)	7 (7 %)		28 (10 %)
e. Don't know	6 (10 %)	13 (10 %)	7 (7 %)		26 (9 %)
What do you think can be the minimum root development of the third molar if it is to be transplanted in first molar's place?					
a. At least 1/3rd root formation	12 (19 %)	17 (13 %)	16 (17 %)	0.97	45 (16 %)
b. At least 2/3rd root formation	40 (63 %)	83 (64 %)	58 (62 %)		181 (63 %)
c. Root complete but apex can be open	4 (6 %)	12 (9 %)	8 (9 %)		24 (8 %)
d. Root complete but apex should be closed	2 (3 %)	5 (4 %)	2 (2 %)		9 (3 %)
e. Don't know	5 (8 %)	13 (10 %)	10 (11 %)		28 (10 %)
If the first molar is extracted and third molar with completely formed roots is transplanted to its place, what would be the fate of the pulp of the third molar?					
a. Necrose	28 (44 %)	60 (46 %)	55 (59 %)	0.2	143 (50 %)
b. Revascularize	21 (33 %)	34 (26 %)	23 (24 %)		78 (27 %)
c. Don't know	14 (22 %)	36 (28 %)	16 (17 %)		66 (23 %)
If in the above scenario, the third molar roots were incompletely formed, what would be the fate of the pulp of the third molar?					
a. Necrose	10 (16 %)	25 (19 %)	20 (21 %)	0.67	55 (19 %)
b. Revascularize	41 (65 %)	71 (55 %)	51 (54 %)		163 (57 %)
c. Don't know	12 (19 %)	34 (26 %)	23 (24 %)		69 (24 %)
In your opinion, if such tooth transplantation is carried out, what would be the most common result?					
a. Tooth roots will undergo resorption	14 (22 %)	49 (38 %)	24 (26 %)	0.01	87 (30 %)
b. Tooth will become ankylosed	29 (46 %)	37 (28 %)	42 (45 %)		108 (38 %)
c. New periodontal ligament will form around the tooth	13 (21 %)	38 (29 %)	18 (19 %)		69 (24 %)
d. Don't know	7 (11 %)	6 (5 %)	10 (11 %)		23 (8 %)

Table 1 continued

	1st year N = 63 (22 %)	2nd year N = 130 (45 %)	3rd year N = 94 (33 %)	<i>p</i> value*	Total N = 287
In your opinion, can cross-arch transplantation be carried out? (can maxillary 3rd molars be used to replace mandibular 1st molar and mandibular 3rd molar be used to replace maxillary 1st molars)					
a. Yes, always	10 (16 %)	31 (24 %)	27 (29 %)	0.51	68 (24 %)
b. Yes, if of appropriate size and shape	20 (32 %)	34 (26 %)	23 (24 %)		77 (27 %)
c. No	16 (25 %)	38 (29 %)	21 (22 %)		75 (26 %)
d. Don't know	17 (27 %)	27 (21 %)	23 (24 %)		67 (23 %)
If the patient reports to you for replacement of a missing first molar, after complete healing of the alveolus with a well formed ridge; can third molar still be transplanted in its place?					
a. Yes	12 (19 %)	37 (28 %)	27 (29 %)	0.47	76 (26 %)
b. No	30 (48 %)	63 (48 %)	44 (47 %)		138 (48 %)
c. Don't know	21 (33 %)	30 (23 %)	23 (24 %)		73 (25 %)
Do you think second molars can be replaced by transplanting third molars to its place?					
a. Yes	32 (51 %)	57 (44 %)	48 (51 %)	0.42	137 (48 %)
b. No	16 (25 %)	27 (21 %)	16 (17 %)		59 (21 %)
c. Don't know	15 (24 %)	46 (35 %)	30 (32 %)		91 (32 %)
Has the procedure of tooth autotransplantation ever been demonstrated to you?					
a. Yes, in UG	4 (6 %)	11 (8 %)	7 (7 %)	0.74	22 (8 %)
b. Yes, in PG	20 (32 %)	47 (36 %)	30 (32 %)		97 (34 %)
c. Yes, outside Dental school	13 (21 %)	17 (13 %)	11 (12 %)		41 (14 %)
d. Never	26 (41 %)	55 (42 %)	46 (49 %)		127 (44 %)
Have you yourself performed this procedure on your patients?					
a. Yes	13 (21 %)	36 (28 %)	25 (27 %)	0.57	74 (26 %)
b. No	50 (79 %)	94 (72 %)	69 (73 %)		213 (74 %)

RPD removable partial denture, FPD fixed partial denture, PDL periodontal ligament, UG under-graduation, PG post-graduation

* Fishers exact test applied

Fig. 1 Preferred tooth replacement modality of the residents

about it (32 %); while 74 % believed transplanting a third molar after preparing a new alveolus was not possible (Fig. 4). 44 % had never seen the procedure and 74 % had never performed it themselves.

Discussion

The survey reveals that though majority of the residents (74 %) claim to know about the possibility of replacing first molars with autogenous third molar transplantation,

Fig. 2 Responses regarding pulpal fate of the transplanted tooth

misconceptions regarding the procedure do prevail. We did not intend to examine the residents on the minute intricacies of the tooth transplantation. The survey form was carefully prepared so as to restrict it to the most fundamental questions on the science of the tooth transplantation. When asked about socket preparation, which is one of the most basic steps, only half of the residents (51 %) deemed it to be necessary. There seem to be a misconception that such socket preparation would cause damage

Fig. 3 Resident's opinion regarding the final result of the transplanted tooth

Fig. 4 Responses regarding cross-arch transplantation, replacing second molars by transplantation and new alveolus transplantation

to socket PDL (36 %), adjacent teeth (30 %) or may even cause bone loss in the area (33 %). The new PDL formed after transplantation is shown to originate from the viable cells around the root of the donor tooth [2]. Though the importance of progenitor cells on the socket wall should not be overlooked [5], socket preparation is necessary for the donor tooth to fit in the recipient site. Also it is important that the socket is prepared before harvesting the third molar to minimize extra-oral time. Socket preparation may also be required after harvesting to adjust the third molar position at the recipient site, during which the third molar is preferably replaced back in its socket to minimize PDL damage or it can be stored in gauze dipped in physiologic saline solution, but not for a long period of time [6].

Once the tooth is transplanted, stabilization is vital for healing at the new site. Rigid splinting is required only if stability is not achieved by frictional contact of the adjacent teeth. High success has been demonstrated after stabilization of transplanted teeth with sutures alone provided the tooth is stable in its position [7]. However, we found that majority of the residents (47 %) believed splinting would always be required for such a procedure while only 28 % answered that splinting may be required.

While selecting a donor tooth, it is preferable that the tooth roots should achieve maximal length before transplantation and also have a potential of pulpal regeneration (apex open >1 mm radiographically) [7]. This ensures maximal root length of the transplanted tooth even if further root development does not occur with pulpal revascularization. However such is not the case in every patient and third molars with even 1/3rd root formation can be transplanted successfully [8]. The majority opinion (63 %) of those surveyed was that at least 2/3rd root formation of third molar should be completed to consider it for transplantation. Harboring such a misconception would lead to neglect of autogenous tooth transplantation as a potential treatment option in young patients where third molars may have not reached 2/3rd root development. While transplanting third molars with incomplete root formation, an important aspect is that revascularization of the pulp can be expected in most cases negating the need of endodontic treatment. Whereas while transplanting third molars with complete root formation endodontic treatment is necessary and failure to do so would often lead to root resorption [2]. This fact was however correctly identified by only half of the respondents. Another important finding of our survey was that only 24 % of the residents believed that a new PDL would form after tooth transplantation. Majority were of the opinion that either ankylosis (38 %) or root resorption (30 %) would occur. These findings correlate with the opinion of Baviz [9] that misconceptions regarding pulp and periodontal healing exist amongst clinicians. He also suggested that some believe third molars can only be transplanted in fresh sockets i.e. teeth extracted on the same day. This misconception was found in 74 % of the residents in the present survey. Such erroneous beliefs preclude routine adoption of this procedure against the more popular implants and traditional FPDs. The popularity of implants was also seen with our sample where it was the choice of 60 % of the residents. Additionally, inadequate knowledge and inexperience with the procedure was reflected when nearly half of the residents denied or were unaware of the possibility of cross-arch transplantation. Similar was the response on the possibility of replacing second molars with third molars. Also only 1/4th of the respondents were aware that transplantation is possible after preparing a new alveolus in an edentulous space.

We believe such response was inevitable considering 44 % had never seen the procedure while 74 % had never performed it themselves.

One would hypothesize that as the post-graduation progresses, residents would have increased understanding and experience in the procedure. However, there was no statistical significant difference seen in the responses of the residents when classified according to the year of residency. Only 42 % of the residents we surveyed had seen the procedure in their dental school. This would have ramifications when the residents complete their training period and start their clinical practice. With absence of training and basic knowledge it is highly unlikely that they would provide their patients with options of tooth transplantation. Although exodontia and surgical extraction of impacted teeth is a fundamental topic learned at the most basic level and is an important part of oral surgery textbooks, the science of tooth transplantation is not included in many of them [5]. Tooth transplantation is a highly economical and successful procedure when carried out with proper technique. High success rates (up to 96 %) are seen when transplantation is carried out in young individuals especially 15–25 years of age [6, 8]. Autotransplantation has also been carried out in older individuals with good success but with increasing age, prognosis becomes poor [10]. Also in adults revascularization cannot be expected as the third molar roots are completely formed hence root canal treatment is necessary to prevent root resorption and failure [6]. A few contraindications of the procedure need to be specified, namely: inadequate space at the recipient site due to migration of adjacent teeth, gross infection at recipient site, inadequately developed third molars, inability to harvest third molars without damage due to abnormal position or anatomy. Thus it is important to note that this procedure is not universally applicable in all patients but requires proper case selection in terms of both recipient and donor site.

Going by the results of this survey, we have an unfortunate picture of autogenous tooth transplantation in the country. There is a need to include the procedure in the standard oral and maxillofacial surgery textbooks with its routine use in clinical practice. Similar surveys are required to be carried out in different countries to evaluate similar misconception in the local population.

The study has some limitations which need to be considered. The study did not include all the oral and maxillofacial surgery residents in the country but only those who participated in the said conference. Also it was a self-reported survey which could be influenced by the respondents recall bias and a desire to present their clinical knowledge and experience in good light. Nevertheless, a large number of residents voluntarily participated in the

survey providing a good picture of their knowledge about the procedure.

To conclude, the study demonstrates that oral and maxillofacial residents in India have poor understanding of the procedure of autogenous third molar tooth transplantation. A number of misconceptions exist especially with regards to pulpal and periodontal healing process of the transplanted tooth. It also seems that the science of tooth transplantation is not a part of the oral and maxillofacial surgery curriculum nor is it routinely practised in many teaching hospitals of the country. Better coverage of the procedure in academics with routine demonstration would help residents develop skill and knowledge and lead to widespread use of autogenous tooth transplantation as a treatment modality.

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Compliance with Ethical Standards

Conflict of interest None.

Ethical Approval All procedures performed in the study involving human participants were in accordance with the ethical standards of the institute and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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