European Journal of Musculoskeletal Diseases
ISSN 2038-4106/2024

Original Article

VINYLSILOXANETHER®: REDUCTION OF THE INTRA-SURGICAL IMPRESSION'S SETTING TIME AND ENHANCEMENT OF AESTHETIC PREDICTABILITY IN IMMEDIATE LOADING

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ABSTRACT

The impression affects the accuracy of the definitive cast thus an accurate impression is essential to fabricate a prosthesis with a good fit. In implant prosthodontics, a successful result can be achieved only when passively fitting prostheses are fabricated. The aim of the present report is to the evaluation of Vinylsiloxanether® (VSX) for the reduction of the intra-surgical impression's setting time and enhancement of aesthetic predictability in immediate loading. VSX was used in four clinical cases of immediate implant loading, (two cemented and two screw-retained) to verify the predictability of transfer of soft tissues on a plaster model and the predictability of impression transfer. VSX gave a predictability transfer of both systems reducing the intra-surgery setting time of the impression and ensuring an immobilization of the transfer impression copings, with accurate intra-oral implant position to the working cast. VSX is an excellent impression material, reducing the intra-surgical impression's setting time and enhancing aesthetic predictability in immediate loading.

KEYWORDS: *intra-surgical impression, immediate implant-loading, Vinylsiloxanether®, aesthetic predictability*

INTRODUCTION

A dental impression is a negative imprint of an oral structure used to produce a positive replica for a permanent record or for producing a dental restoration or prosthesis (1). Since the accuracy of the impression affects the accuracy

Received: 03 november 2023
Accepted: 15 december 2023

ISSN: 2038-4106

of the definitive cast, an accurate impression is essential to fabricate a prosthesis with a good fit. In dentistry, prosthetic work has traditionally been an intra-oral impression that is subsequently poured into dental stone. The model from dental impression forms the basis for manufacturing crowns, fixed partial dentures and frames attached to natural teeth. Stone models are also used for producing frameworks for implant cases.

Dental implants have been proven successful in the treatment of edentulism (2, 3). Osseointegrated implants were used for the rehabilitation of edentulous patients with the principle objective of replacing conventional complete dentures with an implant-supported prosthesis (4, 5).

In implant prosthodontics, a successful result can be achieved only when passively fitting prostheses are fabricated (6-8). Although there is some evidence that prosthesis misfit may not affect osseointegration, there is evidence that prosthesis misfit is likely to increase the incidence of mechanical component loosening or fracture. The causes of component failure and loosening are multifactorial, but it must be assumed that prosthesis misfit plays an important role in complications such as occlusal and abutment screw loosening and fracture in implant restorations (2, 9-13). Because of these, prosthesis misfit must be minimized.

The position of dental implants is recorded and transferred to a working stone cast for the manufacturing of implant-supported prostheses (14). The correct transfer of each implant position in relation to neighbouring implants or teeth is of paramount importance for the design and fit of an implant-supported prosthesis and therefore for the long-term success of implant therapy avoiding mechanical and biological complications (15-17).

The conventional workflow for dental implant impressions involves screw-retained impression copings that are attached to the implant and impression trays loaded with impression material. Impression copings are either retained in the cured impression material (pick-up method) (18-20) or remain in the implants and are repositioned in the respective regions in the impression after it is removed from the mouth (transfer method) (21, 22). Replacement of transfer copings after removal of the impression from the mouth may be facilitated by plastic caps seated on transfer copings that are retained in the impression (23, 24).

The pick-up method is performed with open impression trays. To remove the impression with copings, the screw retention must be loosened. This is achieved through holes in the impression tray that are located on top of the impression coping. The transfer method is performed with closed impression trays, as no access to the screw-retained copings is required. Pick-up impression copings are frequently splinted to each other with acrylic resin or other materials or structures (bars, straws, or dental floss) before adding impression material (25-27). The rigid connection of multiple impression copings is applied to avoid movement of impression copings in the elastic impression material. A higher impression accuracy with splinted impression copings compared to non-splinted copings has been reported (27-30).

Today the majority of dental impression make use of polyether and additional silicone impression materials (31-33). Polyether is well known for its fluidity and precision. Casts obtained from polyether impression material are more accurate than casts obtained from other impression materials (34).

Silicon impression materials, on the other hand, secure a better elasticity: the impression can be easily removed from the oral cavity after a quick setting time. In addition, patients better tolerate this type of impression material since it is odourless and tasteless. The most recent review supports the supremacy of these two impression materials, especially in implantology (14).

The aim of the present report is the evaluation of Vinylsiloxanether® for the reduction of the intra-surgical impression's setting time and enhancement of aesthetic predictability in immediate implant loading.

MATERIALS AND METHODS

The impression material used combines the advantages of polyether and additional silicone impression materials: Identium® (IDT) which is named Vinylsiloxanether® (VSX). VSX was used in four clinical cases of immediate implant loading, two of them with a cemented technique and two with a screw-retained implant, to check the predictability of transfer of soft tissues on the plaster model and the predictability of impression transfer. IDT is available in three different viscosities: we chose the intermediate one (IDT medium) for the clinical cases of immediate loading with the cemented technique and the material with superior viscosity (IDT heavy) in the screw-retained technique.

The two clinical cases rehabilitated with immediate loading with the cemented technique were female patients aged 54 and 63; patients treated with immediate loading with the screw-retained technique were females of 37 and 47 years old (Fig. 1).

Patients underwent an implant prosthetic surgery with the insertion of n. 6 implants (patient 1, already supplied with 3 osteo-integrated implants on overdenture) or with the insertion of n. 8 implants (patient 2) with transmucosal technique. Patients underwent regional anaesthesia, then bone thickness was measured by a surgical feeler gauge and Intralock® implants with self-tapping thread profile were inserted. The required tightening torque was 50 N. Patients underwent intra-surgery impressions with IDT medium. It was not necessary to splint all the transfer impression copings together with pattern resin. A fixture-level impression was taken using an open tray. After 12 hours from surgery, the check of the structure was made on the screwed titanium abutments and after 72 hours a Co-Cr alloy and composite framework with cementation technique was delivered.

Screw-retained group of patients underwent regional anaesthesia (35). Then bone thickness was measured by a surgical feeler gauge, and Intralock® implants with self-tapping thread profile were inserted. The required tightening torque was always 50 N. Flat abutments were screwed at 35 N/cm at the peri-implant mucosal collar profile. Afterwards, an impression was taken with IDT heavy. It is not necessary to splint all the transfer impression copings together with pattern resin (Fig. 2).

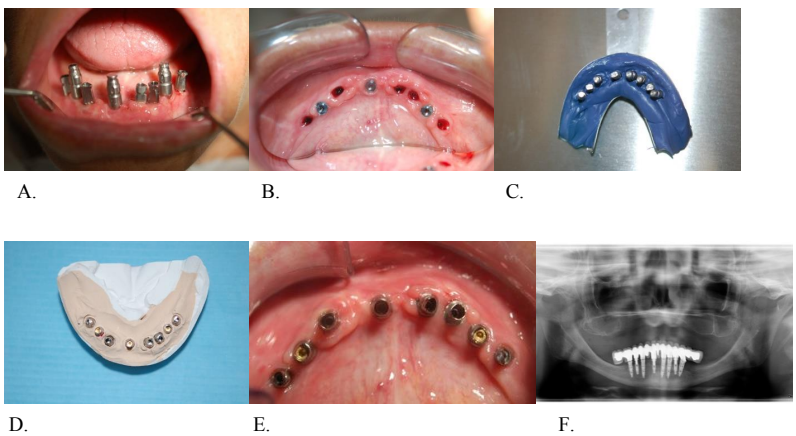

Fig. 1. *Cemented Technique. A): Transfer impression; B): Flapples technique; C): Impression. D): Plaster Model; E): Abutments 0°; F): Final X-ray.*

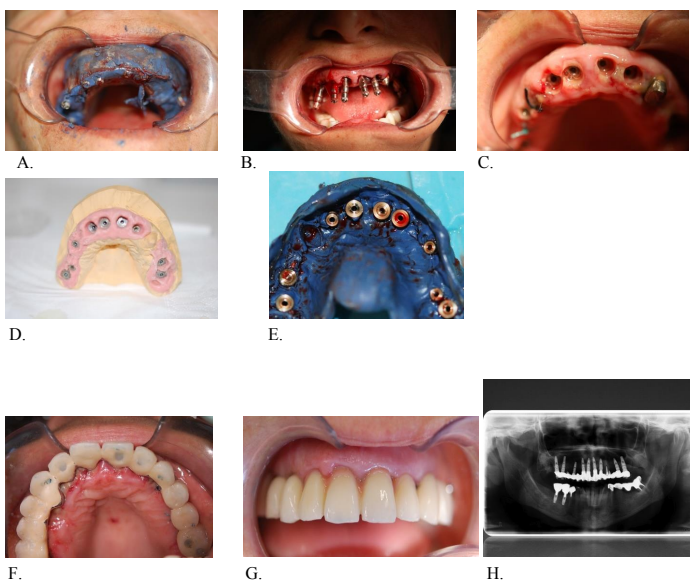

Fig. 2. *Screw-Retained Technique. A): Intrasurgey impression; B): Transfer Impression; C): Multi-unit abutments and transmucosal tissue after 48 hours; D): Plaster model; E): Intrasurgery impression; F): Occlusal view; G): Front view; H): Final x-ray.*

After 12 hours from surgery, the structure was checked for a completely passive fit. After 72 hours from surgery, a Co-Cr alloy and composite framework with screwed technique was delivered. The torque of fixation was 25 N.

RESULTS

VSX gave a predictability transfer of both cemented and screw-retained systems, reducing the intra-surgery setting time of the impression and ensuring an immobilization of the transfer impression copings, with accurate intra-oral implant position to the working cast. The consistency of the material and its considerable hydrophilic behaviour allowed to obtain an excellent closure of the peri-implant transmucosal collar profile without affecting periodontium (Table I).

DISCUSSION

Today available impression materials have advantages and disadvantages: VSX is the result of a combination of the two most widely used impression materials, e.g. polyethers and silicones. VSX combines the advantage of polyether and an additional type of silicone impression material (36).

Baer stated that VSX has been optimized for the one-step impression technique or monophase technique (37). This material is considered reliable for the impressions of the dental arches. It is used as the material of choice for studies on the accuracy of 3D scanners (38) and other oral digital impressions (39) compared to other types of materials. One notable finding was the better taste rating of the polyvinyl ether in comparison with the polyether material (36).

The differences in impression precision can likely be attributed to the fact that because of the lighter colouring of the IDT, it proved easier to assess than the darker "Impregum". From a clinical point of view, good legibility is an advantage because it allows rapid assessment of the impression quality and eventually makes a new impression if the first one is poor (36). Furthermore, Enkling et al. (36) claim VSX as a good alternative for polyether materials: based on the results of their study, it allows users to achieve excellent fits for dental prostheses and simultaneously achieves very positive ratings in terms of its clinical handling.

The results of Enkling's study demonstrated that VSX with respect to dentists, patients, and technician assessment was ascertained to be similar or superior to the polyether (36). The results of the study conducted by Vojdani et al. were the same as in the study of Enkling et al. (36, 40) demonstrating no difference between polyether and VSX for multi-implant impressions with parallel implant placement. Also, Ender et al. confirm that conventional impressions using VSX material showed the highest precision to obtain the complete-arch impression (41).

The study of Tolidis et al. (42) agrees that newly formed VSX material exhibited no significant differences when compared with other polyvinylsiloxanes. Instead, Gupta et al. (39) conclude that the casts obtained from impressions made with polyether impression material proved to be more accurate statistically than casts obtained from VSX impression material.

Table I. *Predictability of transfer.*

	Cemented technique	**Screw-retained technique**
	Identium® medium	Identium® heavy
Years old	**54 - 63 ± 2.12* y/o**	**37- 47 ± 2.37* y/o**
Viscosity	**1.5 ρ** (g/cm³)**	**1.5 ρ** (g/cm³)**
Density	**36** μ (kg × m−1 × s−1)**	**32** μ (kg × m−1 × s−1)**
Torque	**30 - 35 ± 2.5* Nm**	**20-25 ± 2.5* Nm**
Total (N):	**10 pz**	**10 pz**

**Standard deviation applied to the reference samples. **values reported by the Safety Data Sheet.*

VSX impression material quickly develops its hydrophilicity and provides an accurate impression in narrow spaces even in the sulcus after 1 second. Because of the hydrophilicity, it can produce a well-defined impression with crisp marginal details (37). VSX allows an immediate impression-taking procedure due to its hydrophilic and elastomeric properties in the peri-implant area. It doesn't have retraction and thus there is no need to splint the impression copings together with resin. This procedure simplifies the traditional technique and assures the total immobilization of the transfers in the impression. Soft tissue predictability, e.g., excellent transport, is another characteristic we appreciated during the reported clinical cases. In 2009 another paper compared several impression materials, acknowledging best results to IDT (43).

CONCLUSIONS

VSX is an excellent impression material with the following advantages: fluidity and stability, hydrophilic behaviour and viscosity at the same time, details precision, easy removal from the oral cavity and resistance to split without deformation, long processing time with short intra-oral setting time, universality of use, odourless and tasteless.

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