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## Awareness on interocclusal record materials among dental interns in private dental colleges in Chennai

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### ABSTRACT

To assess awareness among dental interns about interocclusal record material used in prosthodontics. The interocclusal registration material records the three-dimensional relationship between the Maxilla and mandible. The material to be used should have appropriate properties as it plays a vital role in establishing and recording this relationship. A clear understanding of various materials and their properties helps in making a choice that satisfies all the required characteristics. A self-administered questionnaire with ten questions was prepared and circulated among 100 dental interns from private dental colleges. The data were extracted, and the level of awareness was analysed. The results of the present study concluded the knowledge and awareness with regards to interocclusal record materials were only moderate among the dental students. Hence, more treatment awareness and education programs need to be initiated to improve this situation.



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### INTRODUCTION

The interocclusal record materials will play a positive role in securing the desired occlusion in the prosthesis fabrication. Diagnosis and treatment of a patient for prosthetic rehabilitation require the clinicians to fabricate diagnostic cast, as well as a master cast and articulate. In some cases, the casts can be easily mounted in maximum intercuspation by stabilizing them with cast cement after hand articulation. While in others, it is necessary to record a maxillomandibular relationship and accurately transfer it to the articulator by using appropriate (Luebke RJ 1981).

The first interocclusal records using natural waxes was made by the Phillip Pfaff in 1756. These materials are impression materials that have been modified to give better handling characteristics (Millstein PL *et al.*, 1971). These include impression plaster, Dental waxes, ZOE impression paste, acrylic resin, hydrocollides and newer one includes polyether. Interocclusal recording materials like wax and zinc oxide eugenol are used since the beginning. But the introduction of newer elastomeric materials in a market has put clinicians in a dilemma for the selection and usage (Millstein PL *et al.*, 1973).

These elastomeric materials are chemically similar to the impression materials that have been used for many years. Both waxes and zinc oxide eugenol are most commonly used interocclusal recording materials because of their ease of manipulation, economy, less time consuming and less skill dependent. These materials serve as the baseline for newer developments in the interocclusal recording materials (Scott W 1978).

Modelling wax is the most versatile and most commonly used interocclusal recording material. The reason for its versatility is its easy

manipulation, and when softened, it softens uniformly and remains soft for adequate working time. However, it is dimensionally inaccurate interocclusal recording material as it has a high coefficient of thermal expansion and high resistance to closure, which lead to inaccuracies while registration is made (Skurnik H 1977). Distortion of wax is also very common due to the release of internal stresses, thus, leading to inaccuracies in the record. Therefore, it has been classified as the most inaccurate material among the interocclusal records studied (Tripodakis AP *et al.*, 1997).

Zinc oxide eugenol is generally used as an interocclusal recording material. Because of the fluidity of paste before setting, it offers minimal resistance with mandibular closure and becomes rigid after it sets finally. However, zinc oxide eugenol pastes have a lengthy setting time, significant brittleness; they stick to the teeth and have unreliability to reuse. As it sets by chelation reaction, leading to dimensional changes takes place as the by-product undergo evaporation (Urstein M *et al.*, 1985). Vital portions of the record can be lost through breakage on removal from the mouth. Once zinc oxide eugenol record has been used to mount the casts, it is rarely used again. Unless trimmed, flash around the teeth can prevent the accurate seating of casts. Thus, it is advisable to use a minimal amount of zinc oxide eugenol to avoid excess flash. Therefore, zinc oxide eugenol was added to the wax impression in a very thin layer to improve poor detail transfer and displacement of wax (Urstein M *et al.*, 1991).

Elastomers are the most dimensionally stable materials till yet. Elastomers as interocclusal record materials consistently yielded the least error among the materials studied. They are easy to manipulate and offer little or no resistance to closure, set to a consistency that makes them easy to trim without distortion, and accurately reproduce tooth details. Furthermore, addition silicones exhibit the least amount of distortion among the elastomers. The excellent dimensional stability of addition silicones is attributed to the fact that it sets by addition polymerization reaction (Warren K *et al.*, 1990). Therefore, no by-products and no loss of volatiles occur in addition silicones. Accuracy, minimal resistance to closure and easy manipulation are the main advantages of addition silicones as an interocclusal recording material. However, its major disadvantage is that any compressive force exerted on these materials during mounting procedures may cause inaccuracies during mounting of the casts. Spring action found in these materials may cause inaccuracies during mounting of the casts. The

spring action found in these materials caused the articulated cast to open in centric relation position. Thus, the records should be trimmed and carefully seated over the occlusal surface to minimize the negative spring action (Wirth CG *et al.*, 1971).

Polyether interocclusal registration material consists of the basic impression material augmented by plasticizers and fillers. Impression plaster is plaster of Paris with modifiers. Modifiers decrease setting expansion and decrease setting expansion. Records of impression plaster are rigid after setting, accurate and do not distort with extended storage. It is difficult to handle because the material is fluid and are difficult to manage prior to setting. The final interocclusal record is brittle (Lucia VO 1964).

Acrylic resins most frequent application of acrylic resins for interocclusal records is in the fabrication of single stop centric occlusion records. Acrylic resin is both accurate and rigid after setting. Disadvantages of acrylic resin as an interocclusal registration material include dimensional instability due to continued polymerization resulting in shrinkage; rigidity of the material can damage plaster cast and dies during mounting on the articulator (Rosensteil 2001).

Requirements for ideal interocclusal registration material include; a) It should have limited resistance before setting to avoid displacement of teeth or mandible during the closure. b) It should become rigid and exhibit minimal dimensional change after setting. c) It should produce an accurate record of the incisal and occlusal surface of the teeth d) It should be easy to manipulate. e) It should not produce adverse effects on the tissues involved in the procedure, and it should allow easy verification. Hence, this study was planned to compare and to access the level of confidence in choosing different interocclusal record materials used in prosthesis among dental interns and practitioners (Sato Y *et al.*, 2000; Sonune S *et al.*, 2005).

This survey aims at analysing the level of awareness among the dental interns about different interocclusal record materials available, their properties, Composition and techniques.

## MATERIALS AND METHODS

**Study design:** A Questionnaire-based cross-sectional survey

**Study area:** Dentistry is a clinical discipline that must be evidence-based, and hence the need for research is important. Recent advances in all aspects of dentistry have been numerous and impressive. Dental research is experiencing dramatic progress across the world. The study was

**Table 1: Questionnaire used in the study**

S.No.	Questionnaire
1.	Do you think interocclusal records are required for diagnostic mounting? A. Yes B. No C. Not sure
2.	Is it alright to use stapler pins to make centric relation records in complete denture? A. Yes B. No C. Not sure
3.	Do you think modelling wax is an ideal interocclusal record material? A. Yes B. No C. Not sure
4.	Can you use self-cured acrylic/pattern resin as interocclusal record material for a dentulous patient? A. Yes B. No C. Not sure
5.	Do you think all elastomeric materials fair better as interocclusal record materials? A. Yes B. No C. Not sure
6.	Which of the following waxes can be used as interocclusal record materials? A. Alu wax B. Carding wax C. Physiologic wax
7.	What properties do you desire from an interocclusal record material? a. Dimensional stability b. Resistance to tear and fractures c. Slow setting time. faster working time A. All of the above B. a & b C. a, c & d
8.	which of the following materials have indefinite working time and short setting time? A. Silicone-based Bite registration paste B. Light cured resin materials C. Plaster of Paris
9.	which material do you often use to make interocclusal records? A. Plaster B. Modelling wax C. Silicone-based materials
10.	Are there any technological advances that can be used as alternatives for physical interocclusal record materials? A. Yes B. No C. Not sure

conducted in Saveetha dental college and hospitals among the dental interns who work in the hospital.

**Study population:** Majority of dental research in India are carried out among patients, staffs and clinical students. This study was carried out among 100 dental interns from private dental colleges in order to assess their knowledge and the level of confidence regarding interocclusal record medium used in a prosthesis.

**Inclusion criteria:** Dental interns aged 22-24 years and who are interested to participate in the study were included.

**Exclusion criteria:** Dental interns who were not interested to participate in the study and those who are not available during the time of data collection were excluded.

**Ethical clearance:** Prior to the start of the study, ethical clearance was obtained from the institutional ethical committee, Saveetha University.

**Scheduling:** Data collection was scheduled for a period of one month from November to December 2017.

**Sample size:** N=100

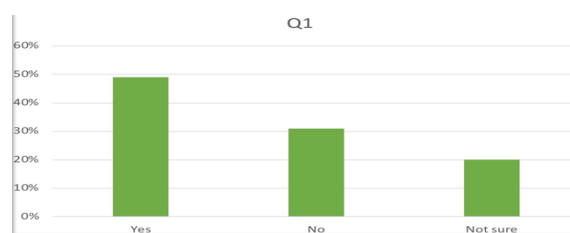
**Sampling:** A list of dental interns in private Dental Colleges formed the sampling frame. Dental

interns were randomly selected from the list until the sample size was achieved.

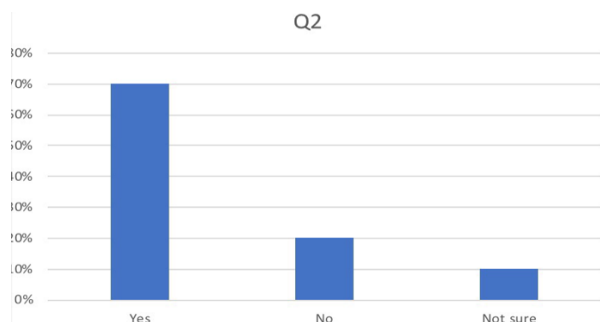
**Survey instrument:** A self-administered questionnaire with ten questions was designed and circulated among 100 dental interns. The study was conducted in Saveetha dental college and hospitals in Chennai. Data collection and analysis will be done using descriptive statistics.

**Statistical analysis:** Descriptive statistics were done using frequency and percentages values using SPSS software.

**Results:** All the questionnaires administered to the 100 participants who gave their consent to participate in the study were found to be complete and analysed. The participants were aged 22-24 years (Mean =23). Most of the participants were females. The response rate of participants was categorised as yes / No/ Not sure. Table 1 shows the confidence level of the participants according to the questions probed.

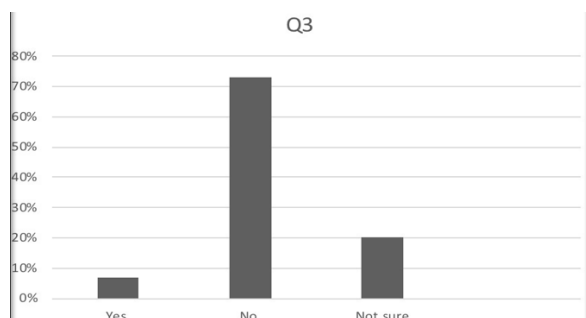
**Figure 1: Responses to Question 1**

The above graph shows that 49% of the participants do understand that Interocclusal records are required even for diagnostic mounting, while 31 % felt that it is not necessary. 20% of them were not sure if it is required.



**Figure 2: Responses to Question 2**

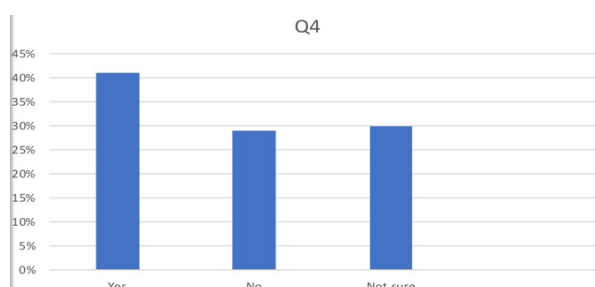
The responses from the above graph for question 2 showed that majority of the participants, about 70%, think that use of stapler pins to make an interocclusal record to be unacceptable, while 20% say it is acceptable and 10% of them were not sure about the suitability of stapler pins.



**Figure 3: Responses to Question 3**

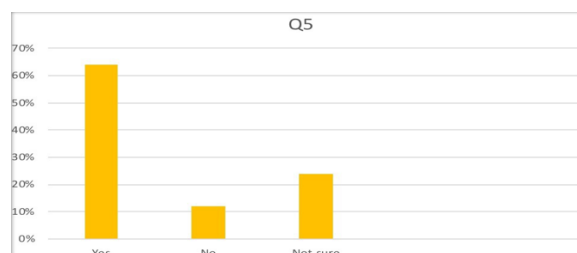
Responses for question 3 from the above graph illuminates shows that a majority, about 73%, do not consider modelling wax to be an ideal interocclusal material. 20% of them were not sure, and only 7% thought that wax could as be good as any recorded material.

Question four gave answers that were not conclusive or favourable towards the use of self-cure/ pattern resins as interocclusal record materials. Only 41% said that it is ok to use resins for recording interocclusal positions. 30% were not sure, and 29% were not accepting the use of acrylic resins for making records.

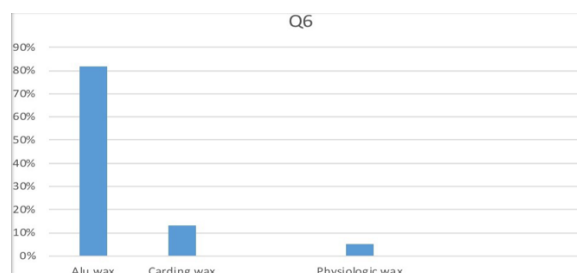


**Figure 4: Responses to Question 4**

64% of the respondents believed that elastomers could be good interocclusal record materials and only 12% were of the opinion that it may not be good enough. 24% of them were not sure if elastomers are the best materials.



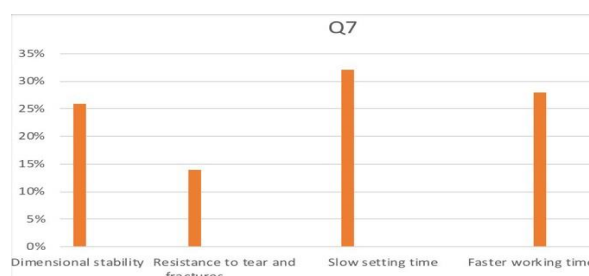
**Figure 5: Responses to Question 5**



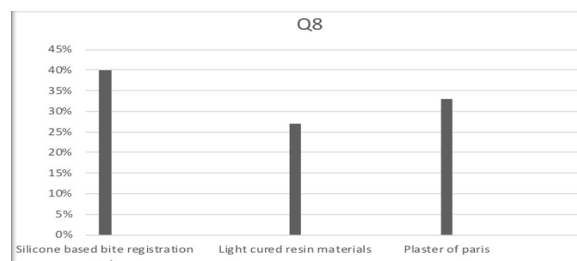
**Figure 6: Responses to Question 6**

Aluwax became a clear winner among other waxes with 82% of the participants voting to it, while only carding wax was preferred by 13% and only 5% voted for physiologic wax.

Question 7 was designed with little complexity to understand the level of knowledge of the participants about the ideal properties of interocclusal record materials four factors were considered and a second level response was obtained. Only 14% of the respondents were clear about the desired properties and chose an option that gave both dimensional stability and resistance to tear and fracture. This shows that clear understanding is still lacking.

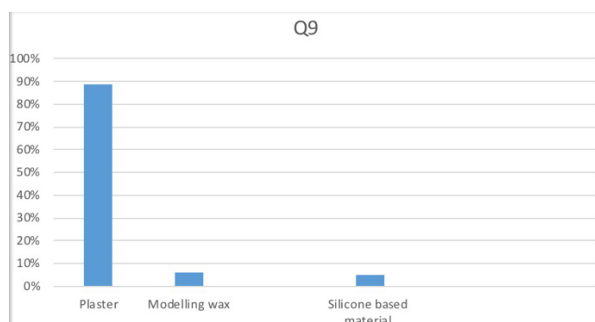


**Figure 7: Responses to Question 7**



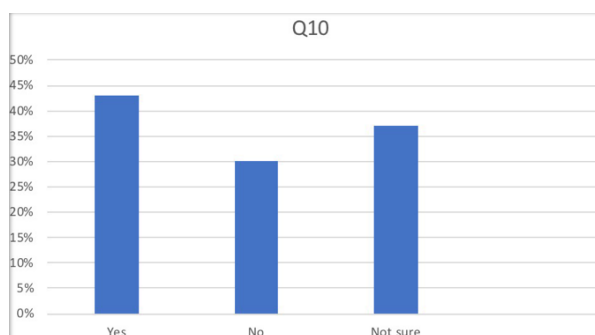
**Figure 8: Responses to Question 8**

Question 8 was about to light cured resin material which are promising in nature. But only 27% of the respondents chose light cured resin materials when asked which material has indefinite working time and shortest setting time.



**Figure 9: Responses to Question 9**

When asked which material they used commonly for making records, 89% responded in favour of plaster of paris, while only 6% chose wax and 5% chose silicone-based materials.



**Figure 10: Responses to Question 10**

The last question was directed towards knowledge of participants towards digital bite registrations using optical impression systems, and not many were sure of such technical advancements with a total of 57% responding against 43% who said that they were aware of such advancements.

## DISCUSSION

The success of prosthodontic treatment is closely related to an exact reproduction of occlusal relation in the articulator during all stages of treatment. The conditions are dependent on procedures and materials used for the interocclusal records which should result in the installation of prosthetic restorations, with a minimal occlusal adjustment. The interocclusal registrations must be obtained with special attention to the materials and the manufacturer's instructions (Petridis HP 2004).

Four techniques for interocclusal registrations of centric relation based on materials or combinations of materials usually utilized were tested by means of mounting of casts for a patient with partial lower edentulousness, without a free end saddle. To ensure the correct position of

centric relation a Lucia jig was utilized. The following conditions for the record of the posterior section were tested: registrations with wax, wax plus zinc oxide-eugenol paste, wax plus Duralay acrylic resin, and condensation silicone (putty) (Savabi O and Nejatidanesh F 2004). The evaluation was made by the measure of vertical distance between reference points in the base of the casts and calculation of variations occurring with each material. The combinations of wax plus zinc oxide-eugenol paste and wax plus Duralay acrylic resin showed the smallest variations in centric relation position (Singh L, *et al.*, 2011).

According to the study conducted byde Oliveria Pagnano V. *et al.* (2000), the confidence level in interocclusal records are required for diagnostic mounting was poor (31%). When this result was compared to our study, the confidence level is a little higher (49%)(de Oliveria Pagnano V 2000).

According to our present study, the participant's confidence level in the use of stapler pins to make centric relation records in complete denture was (70%). When these results were compared to the study conducted by Adams HF *et al.*, the confidence level was seemed to be poor (42.3%) (Adams HF 1982).

The study conducted by Berman MH *et al.*, says that modelling wax is also an ideal interocclusal record material, the confidence rate of the subjects to this was 53%. This statement is said to be ultimately wrong because the modelling wax is not an ideal choice of material for an interocclusal record material. This results when compared to our study the response rate is said to be only 7% (Berman MH 1960).

According to the study results encountered by Bezzon MH *et al.*, the confidence level of the participants in judging that self-cured acrylic can be used as an interocclusal record material in the edentulous patient was (58%). When these results were compared to our study, the self-cured acrylic was considered to use as an interocclusal record material, and the confidence level of the subjects in judging this was (41%) (Bezzon OL and Orsi IA 1994).

The study conducted by Calagna LH *et al.*, states that elastomeric material is not better as interocclusal record material, the confidence level to this statement was 62.4%. When these results were compared to our study, the study stated that elastomeric material is better as interocclusal record material and the confidence level of the participants was 64% (Calagna LJ *et al.*, 1973).

According to the study conducted by Carroll WJ *et al.*, the waxes in choice for using interocclusal record material includes carding wax and Alu wax,

the confidence level of the subjects was 76.2%. But When these results were compared to our study, the participants were very much confident that only alu wax is used as wax in choice as an interocclusal record material (82%) (Carroll WJ *et al.*, 1988).

The study conducted by Cohn.LA *et al.*, says that the properties which desire from interocclusal record material was said to be resistance to tear and wear, dimensional stability and slow setting time, were the confidence level of the subjects were 57.8% when these results were compared to our present study the properties include dimensional stability, slow setting time, resistance to tear and fracture and faster working time. The response rate to this answer by the participants was 60% (Cohn LA 1963).

According to Dawson PE *et al.*, Light cured resin material has an indefinite working time and short setting time and the confidence level was said to be 45.9%. These results were compared to our study, plaster of Paris was said to have indefinite working time and short setting time, the subject's response rate was 49% (Dawson PE 1993).

The study conducted by Lassila V *et al.*, modelling wax, as well as silicone based materials, are often used to make interocclusal record material, the confidence level to this statement was 78%. This result when compared to our study, it says that silicone-based material is only often used as interocclusal record material 89% (Lassila V and McCabe JF 1985).

The reason for the difference in results could be due to the time period of the study as de Oliveria Pagnano V. *et al.*, (2000) conducted a longitudinal study as opposed to our cross-sectional study.

To properly evaluate a patient's occlusion and to build up an artificial dynamic occlusal scheme, it is mandatory that the diagnostic casts and the final casts are placed in an articulator in approximately the same relationship to the temporomandibular joint as it exists in the patient. The ideal material-technique combination for making interocclusal records would allow the placement of indirectly fabricated prostheses in the patient's mouth with no occlusal adjustment and hence play a major role in the success of the rehabilitative procedures in terms of function and aesthetics.

## CONCLUSION

The results of the present study concluded the knowledge and awareness with regards to interocclusal record materials were only moderate among the dental students. Hence, more treatment awareness and education programs need to be initiated to improve this situation.

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