

Retention of Teeth Versus Extraction and Implant Placement: Treatment Preferences of Dental Faculty and Dental Students

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Abstract: The purpose of this study was to determine the treatment preferences amongst dental faculty and dental students for either retention of teeth by endodontic and restorative treatment or extraction and implant placement. A survey of 134 general dentistry faculty and 253 senior (fourth-year) dental students was conducted in a university college of dentistry. Participants completed a survey consisting of questions for which one of two choices could be selected. For questions describing specific clinical situations, dental faculty and dental students more frequently selected endodontic and restorative treatment over extraction and implant placement. However, dental students selected implants more frequently than dental faculty, and more recent graduates on the dental faculty selected implants more frequently than less recent graduates on the dental faculty. In addition, there was an increase in the selection of implants, for all participant groups, as the prosthetic and endodontic complexities of the clinical situations increased. Participants were more likely to select endodontics rather than implants for medically compromised patients, and an implant was overwhelmingly selected over a fixed bridge for the replacement of a single tooth unit. In conclusion, the findings of this study indicate that retention of teeth is preferred, but there may be an increased preference toward implants in the future.

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Since the early 1980s, when the concept of osseointegration became a clinical reality, titanium dental implants have been accepted as an integral part of prosthodontic rehabilitation for the support of fixed and removable partial and complete dentures.¹⁻¹² This revolutionary development in dentistry can be attributed to Per-Ingvar Branemark and his coworkers, who did extensive basic and clinical research on the implantation of titanium fixtures in bone. They described the tissue interface of the titanium implant as osseointegration, by which healthy normal viable bone intimately attaches directly adjacent to the implant surface.¹⁻³

In 1985 the Branemark Dental Implant received American Dental Association endorsement.⁴ Since the work of Branemark and others, there has been a wealth of evidence to fully support osseointegrated titanium implants as a dental treatment modality that is highly successful.⁵⁻¹² Albrektsson et al. defined the criteria for successful osseointegrated dental implant treatment.⁵ Successful implants, clinically evaluated after five years of use, are immobile, have no signs or symptoms of pain, infection, or neuropathies and no peri-implant radiolucencies, and have only a

very minimal vertical bone loss.⁵ These criteria are desirable therapeutic outcomes that translate into implant-supported dental restorations and prostheses that adequately function for patients. Because of the high clinical success rates of titanium implants as abutments for dental prostheses, they have been used with excellent results as a primary treatment option over conventional tooth-supported fixed bridges for the replacement of missing teeth¹³⁻¹⁶ and for single-tooth implants immediately placed and restored after extraction of nonrestorable teeth.¹⁷

Endodontics is usually an essential part of dental treatment for restoring teeth that have been ravaged by caries or traumatically injured. Since 1963, when endodontics was recognized as a definitive dental specialty by the American Dental Association, to the present time, the outcomes of endodontic treatment, retreatment, and surgical treatment have been extensively studied and found to have an excellent prognosis.¹⁸⁻³⁰

With both endodontics and implants currently enjoying a high rate of success, a question that dental practitioners face is whether to provide endodontic and restorative treatment for teeth or to extract and

replace them with dental implants. Additionally, as the availability of implant dentistry expands as an alternative to tooth retention and restoration and as more implantology coursework is incorporated into the dental school curriculum, the selection of implants rather than endodontics may increase as a primary treatment approach to support dental restorations.

The purpose of this study was to determine the current treatment preferences amongst dental faculty and dental students for retention of teeth by endodontic and restorative treatment or for extraction and implant placement.

Methods

The proposal and protocol for this survey study were reviewed and approved by the New York University Institutional Review Board and given an exempt status.

One hundred and forty-two full- and part-time practicing general dentist faculty members at New York University College of Dentistry and 321 graduating senior dental students who had lectures in advanced prosthodontics on the diagnosis and treatment planning for implants received letters of invitation explaining the goals and methodology of the study and informed consent to participate in this survey-based investigation. Potential participants were informed that the purpose of this study was to determine their treatment recommendations for specific clinical situations for either retention of teeth by endodontic and restorative treatment or extraction and replacement with dental implants. After informed consent was received, participants were given a treatment planning survey questionnaire (see Appendix). The questionnaire asked the participant's age, gender, and year of graduation from dental school. The questionnaire consisted of fifteen concise clinical situations for which participants selected one of two treatment choices. The treatment choices for questions 1 through 12 were (A) endodontics and restorative treatment to retain teeth or (B) extraction and implant placement. The survey instructions informed participants that, for questions 1 through 12, selecting treatment option (A) could include periodontal treatment, crown lengthening, posts, cores, and crowns as necessary to retain teeth, while selecting (B) could include any surgical treatment or tissue augmentation procedure necessary for implant placement.

The clinical situations for questions 1 through 12 were arranged based on increasing levels of prosthetic and endodontic case complexities. Questions 1 through 4 (treatment for single teeth), questions 5 through 8 (treatment for multiple teeth), and questions 9 through 12 (treatment for abutment teeth) were categorized for prosthetic treatment complexity. Questions 1, 5, and 9 (direct endodontic treatment), questions 3, 7, and 11 (endodontic treatment through a crown restoration), questions 2, 6, and 10 (endodontic retreatment), and questions 4, 8, and 12 (endodontic surgical treatment) were categorized for endodontic treatment complexity.

Question 13 asked which treatment would be more likely selected for a patient with a compromised medical history: (A) endodontics and restoration or (B) extraction and implant placement. Question 14 asked if the treatment choices would differ for anterior or posterior teeth, with the response options being (A) yes or (B) no. Question 15 asked which treatment recommendation would be selected for replacement of a single missing tooth: either (A) a three-unit fixed bridge or (B) a single-tooth implant.

This survey was a paper and pen document on which participants directly filled in and marked their responses. After the participants independently completed the survey questionnaire, they were anonymously returned. There were no participant identifiers of any kind during the entire survey study process. This survey study was conducted at New York University College of Dentistry for a period of six months from January to June 2005. Data were electronically tabulated and statistically analyzed using the SAS system (Version 9.13, Cary, NC). Comparisons of proportions were performed with Pearson's chi square statistic or Fisher's exact test with analysis of trends performed by the Cochran-Armitage trend test.³¹

Results

Of the 142 dental faculty invited to participate in the survey study, 134 independently completed and anonymously returned the questionnaire, a response rate of 95 percent. This participant population sample, of which 76 percent were male and 24 percent were female, had an age range of twenty-six to eighty-two years with mean and median ages of fifty-three and fifty-two years, respectively. The data for the dental faculty participants were stratified into two main groups according to the number of years since graduation from dental school: more recent

graduates, in which fifty (37 percent) had twenty years or less since graduation, and less recent graduates in which eighty-four (63 percent) had twenty-one years or more since graduation. Of the 321 senior (fourth-year) dental students invited to participate in the survey study, 253 independently completed and anonymously returned the questionnaire, a response rate of 79 percent. This participant population sample, of which seventy-nine (42 percent) were male and 108 (58 percent) were female, had an age range of twenty-two to forty-two years with mean and median ages of twenty-seven years.

The response percentages for questions 1 to 12 individually and combined for the dental faculty and for the less and more recent graduates of the dental faculty, as well as for the dental students, are presented in Table 1. Among all of the participant groups, there was a higher rate of selection for endodontic and restorative treatment over extraction and implant placement for each individual clinical situation in questions 1–12 and for all clinical situations in questions 1–12 combined. When comparing the treatment preferences for all of the clinical situations in questions 1–12 combined, dental students selected implants more frequently than did dental faculty, and more recent graduates of the dental faculty selected implants more frequently than did less recent graduates. There was a statistically significant difference between the proportions of faculty and students recommending implant treatment ($\chi^2=114.36$, $df=1$, $p<0.0001$), with students recommending implant treatment more often than faculty. There was also a statistically significant difference between the

recommendations of more recent and less recent graduates on the faculty, with more recent graduates recommending implant treatment more often than did less recent graduates ($\chi^2=5.37$, $df=1$, $p=0.021$). If the groupings of less recent graduates, more recent graduates, and students are used as an indicator of educational exposure to implantology, then there is a statistically significant trend toward a greater recommendation of implants with greater exposure to implantology ($Z=-10.67$, $p<0.0001$).

The response percentages for the question based on prosthetic complexity and endodontic complexity for the dental faculty and for the less and more recent graduates, as well as for the dental students, are presented in Tables 2 and 3. There was a higher rate of selection for endodontic and restorative treatment over extraction and implant placement by all the participant groups for each of the prosthetic and endodontic case complexity categories.

For the single tooth prosthetic case complexity categories, students recommended implants more often than did faculty ($\chi^2=21.91$, $df=1$, $p<0.0001$), and more recent graduates among the faculty recommended implants more often than less recent graduates ($\chi^2=7.43$, $df=1$, $p<0.01$). For the multiple teeth prosthetic case complexity categories, students also recommend implants more frequently than did faculty members ($\chi^2=21.03$, $df=1$, $p<0.0001$), while there was no difference between faculty members who graduated more or less recently ($\chi^2=0.68$, $df=1$, $p=0.408$). For the abutment teeth prosthetic case complexity categories, students recommended implants more often than did faculty ($\chi^2=81.79$, $df=1$, $p<0.0001$),

Table 1. Response percentages for questions 1-12

Question	Dental Faculty (N=134)		Less Recent Grads (N=84)		More Recent Grads (N=50)		Dental Students (N=253)	
	A	B	A	B	A	B	A	B
1	97.0%	3.0%	97.6%	2.4%	96.0%	4.0%	95.3%	4.7%
2	90.1%	9.9%	91.4%	8.6%	88.0%	12.0%	79.4%	20.6%
3	94.8%	5.2%	98.8%	1.2%	88.0%	12.0%	82.2%	17.8%
4	86.5%	13.5%	90.4%	9.6%	80.0%	20.0%	77.1%	22.9%
5	97.0%	3.0%	98.8%	1.2%	94.0%	6.0%	91.6%	8.4%
6	80.2%	19.8%	79.0%	21.0%	82.0%	18.0%	69.0%	31.0%
7	96.2%	3.8%	97.6%	2.4%	94.0%	6.0%	80.6%	19.4%
8	76.7%	23.3%	78.3%	21.7%	74.0%	26.0%	70.3%	29.7%
9	96.2%	3.8%	96.3%	3.7%	96.0%	4.0%	77.4%	22.6%
10	78.2%	21.8%	77.1%	22.9%	80.0%	20.0%	54.8%	45.2%
11	88.0%	12.0%	89.2%	10.8%	86.0%	14.0%	55.2%	44.8%
12	74.4%	25.6%	78.3%	21.7%	68.0%	32.0%	59.5%	40.5%
1-12 (Combined)	87.9%	12.1%	89.4%	10.6%	85.5%	14.5%	74.4%	25.6%

Table 2. Response percentages to question groups (prosthetic treatment complexity)

Question Groups	Dental Faculty (N=134)		Less Recent Grads (N=84)		More Recent Grads (N=50)		Dental Students (N=253)	
	A	B	A	B	A	B	A	B
1-4 Single Teeth	92.1%	7.9%	94.6%	5.4%	88.0%	12.0%	83.5%	16.5%
5-8 Multiple Teeth	87.5%	12.5%	88.4%	11.6%	86.0%	14.0%	77.9%	22.1%
9-12 Abutment Teeth	84.2%	15.8%	85.2%	14.8%	82.5%	17.5%	61.8%	38.2%

Table 3. Response percentages to question groups (endodontic treatment complexity)

Question Groups	Dental Faculty (N=134)		Less Recent Grads (N=84)		More Recent Grads (N=50)		Dental Students (N=253)	
	A	B	A	B	A	B	A	B
1, 5, 9 Direct Access	96.7%	3.3%	97.6%	2.4%	95.3%	4.7%	88.1%	11.9%
3, 7, 11 Through Crown	93.0%	7.0%	95.2%	4.8%	89.3%	10.7%	72.8%	27.2%
2, 6, 10 Retreatment	82.8%	17.2%	82.4%	17.6%	83.3%	16.7%	67.8%	32.2%
4, 8, 12 Surgical	79.2%	20.8%	82.3%	17.7%	74.0%	26.0%	69.0%	31.0%

while again there was no difference between the recommendations of more and less recent graduates among the faculty members ($\chi^2=0.66$, $df=1$, $p=0.418$). Within the entire faculty group and within the student group, the frequencies for the recommendation of implants increased with the prosthetic case complexity ($Z=-3.98$, $p<0.0001$ and $Z=-11.15$, $p<0.0001$, respectively) as shown in Table 2.

For the endodontic treatment case complexity categories, there were differences in the proportion of implant recommendations between faculty and students for all complexity groups, with students recommending implants more often than did faculty members: direct access ($\chi^2=23.60$, $df=1$, $p<0.0001$), through crown ($\chi^2=66.26$, $df=1$, $p<0.0001$), retreatment ($\chi^2=29.36$, $df=1$, $p<0.0001$), and surgical ($\chi^2=13.59$, $df=1$, $p<0.0005$). Comparing more and less recent graduates of the faculty, no difference was found between the proportion of implant recommendations for the direct access group ($\chi^2=1.48$, $df=1$, $p=0.225$) or the retreatment group ($\chi^2=0.05$, $df=1$, $p=0.821$); however, there were statistically significant differ-

ences between these groups for the through crown cases ($\chi^2=4.96$, $df=1$, $p=0.026$) and the surgical cases ($\chi^2=3.94$, $df=1$, $p=0.047$). Within the entire faculty group and within the student group, the proportions of implant recommendations increased with the endodontic case complexity ($Z=-8.60$, $p<0.0001$ and $Z=-8.76$, $p<0.0001$, respectively), as shown in Table 3.

The response percentages for questions 13, 14, and 15 for the dental faculty overall and for the less and more recent graduates of the faculty and the dental students are presented in Table 4. All of the participant groups selected endodontic treatment more frequently than implants for patients with a compromised medical history, but students selected implants more frequently than did faculty ($\chi^2=6.71$, $df=1$, $p<0.01$) and more recent faculty graduates selected implants more frequently than did less recent graduates ($p<0.01$). Dental students indicated that the anterior or posterior position of the tooth would influence their treatment selection more frequently than did dental faculty ($\chi^2=17.38$, $df=1$, $p<0.0001$). More recent faculty graduates also indicated this

Table 4. Response percentages to questions 13, 14, and 15

Questions	Dental Faculty (N=134)		Less Recent Grads (N=84)		More Recent Grads (N=50)		Dental Students (N=253)	
	A	B	A	B	A	B	A	B
13	96.2%	3.8%	100.0%	0.0%	90.0%	10.0%	88.2%	11.8%
14	YES 32.8%	NO 67.2%	YES 24.1%	NO 75.9%	YES 46.9%	NO 53.1%	YES 55.6%	NO 44.4%
15	A 10.9%	B 89.1%	A 15.2%	B 84.8%	A 4.5%	B 95.5%	A 7.7%	B 92.3%

would influence their treatment selection more frequently than did less recent graduates ($\chi^2=7.19$, $df=1$, $p<0.01$). All participant groups selected an implant more frequently for the replacement of a single missing tooth with no difference between the students and faculty ($\chi^2=0.97$, $df=1$, $p=0.325$) and no difference between the less and more recent graduates of the faculty ($\chi^2=3.06$, $df=1$, $p<0.081$).

Conclusions

Under the parameters of this survey study conducted at the New York University College of Dentistry, the following conclusions can be proposed:

1. Dental faculty and dental students generally favored endodontic and restorative treatment over extraction and implant placement; however, the selection of extraction and implant placement was progressively greater as the educational exposure to implantology became more recent.
2. The selection of extraction and implant placement increased within each group (less recent faculty graduates, more recent faculty graduates, and dental students) as the complexities of prosthetic and the endodontic cases increased.
3. A compromised medical history and the position of the tooth in the dental arch was a factor that influenced the treatment selection among all participants.
4. An implant over a fixed bridge was the treatment of choice for the replacement of a missing single tooth unit.
5. There was a generational trend among the participants toward the recommendation of implants, especially in complex treatment situations.
6. The implications of these findings for patient care indicate that more implant treatment will be recommended in the future and suggest that careful consideration should be given to treatment options that restore and preserve the natural dentition before recommending implants.
7. The challenge for dental education will be to provide dental students with a comprehensive and balanced educational experience that will enable them to make the most appropriate and beneficial treatment recommendations for their patients.

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APPENDIX

Treatment Planning Survey Questionnaire

Retention and Restoration of Teeth vs. Extraction and Implant Replacement

- I. This is a survey questionnaire to determine the current opinion of general dentists concerning their decisions, under specific clinical circumstances, for the recommendation of either retention of teeth by endodontic and restorative treatment or extraction and replacement with dental implants.
- II. For each clinical scenario, in which there is a need for either endodontics and restorative treatments or extraction and implant placement, you must select either:
(A) endodontics and restorative treatment to retain the tooth or
(B) tooth extraction with implant and restorative replacement.
- III. Selecting (A) can include periodontal treatment, crown lengthening, posts, cores, and crowns when necessary to restore and retain the tooth.
Selecting (B) can include any surgical augmentation that would be necessary for implant placement as well as the prosthodontic replacement.
- IV. Answer all 15 questions. Do not leave any blanks. Use your best judgment for each of the scenarios described.
- V. Please fill in your age ____, gender ____, and year of graduation from dental school _____.
- VI. Which treatment modality would you recommend for each of the following:
 1. Single tooth requiring endodontic treatment and crown restoration or extraction and implant. (A)___ (B)___
 2. Single tooth requiring endodontic retreatment and crown restoration or extraction and implant. (A)___ (B)___
 3. Single tooth requiring endodontic treatment through an existing serviceable crown or extraction and implant. (A)___ (B)___
 4. Single tooth requiring endodontic surgical treatment only or extraction and implant. (A)___ (B)___
 5. Multiple adjacent teeth requiring endodontic treatment and crown restorations or extraction and implants. (A)___ (B)___
 6. Multiple adjacent teeth requiring endodontic retreatment and crown restorations or extraction and implants. (A)___ (B)___
 7. Multiple adjacent teeth requiring endodontic treatment through existing serviceable crowns or extraction and implants. (A)___ (B)___
 8. Multiple adjacent teeth requiring endodontic surgical treatment only or extraction and implants. (A)___ (B)___
 9. Single and multiple teeth used as abutments for fixed prosthodontics requiring endodontic treatment and restorations or extraction and implants. (A)___ (B)___
 10. Single and multiple teeth used as abutments for fixed prosthodontics requiring endodontic retreatment and restorations or extraction and implants. (A)___ (B)___
 11. Single and multiple teeth used as abutments for fixed prosthodontics requiring endodontic treatment through existing serviceable crowns or extraction and implants. (A)___ (B)___
 12. Single and multiple teeth used as abutments for fixed prosthodontics requiring endodontic surgical treatment only or extraction and implants. (A)___ (B)___
 13. If confronted with a patient who has a compromised medical history, would you be more likely to select endodontic treatment and restoration or extraction and implant? (A)___ (B)___
 14. For any or all of the above clinical scenarios (#s 1-12), would your treatment selection differ for anterior or posterior teeth? (Yes)___ (No)___
 15. Special Question: Which treatment modality would you select for the replacement of a single tooth unit: (A) a fixed 3-unit bridge or (B) a single tooth implant? (A)___ (B)___