Impression materials and techniques used and followed for the fixed partial denture treatment by private dental practitioners in Maharashtra state: A questionnaire study

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Abstract:

Aim and objective: The aim of this survey was to assess and know most common impression materials and techniques that are being used and followed, causes of shortcomings and failure observed during the treatment of fixed partial dentures by private dental practitioners in Maharashtra state.

Material and Method: A questionnaire consisting of 9 questions was prepared and sent to 200 private dental practitioners in Maharashtra state; out of which 170 were filled.

Results: 99% practitioners use irreversible hydrocolloid for making diagnostic impression. 51% do not practice gingival retraction. After tooth preparation, 43% practitioners use irreversible hydrocolloid for making final impression, 48% use single mix impression technique. 58% practitioners send the impression to the laboratory for pouring impression. 54% use dental stone to pour the impression. 52% do not give provisional restorations. 49% shortcomings observed by practitioners were because of lab error. 41% follow up observation in patients was food lodgment.

Conclusion: Private dental practitioners should follow the recommended impression materials and techniques, good communication with the dental laboratories and periodic follow up of the patients for reducing the rate of failure of the fixed partial dentures is needed.

Introduction:
The success of fixed prosthodontics treatment depends upon patient’s selection, diagnosis and treatment planning, impression making, communication with the dental laboratory, cementation of the prosthesis, patient’s satisfaction and proper follow up. All these things are taught in dental colleges in India to the undergraduates and Postgraduate students of prosthodontics as a part of curriculum. Generally it has been observed that many private dental practitioners pay more attention to the quantity of patients, cost and time for the treatment. Very few follow the proper protocol and care about the quality of the treatment.

To make a high-quality fixed prosthesis, all members of the dental team must understand what they can reasonably expect from each other. A mutual knowledge of individual limitations is crucial for the development of sound clinical judgment is a thorough understanding of technical procedures and their
rationale. The dentist has the overall responsibility for the treatment rendered.¹

A study conducted by Abdul Rohman, shows that most dentists using commercial laboratories performed unsatisfactory tooth preparation and sent unusable impressions. The majority of impressions were taken with irreversible hydrocolloid; some impressions were detached from the trays and showed obvious shrinkage. Moreover, in half of the specimens inspected preparation was inadequate and the finishing line was indistinct.² B. Mohamed conducted same kind of study, he observed that the absence of application of retraction cord and temporary restoration in their practice for crown and bridge work³.

Very few studies have been done in Maharashtra state to assess the trends of fixed partial denture practice done by private practitioners. This survey used questionnaire which was designed to assess and know most common impression materials and techniques that are being followed, shortcomings observed during the treatment and patient’s follow up after one year of fixed partial treatment rendered by private dental practitioners in Maharashtra state.

**Material and methodology**

A questionnaire consisting of 9 questions was prepared to assess and know most common impression materials and techniques that are being followed, shortcomings observed during the treatment and patient’s follow up after one year by private dental practitioners in Maharashtra state. This questionnaire was sent to 200 private dental practitioners in Maharashtra state regardless of age, sex and experience. The questionnaire was sent through e-mails, web post and by handing it personally. Clear instructions were given in the questionnaire form about the aim of the study and answering the questions. Name, contact details, place and educational qualification of the participants were kept very confidential.

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**QUESTIONNAIRE:**

1. Which material do you routinely use for making diagnostic impressions before tooth preparation?
   a) Irreversible Hydrocolloid (Alginate) b) Other: (Please specify) c) Don’t make diagnostic impression.

2. What do you use routinely for gingival retraction?
   a) Gingival retraction cord.
   b) Electro surgery
   c) Laser
   d) Rotary curettage
   e) Don’t practice gingival retraction.

3. Which material do you routinely use for making impression after tooth preparation?
   a) Condensation silicone
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<tr>
<td>b)</td>
<td>Addition silicone</td>
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<tr>
<td>c)</td>
<td>Polyether</td>
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<tr>
<td>d)</td>
<td>Polysulfide</td>
</tr>
<tr>
<td>e)</td>
<td>Irreversible Hydrocolloid (Alginate)</td>
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<td>f)</td>
<td>Other (Please specify)</td>
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4. If you are using elastomeric impression materials then which impression technique do you follow?
   a) Single mix (Monophase) technique
   b) Single step / Multiple mix technique
   c) Two step- i) Putty reline/Dual mix technique with spacer
      ii) Putty reline/Dual mix technique without spacer

5. Do you pour the cast in Clinic?
   a) Yes (within how much time after making impression?)
   b) No (within how much time you send the impression to the lab?)

6. With what material is the cast poured?
   a) Dental stone  b) Die Stone  c) Any Other (Please specify): |

7. Do you give provisional prosthesis after tooth preparation for all patients?
   a) Yes  b) No

8. Reasons for any short comings observed in FPD treatment-
   a) Clinical error  b) Lab error  c) Patient's mental attitude  d) No shortcomings observed.

9. Observation by the dentist during 1 year follow up appointment of patients with fixed prosthesis-
   a) Food lodgment
   b) Secondary caries
   c) Mobility / Periodontitis
   d) Fracture / Dislodgement
   e) No abnormal findings observed.
Result

A total of 200 copies of the questionnaires were sent to different private practitioners of various place of Maharashtra out of which 170 responded. The survey result shows the following findings:

99% private dental practitioners use irreversible hydrocolloid (Alginate) for making diagnostic impression. 51% do not practice gingival retraction, 46% practitioners use gingival retraction cord, 2% do rotary curettage, 1% use laser and electro-surgery seems rarely used for gingival retraction by private dental practitioners. After tooth preparation 43% use irreversible hydrocolloid, 26% use Condensation silicone, 23% use addition silicone, 5% use polyether, 2% uses polysulfide impression material. Elastomeric impression technique practiced most commonly is single mix (48%); 28% use putty reline without spacer, 20% use putty reline with spacer, 3% use multiple mix technique. 42% pours impression in clinic within the range of 5 minutes to one hour. 58% sent the impression to the laboratory for pouring; within the range of 15 minutes to 1 hour. 54% use dental stone to pour the impression, 46% use die stone to pour the cast. 52% do not give provisional restorations after tooth preparation, 48% give provisional prosthesis. Percentage of shortcomings observed by practitioners were: because of- 23% clinical error, 49% lab error, 20% patient’s mental attitude. 8% practitioners do not observed any shortcomings. One year follow up observation by private dental practitioner were- food lodgment in 41%, secondary caries in 22%, mobility/Periodontitis in 4%, fracture/dislodgement in 15%, No abnormal finding observed in 17%.

Discussion

Diagnostic impressions are essential step for treatment planning in fixed partial denture. The diagnostic cast gives idea about occluso-cervical dimension of edentulous spaces, relative alignment and angulations of proposed abutment teeth, detailed analysis of the occlusal plane and occlusion. The result of a survey shows that most commonly used impression material for the diagnostic purpose is irreversible hydrocolloid (alginate). Irreversible hydrocolloid is popular, primarily, because of their low cost and ease of use compared to other impression materials.

In fixed prosthodontics treatment planning; one of the challenging procedures is management of soft tissue i.e. to maintain the normal appearance of healthy gingiva. Appropriate, reversible, gingival displacement and tissue management are required, which facilitates making the final impression so it accurately records the prepared finish line and some unprepared tooth structure apical to the finish line. Caustic chemicals such as sulphuric acid can be effectively used for gingival retraction. Alternatively paste system can be used in conjunction with direct pressure. An electro-surgery unit can be used for tissue removal before impression making, but disadvantages are mucosal necrosis and loss of osseous structure. Also rotary curettage, lasers are useful in gingival retraction of soft tissue management.

Various impression materials are available for making impression of FPD. Amongst the hydrocolloid impression materials, laminate technique, i.e. agar alginate technique, is better.
than using agar or alginate individually as agar will record the prepared teeth accurately and the remaining arch is recorded with alginate.\textsuperscript{10} Elastomeric impression materials have excellent properties as impression materials. Advantages of polysulfides include a long working time, good tear strength, good flow before setting, good reproduction of surface detail, high flexibility for easier removal around undercuts, and lower cost compared to silicones and polyethers, disadvantage is its bad odor the lead dioxide materials that stain cloths and it cannot be repoured. Condensation silicones are clean, pleasant materials for the patient. They are highly elastic, and the setting time can be controlled with the amount of accelerator. These materials tend to be inaccurate due to shrinkage on standing and should be poured within 1 hour. Disadvantage of condensation silicone is that they are very hydrophobic, require a very dry field, and are difficult to pour in stone. Polyvinyl siloxane also known as addition silicones has excellent physical properties and handling characteristics. It is dimensionally stable, can record fine detail and can be poured at the convenience of the operator. Addition silicone has the best elastic recovery of all available impression materials, does not stain clothing, has pleasant colors and scents, The materials may be poured 1 week after taking the impression, and multiple pours are possible. The disadvantages are that the material is expensive twice the cost of polysulfide; it is more rigid than condensation silicones and difficult to remove around undercuts.\textsuperscript{11} Polyether is least hydrophobic than all elastomers, have good dimensional stability the disadvantage is that polyethers are stiff so undercuts should be blocked.\textsuperscript{12} Irreversible hydrocolloid is most commonly used by general practitioners. But they are not accurate enough for fixed partial denture impressions. Irreversible hydrocolloid tear easily, must be poured immediately after removal from the mouth, have limited detail reproduction and they are dimensionally unstable. Elastic recovery value of 97.3\% for irreversible hydrocolloid indicates less elasticity and therefore less accuracy than agar hydrocolloids and silicone and polyether impression materials. The compressive and tear strengths increase with increasing rates of deformation. The limit of reproduction is also lower, indicating that less fine detail will be obtained. It has higher permanent deformation upon stretching to pass over undercuts.

Amongst the elastomeric impression technique, the single-phase technique is faster and easier to use. Single-mix materials have some advantage in that, as a result of shear thinning, they have low viscosities when mixed or syringed but higher viscosities when inserted in a tray. In Multiple mix technique two separate mixtures are required. Putty wash technique, when used properly, impression with accuracy more than that of multiple mix can be obtained.\textsuperscript{13} Dimensional changes on setting can be compensated for by use of a double-impression or putty-wash technique. Thickness of 1-2 mm is most accurate-two steps putty wash with spacer.\textsuperscript{14,15,16}

One of the most important manipulative variables with impression materials is the time limit after removal from the mouth to when the
impression is poured. Survey result shows that practitioners pour the cast within the range of 15 min. to 1 hour. Many of them send the impression to the laboratory. To prevent distortion, it is generally recommended that irreversible hydrocolloid i.e. alginate impressions be poured immediately or within 15 minutes from removal from the mouth without wrapping in a wet paper towel. This is because it is not possible to determine the amount of water absorbed or whether the right shape and dimensions of the oral tissues have been reproduced precisely. Condensation silicones produce ethyl alcohol as a by-product of the setting reaction, and evaporation of the alcohol results in distortion. The identical phenomenon occurs with polysulfide rubber, where the by-product is water. These materials should be poured within 1 hour. Polyether materials can absorb water from the atmosphere and thus should be poured within 1 hour for maximum accuracy. Addition silicone impression materials are stable because there is no volatile by-product to the reaction and because they do not give off or absorb water so it has better dimensional stability up to 720 hours (30 days).17

The provisional prosthesis needs to be fabricated to serve for a limited period of time, have a biologic, mechanical, and esthetic role. They may be fabricated in the dental office from any of several commercially available materials and by a number of practical methods. The success of fixed prosthodontics often depends on the care with which the interim restoration is designed and fabricated.19 Avoiding provisional prosthesis can lead to marginal discrepancy and periodontal inflammation at the time of cementation of final prosthesis.20

A Survey shows that many practitioners prefer dental stone (Type III) as a material of choice because of its low cost. But literature shows that Die stones i.e. high strength stones (Type IV) are most successful die materials because of their high strength and greater abrasion resistance .21

Co-relation of the reason shortcomings observed by dental private practitioners is given in following table:

<table>
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<tr>
<th>Private dental practitioners -</th>
<th>Reason of Shortcomings observed</th>
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<tr>
<td></td>
<td>Clinical error</td>
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<td>• Those who do not practice gingival retraction.</td>
<td>40%</td>
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<tr>
<td>• Those who use irreversible hydrocolloid as a final impression material.</td>
<td>30%</td>
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<tr>
<td>• Those who do not give provisional restoration after tooth preparation.</td>
<td>45%</td>
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<tr>
<td>• Those who use dental stone for pouring final impression.</td>
<td>36%</td>
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The above table (Table-1) shows that most of the practitioners, who claimed that shortcomings observed were because of lab error; it is found that they are not practicing gingival retraction, for final impression they are using irreversible hydrocolloid impression material, they are not giving provisional restorations after tooth preparation and for pouring final impression they are using dental stone. This shows that the practitioners assumes that the shortcomings observed were because of lab error, but they are actually because of not following proper protocol during clinical steps that are resulting in difficulty in lab work.

**Conclusion**

Irreversible hydrocolloid (Alginate) is good for making diagnostic impression material for FPD treatment. Gingival retraction or soft tissue management should be followed. Elastomeric impression materials should be preferred over irreversible hydrocolloid (Alginate) after tooth preparation. The cast should be poured preferably in dental clinics. Proper manufacturer’s instructions should be followed about the recommended time for the pouring of cast for particular impression material to avoid distortion of impression. If impression is being sent to the laboratory; communication with the laboratory for the same is needed. The die stones should be preferred over dental stone. Provisional restorations should be given after tooth preparation. Recall examinations are especially important for patients with fixed partial denture treatment and should be carried out by the dentist. Patient must understand the limitations of fixed prosthodontics before treatment begins.
References
