Libyan Journal of Science & Technology 14:1 (2022) 12-16

Faculty of Science - University of Benghazi

Libyan Journal of Science & Technology

journal home page: www.sc.uob.edu.ly/pages/page/77

Awareness of dentists in Benghazi, Libya about current impression materials and techniques used for construction of complete denture.

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Highlights

- **Anonymous questionnaire of closed-ended questions used a survey about current impression materials and techniques used for complete dentures.**
- **To take the impressions of the complete denture, varieties of materials and techniques were employed by dentists.**
- **The ideal impression materials and techniques are mandatory for the long-term success of a complete denture.**

ARTICLE INFO

Article history:

Received 14 September 2021
Revised 13 March 2022
Accepted 14 March 2022

Keywords:

Impression techniques; Materials; Complete; Denture.

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ABSTRACT

The aim: this study aimed to assess the awareness of dentists in Benghazi, Libya toward current impression materials and techniques used for complete denture construction.

Material and methods: Seventeen closed-ended questions were designed as anonymous self-administered questionnaires, and they were intended as a survey of current impression materials and techniques used by dentists in Benghazi to fabricate complete dentures. a questionnaire-based survey was confidentially conducted by a random distribution of 50 surveys among dentists in Benghazi.; out of which, 33 questionnaires were filled. Data were collected and analyzed using Statistical Package for Social Sciences (SPSS) version 25.0.

Results: 75.8% of the practitioners used stock plastic trays for primary impressions. The irreversible hydrocolloid (alginate) was the material of choice for preliminary impression by 72.7%. Most of the participants used light cure acrylic resin to fabricate custom-made trays (87.9%). Nearly 93.9% of responses indicated that the custom-made trays were preferred to be fabricated a couple of days before final impression making. The most common material to be used for border molding of the custom-made tray is the green stick impression compound (75.8%), followed by polyvinylsiloxane (putty) 24.2%. 45.5% of the respondents favoured the mucocompressive impression procedure. Almost more than half of the studied dentists are fans of zinc oxide and eugenol impression paste 51.5%, and polyvinylsiloxane (regular body) 33.3%. **Conclusion:** Within the limitation of this research, we can conclude that multiple choices of impression materials and techniques are available and convenient for the construction of complete dentures. However, the results showed that more conventional techniques for complete denture impression are adopted by dentists in Benghazi. The ideal materials and techniques are mandatory for successful complete denture fabrication.

1. Introduction

Edentulism is still one of the common dental problems seen among geriatric patients; a complete denture is one of the treatment options provided to restore function and esthetic for a completely edentulous patient (Schwindling *et al*., 2014). Impression taking is a crucial procedure in the construction of a complete denture (Kakatkar, 2013). The ideal impression for a complete denture foundation is necessary to provide a good peripheral seal and properly extended borders which guarantee the stability and retention of a complete denture (Petropoulos & Rashedi, 2005).

Accuracy of the impression is mandatory for the success of complete dentures. To fabricate an optimum complete denture, the dentist has to opt for the appropriate material and technique that fit the patient's oral foundation. In the process of complete denture fabrication, an impression is so far a controversial issue (Mehra, 2014). Textbooks and literature show a diversity of options of available impression materials and applicable techniques that are recommended to take an impression for different clinical situations to ensure the success of complete denture (Petropoulos & Rashedi, 2003).

Different impression techniques for complete denture making are employed depending on the condition of supporting tissues, and they can be classified according to the applied pressure into mucostatic, mucocompressive, or selective pressure (Al-Ahmar *et al*., 2008). Choice of the appropriate technique is governed by the status of the oral foundation, availability of materials, and skills and knowledge of the practitioner. For the edentulous mouth, the most common materials to be used for primary impression are irreversible hydrocolloid and impression compound using stock trays. To take the final impression, custom-made trays can be made from either chemical-activated resins or light-activated resins. While the use of a spacer in the design of a custom-made tray is determined by the final impression material. (Basker *et al*., 2011; Fenn *et al*., 1989; Petrie *et al*., 2005).

 ISSN: Online 2663-1407, Print 2663-1393; National Library of Libya, Legal number: 390/2018

Grant *et al.* (1994) mentioned 3 materials for preliminary impression and 7 final impression techniques. Different clinicians offer different solutions to an equivalent problem. In the UK, authors reported in their review that the irreversible hydrocolloid is the most widely used preliminary impression material (Hyde & McCord, 1999). Furthermore, researchers from the USA demonstrated various materials and techniques employed by dentists for final impressions of a complete denture (Petrie *et al*., 2005).

For Definitive impressions, studies in the USA recommended both the philosophy of Selective pressure impression technique and utilization of low fusing impression compound for border molding. Zinc oxide and eugenol paste have been reported as the final impression material (Petrie *et al*., 2005).

Currently, different viscosities of elastomeric impression materials are used for both border molding and final impression. The researches have been conducted to evaluate different elastomeric materials such as polyvinylsiloxane and polyether to be used instead of the traditional materials of final impression (low fusing impression compound for border molding, and Zinc oxide and eugenol paste as the final impression material) (Petrie *et al*., 2005). The use of elastomeric impression materials in final impression making is because of their unique physical and mechanical properties like fine details reproduction, dimensional stability, excellent elasticity, easy manipulation, and the possibility of multiple cast pouring (Chaffee *et al*.,1999; Hayakawa & Watanabe, 2003).

After the revolution of computer-aided design/computer-aided manufacturing (CAD/CAM), digital dental technology has grown and enlarged quickly. Innovative digital impressions have become popular. The intraoral scanners get more popularity and acceptance among dental practitioners in comparison to traditional impression techniques. The studies have proved the pros of digital impressions including 3-D virtuals, and less effort and time (Beuer *et al*., 2008). More merits of intraoral scanning like elimination of tray selection procedure; minimizing dimensional change and reducing material consumption and giving patient accepted comfort (Giménez *et al*., 2015; Lee *et al*., 2015). The virtual data that are captured by the scanners can be saved and sent electronically to be used as a digital impression (Lee *et al*., 2015; Papaspyridakos *et al*., 2016).

Different offers of impression materials and techniques are available and convenient to the dental practitioner. An accurate impression is obligatory to provide good support, retention, peripheral seal, and stability for a complete denture (Carlsson, 2006; Petropoulos & Rashedi, 2003). Ideally, the depth and width of the vestibule should be recorded accurately in the impression to give similar length and thickness to denture flanges respectively (Carlsson, 2006; Hayakawa & Watanabe, 2003; Kawai *et al*., 2005). The steps of complete denture fabrication should be followed precisely as a sequence to produce better results (Hayakawa & Watanabe, 2003; Hyde, *et al*., 2010). These steps include preliminary impression, custom-made tray fabrication, border molding of the special tray, and final impression making. With the innovation of new materials and techniques, impression making has changed; nowadays, a wide variety of materials and methods are available for various clinical situations which necessitate the comprehensive understanding of impression concepts and principles. In spite of the revolution in impression materials and methods, the choice may depend on personal preference and experience (Vohra *et al*., 2015).

Researchers recommend using elastomeric impression materials instead of conventional materials like zinc oxide and eugenol for complete denture impressions. The advantages of rubber base materials are accuracy of details, dimensional stability, elasticity, and multiple cast pouring (Bhochhibhoya *et al*., 2018). Though, there is always a disagreement regarding which impression materials and techniques can be sued for CD denture among dental professionals (Petrie *et al*., 2005; Jabeen *et al*., 2021). Studies have been conducted to assess the preferences of materials and techniques utilized for impression making in CD in several parts of the world. Evidence suggests that there is variability in the choice of the materials and techniques for CD impression making among practitioners. A diverse range of clinical preferences exist. (Alqattan *et al*., 2016; Koodaryan & Hafezeqoran, 2016; Mehra, 2014; Samejo *et al*., 2016).

Regarding the impression of the complete denture, many studies were carried out in the United Kingdom and United States (Hyde& McCord, 1999; Petrie e*t al*., 2005; Petropoulos & Rashedi, 2005; Petropoulos & Rashedi, 2003). During searching, there is no enough data about the awareness and attitude of dentists in Benghazi toward the materials and techniques used for the impression of complete denture.

Aim of the study: The aim of this study was to investigate the awareness and attitude of dentists in Benghazi, Libya toward current impression materials and techniques used for the construction of complete dentures using a questionnaire-based survey**.**

2. Materials and methods

Seventeen closed-ended questions were designed as anonymous self-administered questionnaires, and they were intended as a survey of current impression materials and techniques used among dentists in Benghazi to fabricate complete dentures.

A questionnaire-based survey was confidentially conducted by a random distribution of 50 surveys among dentists practicing in Benghazi. to assess the preference of materials and techniques used for complete denture impression. The survey included questions related to the awareness of participants about digital impressions, and the questionnaire inquire whether the clinicians have utilized the intraoral scanners for impression procedures.

We conducted a pilot study by sending this questionnaire initially to a group of 10 dentists to assess the validity and reliability of the contents and administrative aspects. Then the questionnaire was sent to 50 dentists in Benghazi through e-mail and handed it personally as well. All dentists were contacted regardless of age. An accompanying letter, which described the purpose of the study and how the data would be used, was also sent to the participants. We assure All those who participated in the survey that they will be anonymous. Identification of individual respondents was not required to assure confidentiality. Out of 50 questionnaires, only 33 were filled. Data were collected and analyzed using Statistical Package for Social Sciences (SPSS) version 25.0

3. Results

Table 1 displayed responses of participants to multiple-choice questions about complete denture impression materials and techniques. To the inquiry about the type of stock tray used for making a preliminary impression, 75.8% of the participants chose stock plastic trays. While only 24.2% of dentists chose stock metal trays. The irreversible hydrocolloid (alginate) was the material of choice for preliminary impression by 72.7% of the respondents. About 69.7% Of the respondents use custom trays for making definitive impressions. Most of the participants used light cure acrylic resin to fabricate custom-made trays (87.9%). Nearly 93.9% of responses indicated that the custom-made trays were preferred to be fabricated a couple of days before final impression making, and the others 6.1% made it a few hours before the beginning of the final impression procedure. The material to be used for border molding of the custom-made trays was the green stick impression compound (75.8%), followed by polyvinylsiloxane (putty) (24.2%).

Furthermore, Almost 72.7% of practitioners preferred to mold the borders in sections, and the remaining preferred to trace the borders either simultaneously or using both the techniques by 12.1% and 15.2% respectively. There were 45.5% of the respondents favoured the mucocompressive procedure, and 36.4% of respondents adopted the mucostatic technique, and only 18.2% utilized the selective pressure impression technique. Almost more than half of the dentists are fans of zinc oxide and eugenol impression paste (51.5%), and polyvinylsiloxane (33.3%).

Table 1

Answers of participants to multiple-choice questions about complete denture impression materials and techniques.

s. No.	Inquiry	Answers	Participants No.	(%)
1	What type of stock tray do you prefer for making a preliminary impression?	Stock metal tray	8	24.2
		Stock plastic tray	25	75.8
2	What is type of materials do you use for preliminary impressions?	Impression compound	1	3.0
		Alginate	24	72.7
		Elastomeric P.V.S (putty)	8	24.2
3	Which type of tray do you prefer for final impressions?	Stock metal tray	1	3.0
		Stock plastic tray	9	27.3
		Custom made (special) tray	23	69.7
4	What is material do you prefer to fabricate custom-made trays?	Light cure acrylic resin	29	87.9
		Autopolymerizing acrylic resins (self cure)	4	12.1
		Heat cured acrylic resins	0	0
5	When do you construct the custom-made tray? (to prevent distortion)	Few days before the final impression	31	93.9
		Few hours before the final impression	2	6.1
6	Do you prefer custom-made trays with a spacer?	Yes	3	9.1
		No	30	90.9
7	Do you include tissue stops to fabricate custom trays?	Yes	3	9.1
		No	30	90.9
8	Do you drill the venting holes (perforation of custom trays) before final impression making?	Yes	6	18.2
		No	27	81.8
9	What material do you use for border molding?	Modeling plastic impression compound (Greenstick)	25	75.8
		Polyvinylsiloxane (putty)	8	24.2
		Polyether	0	0
10	Which method do you use to determine the borders of custom trays?	Marking on the preliminary impression	0	0
		marking on preliminary cast	28	84.8
		Others	5	15.2
11	How do you carry out border molding?	in sections	24	72.7
		all-together	4	12.1
		or use both techniques	5	15.2
12	What technique do you prefer for final impression making?	Pressure (mucocompressive) technique	15	45.5
		Minimally pressure (mucostatic) technique	12	36.4
		Selective pressure technique	6	18.2
13	Which impression material do you routinely use for taking final impressions?	Zinc oxide and eugenol/ Non- eugenol	17	51.5
		Polyvinylsiloxane	11	33.3
		Alginate	5	15.2
		Polysulphide	0	0
14	Do you accept the correction of minor defects in your final impression?	Yes	31	93.9
		No	2	6.1
15	What technique do you prefer to locate the posterior palatal seal area in the final impression?	Marking intraorally	11	33.3
		arbitrary cast carving	18	54.5
		Others	4	12.1
16	Which technique do you use to determine the depth of the posterior palatal seal?	T- burnisher	3	9.1
		arbitrarily	23	69.7
		Both	7	21.2
17	do you use any digital impression technique like an intraoral scanner or laser scanner?	Yes	0	0
		No	33	100.0

4. Discussion

Impression making is a crucial phase in the construction of a complete denture (Kakatkar, 2013). Impressions can be done with a different option of materials and techniques. The ultimate goal of an impression is to guarantee the retention, support, and stability of the prosthesis (Mehra, 2014). In the present study, 75.8% of dentists mentioned that they use stock plastic trays for preliminary impression taking. Whereas, a previous study which was conducted in the united states showed that both metal and plastic trays were used by the same preference among the dentists. (Mehra, 2014). In spite of different types of trays that can be used, a rigid tray of a suitable size gives a more acceptable impression (Arbree *et al*., 1996).

Broad-spectrum of impression materials ranging from modeling compound to alginate can be used in a stock tray to take preliminary impressions. Availability and working properties make the irreversible hydrocolloid one of the common current materials used for preliminary impressions. This study indicated that the irreversible hydrocolloid was the material of choice for preliminary impressions by 72.7% of the dentists. While only 3% of the participants made a preliminary impression using impression compound. Previous studies which were carried out in India, the United States, and the United Kingdom displayed similar results and they showed the same tendency to use irreversible hydrocolloid impression materials (Arbree *et al*., 1996; Hyde *et al*., 2014; Hyde & McCord, 1999; Kakatkar, 2013; McCord & Grant, 2000; Montero *et al*., 2013; Petrie *et al*., 2005; Petropoulos & Rashedi, 2005).

Hyde & McCord (1999) reported in their research that 905 surveys were distributed among general practitioners working in Manchester, UK to evaluate their attitude toward the impression materials. They showed that 88% of dentists used only alginate for preliminary impression making. This is in disagreement with the study that was done in Pakistan, where impression compound was used for preliminary impression by 93% of clinicians (Samejo *et al*., 2016). Therefore, the variations in the teaching and training programs of the students may be the reason for different preferences of dentists among the impression materials. This survey indicates that dentists preferred zinc oxide eugenol/non eugenol, polyvinylsiloxane, and Alginate for final impression taking by 51.5%, 33.3%, and 15.2% respectively. This agreement with the result from the previous study (Kakatkar, 2013). A similar questionnaire about the final impressions showed that alginate was the option by 94% of participants, and the percentages of using zinc oxide eugenol and polyvinyl siloxane were 29% and 13% respectively (Hyde& McCord, 1999).

Many commercial materials are available and convenient for final impression making. However, preferences vary among dentists. there is no proof indicating that one procedure or material gives more durable results than the other (Koodaryan & Hafezeqoran, 2016). The preference of zinc oxide eugenol as a final impression material may be explained by its low cost and protocols of training and teaching dental students. Other studies refute our results; these studies showed that the popularity of zinc oxide eugenol is decreasing, and it is being replaced by elastomeric impression materials initially polysulfide and currently polyvinylsiloxanes (Arbree *et al*.,1996; Hyde & McCord, 1999; Mehra, 2014; Petrie *et al*., 2005; Petropoulos & Rashedi, 2003). The pros of using elastomeric impression materials are dimensional stability, ease of handling and manipulation, adequate working and setting times, and improved properties of these materials (Mehra, 2014; Petrie *et al*., 2005; Petropoulos & Rashedi, 2003).

Our study found that the custom-made trays were used by 69.7% of the participants. This percentage is in agreement with the result from a previous survey (Hyde & McCord, 1999; Kakatkar, 2013; Petropoulos & Rashedi, 2003). This survey displayed that the light-cured acrylic resin is the most favorable material to construct custom-made trays (87.9%). These findings are in disagreement with earlier studies (Arbree *et al*., 1996; Hyde& McCord, 1999; Kakatkar, 2013). In the present study, 93.9% of participants tend to fabricate custom-made trays a few days prior to the final impression. This is in agreement with the findings from previous research (Mehra, 2014).

In this study, 90.9% of the participants prefer not to use spacers. This is in contradiction with previous studies, which were carried out in India and the United States (Kakatkar, 2013; Petropoulos & Rashedi, 2003). The sequelae of using custom-made trays without spacer are alveolar bone loss caused by excessive pressure and pain due to pressure on sharp bony ridges. During the function, the tissues which are under stable and well-fitted dentures are more likely to rebound and return to the rest state (Shah *et al*., 2015). The border molding of the custom-made trays was done by most of the participants. In the present survey, a low fusing impression compound was used for border molding by 75.8% of dentists. This finding correlated with the data collected from other samples (Arbree *et al*., 1996; Mehra, 2014; Petrie *et al*., 2005; Petropoulos & Rashedi, 2003; Shah *et al*., 2015).

In the current study, 45.5% of practitioners used mucocompressive impression philosophy. This is in disagreement with previous studies where the selective pressure impression technique was the most predominant (Kakatkar, 2013; Petropoulos & Rashedi, 2003; Shah *et al*., 2015). The explanation might be that the dentist was not taught and trained to do the all techniques, so they do not have enough skills and experience. In this study, 81.8% of participants prefer not to perforate the custom-made tray which is in disagreement with a study in the United States in 2003 (Petropoulos & Rashedi, 2003). The venting holes in the custom-made tray is to permit the excess impression material and air to escape and to minimise pressure on the tissues and eliminate bubbles in the final impression (Shah *et al*., 2015).

5. Conclusion

Within the limitation of this research, we can conclude that multiple-choice impression materials and techniques are available and convenient for the construction of complete dentures. However, the results showed that more conventional techniques of complete denture impression are adopted by dentists in Benghazi. The ideal materials, and techniques, are mandatory for the long-term success of the complete denture. Concerns and issues regarding the non-use of the latest impression materials and techniques related to complete denture impressions as well as the lack of understanding of the related concepts of participants were observed.

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