

AWARENESS, KNOWLEDGE AND ATTITUDE OF PROSTHODONTISTS AND OTHER DENTAL PRACTITIONERS TOWARDS PRECISION ATTACHMENTS: A SURVEY.

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Abstract

Context & aim: Precision attachments have the potential to significantly enhance the performance of our prosthetic treatment and render it aesthetically pleasing. The aim of this survey is to evaluate the awareness, knowledge and attitude of dental practitioners (as the primary objective), & lab technicians (as secondary objective) towards precision attachments.

Settings and Design: A questionnaire-based survey.

Methods and Material: A survey with fifteen & ten questions were prepared and validated to analyse the awareness, knowledge and attitude of dental practitioners and lab technicians towards precision attachments respectively. The survey was conducted via Google Forms.

Statistical analysis used: The data was analysed based on qualification and years of experience for the dentist-based survey and based on years of experience for the lab technician-based survey using Chi-Square test.

Results: The results of this survey show that dental practitioners are aware of the importance of precision attachments and their grasp of treatment planning protocols also seems to be

adequate. However, they are not confident enough to independently handle cases of precision attachments since they seem to be lacking in their fundamental principles and scientific knowledge. Moreover, the lab technicians included in the survey also stated that lack of knowledge and skill of the practitioners is the primary hurdle to a more optimum use of precision attachments.

Conclusions: The use of precision attachments presents a challenge in the current dental scenario primarily due to deficiencies in treatment planning, knowledge and technical skill.

Key words: awareness, knowledge, attitude, precision attachments, dental practitioners, lab technicians.

Introduction:

Precision attachments have been in use since a very long time. Evidence of its earliest use dates back to the Egyptian times in the 4th and 5th century BC. However, development of precision attachments as we know of today began only in the early 20th century with Dr Herman E Chayes.

Precision attachments can offer considerable benefits in prosthetic dentistry by enhancing

retention, aesthetics, stress distribution and cross arch stabilization.¹ They can be used in a variety of cases such as with removable prosthesis, fixed dental prosthesis, implant supported prosthesis, overdentures, maxillofacial prosthesis etc making them extremely versatile.²⁻⁴ There are numerous types of attachments currently available in the market today and they can be broadly classified based on location (intracoronal/extracoronal); type (stud, bar, magnets and auxiliary groups);

and fit (rigid or resilient).⁵⁻¹⁰

The principal aspects to be considered in designing cases of precision attachments are thorough diagnosis, space analysis, comprehensive evaluation of condition and location of abutment teeth, precise establishment of path of insertion, meticulous selection & position of attachments, understanding patient compliance & their manual dexterity and maintenance protocol to name a few.^{11,12} These factors are extremely critical to the success of the prostheses and must be

judiciously planned and evaluated. A thorough understanding of the different attachments, material science & biomechanics of maxillomandibular function are a fundamental prerequisite in successfully treating a case with precision attachments.¹ A well planned and executed prosthesis, coupled with optimum maintenance and care, has the potential of providing a robust and enduring patient experience for a long time. However, using precision attachments involves a highly technique-sensitive process. Even the slightest miscalculation or violation of biological and/or mechanical principles at any step can result in improper fit of the final prosthesis thus making them highly tedious to use for many practitioners.

Thus, the primary objective of this survey is to evaluate the awareness, knowledge and attitude of dental practitioners towards precision attachments and to assess if there is a correlation of the above factors with their qualification and years of experience. For this purpose, the sample has been classified into four groups as per qualification (BDS, MDS in Prosthodontics, MDS Others, OTHERS i.e., DCI recognized diploma

and fellowship courses post-BDS) and into three

1. Have you used precision attachments in any case so far?
 Yes. No.

2. A) If yes, in which type of cases have you used precision attachments more frequently?
 Removable partial dentures. Fixed partial dentures. Overdentures. Maxillofacial Prosthesis.

B) If No, what is your main reason for not using precision attachments?
 Never felt the need to use precision attachments. Inadequate lab support.
 Cost of attachments. Lack of knowledge and skill.
 Follow-up and maintenance are tedious. Time consuming procedure.

3. Are you aware about the various indications of precision attachments?
 Yes. No. Not sure

4. Should inter-arch space be considered during case selection while planning to use precision attachment?
 Yes. No. Not sure.

5. Should condition and location of abutment be considered during case selection while planning to use precision attachment?
 Yes. No. Not sure.

6. Should manual dexterity of the patient be considered during case selection while planning to use precision attachment?
 Yes. No. Not sure.

7. If ideal conditions are present for tooth supported overdentures, will you still prefer implant supported over tooth supported overdenture?
 Yes. No. Not sure.


8. Do you feel that precision attachments could help provide better retention in bilateral distal extension cases as compared to conventional removable partial dentures?
 Yes. No. Not sure.

9. Do you feel that you could get better results in rier abutment cases using precision attachments?
 Yes. No. Not sure.

10. Can precision and semi-precision attachments be used interchangeably?
 Yes. No. Not sure.

11. How often does a removable prosthesis with precision attachments need maintenance?
 Every 2 months. Every 6 months. Every 1 year. Every 2 years.

12. Which of the following precision attachment would require more inter-arch space?
 Stud. Magnet. Telescopic. Bar.

13. According to you, is this the correct treatment option for unilateral distal extension cases using precision attachments?

 Yes. No. Not sure.

14. Are you confident enough to handle cases of precision attachments on your own?
 Yes. No. Not sure.

15. Do you feel there is a need to attend more seminars, workshops and continued dental education programs regarding precision attachments?
 Yes. No. Not sure.

Fig 1

groups as per years of experience (0-10, 11-20 & >20 years).

Since lab technicians constitute an important link in the successful use of precision attachments, this survey also aims to evaluate the awareness, knowledge and attitude of lab technicians towards precision attachments based on their years of experience (0-10, 11-20 & >20 years), as the secondary objective.

1. Do you frequently get precision attachment cases?
 Yes. No.

2. What is the approximate number of precision attachment cases you generally do in a month?
 <5 5-10 >10


3. In which type of cases have you used precision attachments more frequently?
 Removable partial dentures. Overdentures.
 Fixed partial dentures. Maxillofacial Prosthesis.

4. Why do you think that the use of precision attachments is limited in clinical practice?
 Lack of knowledge and skill.
 Cost of attachments.
 Dentists never asked to use precision attachments.
 Time consuming.
 Difficulty in fabrication.

5. What are the problems you would anticipate in cases of precision attachments?
 Lack of Availability of attachments.
 Casting difficulties.
 Lack of communication by the dentist.
 Poor treatment planning and space analysis by the dentist.

6. Do you feel precision attachment results in better casting fit in cases of pier abutment?
 Yes. No. Not sure.

7. In what type of precision attachment cases do you get maximum repetitions for improper fit?
 Removable partial dentures. Overdentures.
 Fixed partial dentures. Maxillofacial Prosthesis.

8. According to you, is this the correct treatment option for unilateral distal extension cases using precision attachments?

 Yes. No. Not sure.

9. In overdenture cases, do you frequently come across fracture of dentures?
 Yes. No. Not sure.

10. Do you feel there is a need to attend more seminars, workshops and continued dental education programs regarding precision attachments?
 Yes. No. Not sure.

Fig 2

Materials and Methods:

A survey with 15 questions was prepared and validated to analyse the awareness, knowledge and attitude of prosthodontists and other dental practitioners towards precision attachments (Fig 1).

Awareness of prosthodontists and other dental practitioners was evaluated based on answers obtained in question numbers 3,4,5,6,7,8,9.

Knowledge of prosthodontists and other dental practitioners was evaluated based on answers obtained in question numbers 10,11,12,13.

Attitude of prosthodontists and other dental practitioners was evaluated based on answers obtained in question number 14 i.e., the confidence to independently handle cases of precision attachments.

A survey with 10 questions was prepared and validated to analyse the awareness, knowledge and attitude of lab technicians towards precision attachments (Fig 2).

This questionnaire-based survey was conducted via google forms after prior approval from the Institutional Ethics Committee. Sample size was calculated based on a pilot study conducted with 150 responses obtained from qualified dentist (prosthodontists and other dental practitioners) using the formula:

$$n = Z^2pq/d^2$$

n = Desired sample size

Z = Standard normal deviate (1.96)

p = Proportion in target population estimated to have particular characteristics (50% i.e. 0.5)

q = 1-p (Proportion in target population not having particular characteristics)

d = degree of accuracy required (0.05)

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Total sample size calculated was 384 for the dentist-based survey; 391 responses were included in this survey. Due to paucity of data and resources, sample size was not calculated for the lab technicians-based survey & 40 qualified lab technicians were included. Convenient sampling technique was used.

Dentists with BDS, MDS & DCI recognised diploma courses post BDS degrees were included in the dentist-based survey. Interns, Dentists with non-DCI recognised degrees and unqualified lab technicians were excluded from this survey.

Data was collected as per responses obtained via google forms, entered into Microsoft Excel spreadsheet and was subjected to Chi-square test using Statistical Package of Social Sciences (SPSS) Software. This data was analysed based on qualification (i.e. BDS, MDS in Prosthodontics, MDS Others, OTHERS i.e., DCI recognized diploma and fellowship courses post-BDS) and years of

experience (0-10, 11-20 & >20 years) for the dentist-based survey and based on years of experience (0-10, 11-20 & >20 years) for the lab technician-based survey.

Results:

Dentist-Based Survey:

Out of 391 respondents, 40% were BDS, 32% were MDS in Prosthodontics, 25% were MDS in fields other than Prosthodontics and 3% were from Others category i.e., DCI recognized diploma and fellowship courses post-BDS (Figure 3). Due to unequal representation of 'Others' group, this group was excluded from further evaluation to avoid sampling bias.

Maximum positive responses for having used precision attachments were elicited from 'MDS in Prosthodontics' group in >20 years of experience group. They primarily implemented precision

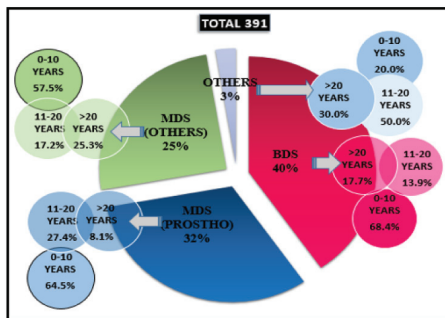


Fig 3

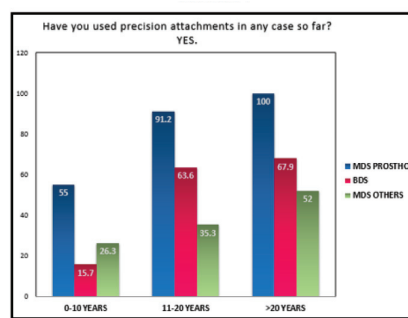


Fig 4

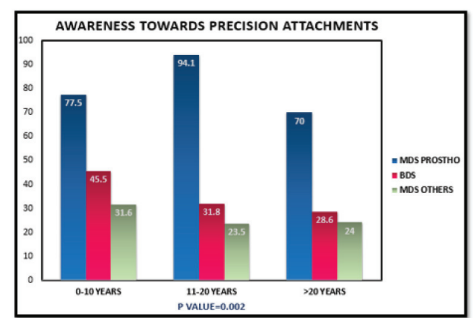


Fig 5

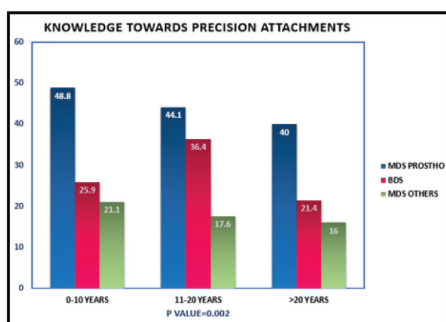


Fig 6

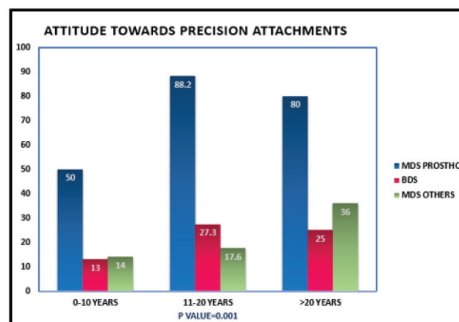


Fig 7

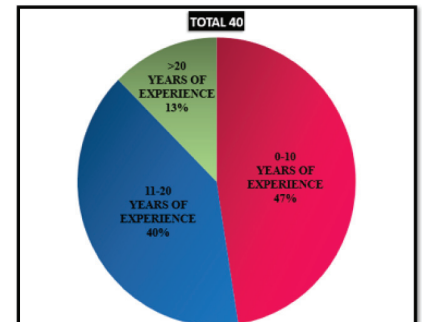


Fig 8

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attachments in Removable partial denture (54.1%) > Overdentures (28.2%)>Fixed dental prosthesis (16.5%) > 1.2% Maxillofacial Prosthesis cases (1.2%).

Least positive responses were elicited from 'BDS' group in 0-10 years of experience group. This limited use was attributed to lack of knowledge and skill (51.9%) >Never felt the need (18.5%) >Cost of attachments (9.3%) >Inadequate lab support (8.3%) (Figure 4).

As mentioned earlier, awareness of prosthodontists and other dental practitioners was evaluated based on answers obtained in question numbers 3,4,5,6,7,8,9. Statistically significant results found in questions 5 (P=0.012), 8 (P=0.023) & 9 (P=0.002). Awareness was found to be maximum in 'MDS in Prosthodontics' with 11-20 years of experience group and least in 'MDS others' in 11-20 years of experience group (Figure 5).

As mentioned earlier, knowledge of prosthodontists and other dental practitioners was evaluated based on answers obtained in question numbers 10,11,12,13. Statistically significant results found in questions 10 (P=0.002) & 13 (P=0.009). Knowledge was found to be maximum in 'MDS in Prosthodontics' with 0-10 years of experience and least in 'MDS others' in > 20 years of experience group (Figure 6).

As mentioned earlier, attitude of prosthodontists and other dental practitioners was evaluated based the confidence to independently handle cases of

precision attachments. Statistically significant results found in question 14 (P=0.001). 'MDS in Prosthodontics' with 11-20 years of experience seem to have the maximum confidence to handle cases of precision attachments. 'BDS' with 0-10 years of experience group have the least confidence to handle cases of precision attachment (Figure 7).

Lab-Technician Based Survey:

Out of 40 responses, 47.5% lab technicians had 0-10 years of experience, 40 % had 11-20 years of experience & 12.5% had >20 years of experience (Figure 8).

Statistically significant results found in the questions 2 (P=0.05) & 4 (P=0.035). the results showed that less than five precision attachments are done per month by lab technicians in all the groups of experience. This shows a general lack of use of precision attachments (Figure 9). Also, lack of knowledge and skill is the most common cause for this lack of usage of precision attachments (Figure 10).

Discussion:

This survey primarily aimed to find out about the awareness, knowledge and attitude of prosthodontists & other dental practitioners towards

What is the approximate number of precision attachment cases you generally do in a month?		
0-10 YEARS	11-20 YEARS	>20 YEARS
• 94.7%	• 81.3%	• 80%
• <5	• <5	• <5

Fig 9

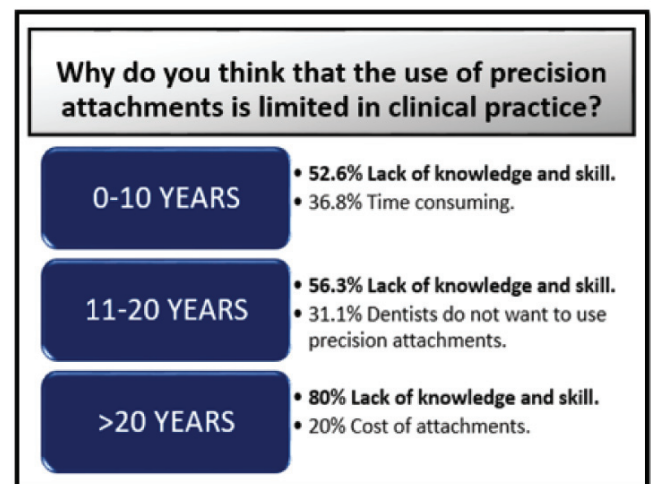


Fig 10

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precision attachments. Under the awareness subset, this survey evaluated the clinical mindset and general approach of prosthodontists & other dental practitioners during case selection towards precision attachments. Under the knowledge subset, this survey evaluated the theoretical know how of prosthodontists & other dental practitioners towards precision attachments. Under the attitude subset, this survey mainly evaluated the confidence levels of prosthodontists & other dental practitioners to independently handle cases of precision attachments.

The questionnaire was prepared after a detailed search of published data available with respect to precision attachments as well as inputs from various practitioners.¹³⁻²¹

This survey shows that 72.1% of dental practitioners are aware of the indications of precision attachments and consider inter-arch space (80.6%), condition and location of abutment teeth (85.2%) and manual dexterity of the patient (66.8%) as important factors during case selection.^{5,12,15} The practitioners do understand the importance of precision attachments with 78% of practitioners accepting that precision attachments could help provide better retention in bilateral distal extension cases as compared to conventional removable partial dentures and 50.6% of practitioners acknowledging that they could get better results in pier abutment cases using precision attachments.^{8,9,14} Their grasp of treatment planning protocols seems to be adequate with 73.1% practitioners being able to correctly choose between tooth-supported and implant-supported prosthesis based on individual case requirements.^{6,21} Despite the above findings, only 32.5% of practitioners are confident enough to handle cases of precision attachments on their own. Also, they seem to be lacking in fundamental principles and scientific knowledge with only 31.1% of practitioners being able to correctly differentiate between precision and semi-precision attachments and 35.8% of practitioners being able to correctly

analyse the scientific basis of a certain prosthesis design.

This survey also shows that knowledge about precision attachments is maximum in 'MDS in Prosthodontics' with 0-10 years of experience group whereas awareness and confidence to independently handle cases of precision attachments is maximum in 'MDS in Prosthodontics' with 11-20 years of experience group. This can be attributed to the considerable exposure to precision attachment cases in their post-graduation curriculum making young prosthodontists highly knowledgeable in this topic. However, the clinical know how and confidence develops with experience and hence the middle-aged prosthodontists have better awareness and confidence towards precision attachments. This is in accordance with the result showing that maximum positive responses for having used precision attachments is from 'MDS in Prosthodontics' group in >20 years of experience group.

Least positive responses for use of precision attachments were elicited from the 'BDS' with 0-10 years of experience group. This is in accordance with the result showing that 'BDS' with 0-10 years of experience group have the least confidence to handle cases of precision attachment and the reason for this limited use was stated to be lack of knowledge and skill (51.9%). This is mainly due to lack of exposure to precision attachments in the BDS curriculum. This also explains their risk-aversion towards experimenting with precision attachments.

Awareness is found to be least in 'MDS others' in 11-20 years of experience group. Knowledge level is least in 'MDS others' in > 20 years of experience group. Despite inadequate awareness and knowledge, this group does use precision attachments in their cases and the use is seen to increase with years of experience as clearly shown in figure 2. This is probably because of the short courses and workshops available nowadays enabling them to use precision attachments with

increasing levels of confidence in their cases.

Only 32.5% of lab technicians stated that they frequently received cases of precision attachments. This clearly shows a limited use of precision attachments in the dental set-up. Also, majority of the cases they received were for removable partial dentures (45%). When asked about the problems they anticipated while fabricating such prosthesis, they stated casting difficulties (50%), followed by lack of communication (25%) and poor treatment planning and space analysis done by the dentist (22.5%). They also indicated that they get maximum repetitions for improper fit in fixed dental prosthesis cases (47.5%). 50% of lab technicians felt that using precision attachment results in better casting fit in cases of pier abutment but 42.5% were not sure whether this improved fit was purely because of precision attachments. Only 32.5% of lab technicians were able to correctly identify a prosthesis design indicating a deficiency of understanding the fundamental principles and scientific knowledge.

This survey also found that 8.4% of respondents felt that inadequate lab support was discouraging the use of precision attachments in clinical practice. However, the survey on lab technicians indicates otherwise. As shown in figure 9, this survey found that less than 5 cases of precision attachments are being done per month by majority of the lab technicians in all the 3 'years of experience' categories. This clearly shows a general disinterest for using precision attachments by the practitioners since the number of cases do not seem to vary with the 'years of experience' of the lab technicians. This survey also clearly shows, that a majority of the lab technicians feel that lack of knowledge and skill of the practitioners is the primary hurdle to a more optimum use of precision attachments.

The limitations of this survey include the small sample size for the lab-technician based survey and hence limited statistically significant results were obtained for the same. Further questionnaire-

based surveys should be planned with a larger sample size owing to the paucity of literature on this subject.

Conclusion:

The following conclusions were drawn based on the results of this survey:

- This survey shows that dental practitioners are aware of the indications and importance of precision attachments.
- Their grasp of treatment planning protocols also seems to be adequate but they are not confident enough to handle cases of precision attachments on their own.
- They seem to be lacking in the fundamental principles and scientific knowledge.
- 'MDS in Prosthodontics' definitely have better awareness, knowledge and attitude towards precision attachments vis-à-vis the other groups attributed to a better exposure to the same during their post-graduate studies.
- Overall, there is limited use of precision attachments in the dental set-up.

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Continuation from page 103

The three key elements of TE includes a) cell sources, b) scaffolds and c) bio active agents.

Currently, a series of highly potent human stem cells, both embryonic and adult, such as multipotent mesenchymal stem cells (MSCs) (Fig 1), umbilical cord matrix stem cells, and pluripotent embryonic stem cells (ESCs) (Fig 2), have turned up with positive results in TMJ tissue regeneration.

Other than polyglycolic acid (PGA) and Poly-L-Lactic acid (PLLA) nonwoven mesh scaffolds, synthetic polymers like poly(glycerol sebacate) (PGS), polycaprolactone (PCL) (Fig 3) and natural polymers like Chitosan and alginate are presently used as (Ch/Alg) hybrid scaffolds (Fig 4) for cartilage and bone regeneration.

The use of costal chondrocytes enabled the use of scaffold less 'self assembly' technique.

To enhance cellular proliferation various growth factors (Fig 5) have been investigated for TMJ disc tissue engineering: platelet-derived growth factor (PDGF); basic fibroblast growth factor (bFGF); transforming growth factor- β 1 (TGF- β 1); transforming growth factor- β 3 (TGF- β 3); and insulin-like growth factor-I (IGF-I).

To simulate forces generated during function, a mechanical stimuli may be required to produce an optimally engineered construct. Presently it is accomplished by using a rotating wall bioreactor (Fig 6) or by applying a continuous hydrostatic pressure of 10 MPa.

The rapid advancements in the field of bio engineering provides positive signals and a functional and biological replacement for temporomandibular disc (Fig 7) is not far from reality.

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