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DUPLICATE DENTURE

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ABSTRACT

Duplication or coping technique offer considerable advantage to both the patient and the operator for saving time and achieving a satisfactory conclusion to treatment. In patient who need another set of denture for whatever reason, some factors in the duplicated dentures should be considered, the original dentures should be acceptable physically and esthetically, the vertical dimension should be accurate and the centric occlusion achieved at centric relation. Several methods for duplicating dentures were used, some use both tooth colored and denture base from cold cure acrylic resin material in a flexible mould material, and other use a set of artificial teeth with heat cure acrylic denture base material using articulator and conventional flasking procedure. In this article we will review different methods for denture duplication and the variations between them.

KEYWORDS: Copy denture, duplicate denture, replica.

INTRODUCTION

Copy denturea new set of dentures that are manufactured based on your existing set of dentures. the technique can produce a replica of an existing set or incorporate all the benefits of the existing set, as well as adding new teeth and improving the fit and overall aesthetics.(free dictionary).

Duplicate denture, copy denture, or replica; is second set of an existing denture.

Duplicate dentures are similar in most aspects to those dentures which patient is accustomed to, these dentures are often desirable for elderly patients, Chick 1962 and Heath 1981.

As a general rule, older patients are difficult to adapt to their well patterned reflexes to new circumstances which imposed by providing dentures of different designs, Chick 1962, Scher

1964, Liddelow 1964. Several techniques have been developed and described over the past 70 years, which can be grouped according to the clinical or technical procedures involved.

The general procedure for duplication has been described by Chestnutt and Gibson 1998 as follow.

1. Modification of an existing denture, eg., under extension of lingual pouches modified by tracing stick to lower denture.
2. putty impression of fitting, polished and occlusal surfaces of modified intented to be replica to the first.
3. In the laboratory putty moulds are poured into copy dentures with their wax, sometimes with shellac base plates,or pour cure acrylic.
4. Set up, trial of teeth, and insertion; as for conventional complete denture

Possible causes and advantages of duplication

Certain circumstances occur in which the duplication of complete denture provides valuable services to the patient.

- May be needed by patients who are having their dentures relined or rebased and they can't withstand the embarrassment of being without dentures even for a short period of time.
- Or by patient who wishes to have another set of denture as a spare denture in case the original one are lost or broken.
- Also denture duplication is indicated in elderly patients, patient with old, worn, or loose dentures which were otherwise successful.
- The patient who is extremely satisfied with an esthetic result and wishes to re produced in a new denture.
- When the dentist is difficult to be reached or its difficult for the patient to do a new denture because of extra clinical visits.
- Poor patient cooperation, eg., Alzheimer, Parkinson's or dementia, as the duplicate denture enhance the neuromuscular adaptation to new denture as they are basically of similar shape and form to the original one.
- Include less clinical steps, simple registration of jaw relation, and it gives the technician a guide to teeth position and moulds.

Chick 1962, Scher 1964,Dukes 1980, Azarmehr 1997, Wagner 1970 Sttafford&Huggett 1971, Assery & Fakiha 1997, Ansary 1994& Lindquist 1997, Chestnutt & Gibson 1998.

Disadvantages

Large errors in the original denture are difficult to be corrected, and the procedure is only used in complete denture prosthetic existing denture and re-locating together as a mould.

Review for technical procedures

Over the years; variety of **techniques** Have been evolved,and various **materials** are available for denture duplication.

1952; **Beckett, the first method of duplication has been described** where he made a plaster control key to replace the teeth of the original denture by trimming the teeth as rebasing and put it on a master cast on articulator.

1953; **Liddelow and Victor,** use the same teeth of the old original immediate denture in the dublicate denture and made an index for replacing the teeth on the cast. so the denture was irreversibly altered.

1956; **Colyer,** use soft model from rubber, which then was replaced by hard model for processing the finished denture.

1962; **Shaw,** describe laboratory technique with no need of impression or centric relation record.

1962; **Chick;** 1964; **Liddelow**; 1964; **Scher;** modify the denture by increasing the retention of the dublicate denture and increase the vertical dimension of occlusion.

1962; **Marcroft et al,** used a layered silicon technique at the try in stage, in this method a layer of silicon rubber covered the polished and occlussal surfaces of the denture, after investing in the flask, the wax denture was removed and acrylic resin processed directly into the silicon mould, it was necessary to duplicate the working models and provide interchangeable flasks.

1967; **Chamberlain and Basker;** modified **Marcroft's** method by using undercuts (wire gauze cage) on the fitting surface between silicon and the investment plaster.

1967; **Thomson;** obtained cast from the original denture by using it as impression special tray, then he record centric relation and mounting the records on articulator, he suggested that

when correction is preferable it should be done on the original denture before duplication is carried out.

1969; **Manoli and Griffin;** use vulcanizing silicon rubber as a mould material,and used a gauze to increase the retention of silicon rubber with the stone instead of wire guaze cage.

1970; Azarmehr and Azarmehr; gave a method of duplicating trial denture using tow identical flasks, it can produce two to several identical dentures, this technique is simple and require one extra laboratory work and no chair time.

1970; **Zoeller and Beetar;** duplicate denture in plaster of paris as intermediate stage, then replaced it by set of teeth fixed with wax which was tried in patient mouth.

1971; **Basker and Chamberlain;** use silicon impression material to make the mould of vulcanite dentures then replace the whole denture with pink hot cure acrylic, then replacethe teeth one by one with porcelain teeth after mounting the pink acrylic denture and the lower denture on articulator.

1974; **Boos and Carpenter;** used a pour type denture flask which was filled with reversible hydrocolloid after securing the original denture in the floor of the flask. Then tooth coloured acrylic was used for the preparation of the teeth and then ordinary pink cold cure acrylic was used for denture base. this method should be done in a short time because of the dimensional changes of the alginate.

1976; **Cooper and Watkinson;** describe a method of duplication of dentures with problems of wearing of teeth and loss of vertical height.

1978; **Duthie et al;** he used silicon putty for impression placed in a stock tray and shellac base material for intermediate denture and wax replica teeth which was placed on an articulator.

1978; **Chalifoux;** present a quick inexpensive not identical not permanent replica of the lost denture, but save the patient from embarrassment of denture loss and provide record for new denture construction.

1978; **Heath and Basker;** examined the variation in dimension of duplicate dentures prepared by different techniques, they found that when alginate mould is secured by a rigid

container it gave better dimensional accuracy than methods where impression trays were used as they appear to offer little support to the flexible investing medium.

1980; **Rudd and Morrow;** presented 3 types of methods for duplication by using reversible and irreversible hydrocolloids for the mould and pour type resin for duplicate denture. They showed that reversible hydrocolloid moulds produce better denture surface than alginate mould do, but not as easy to use as alginate, Also they insisted on extreme care for best esthetic result in painting tooth shade resin in mould.

1981; **Heath and Johnson;** used alginate investment for duplication of denture with cobalt chromium palatal area and increasing the occlussal vertical dimension,adding labial flanges or with dentures of integral obturator and others.

1982; **Heath and Davenport;** describe a method where duplication of wax teeth produced on acrylic resin base plate as intermediate stage in the production of duplicate denture, the waxed teeth then were replaced by aset of artificial teeth.

1984; **Krug;** described a method of duplication of complete denture using alginate mould and ceramic flask.the resulting duplicate denture is not a spare prosthesis for the patient but serves an excellent custom tray for final impression, transferring the vertical dimension of occlusion to the articulator. Alteration of esthetic, phonetic and occlusion can be acheaved by replacing the original teeth of duplicate denture with ready made acrylic resin teeth.

1984; **Nassif and Jumberic;** used a modified Hanua denture flask for duplicating maxillary denture with pour cold cure acrylic and alginate mould material.

1986; **Lanchner;** describe a method for duplication using alginate as investing material and pour cold cure acrylic resin denture base in a study on problem solving in removable prosthodontics.

1993; **Lechner;** used two parts silicon mould for duplicating maxillary and mandibular dentures at the chair side and the denture was return to the patient.

1994; **Ansari;** used plaster as investing material lined by putty soft material with wire loops inserted as retention for wax denture as they mounted on articulators and teeth replaced with acrylic resin teeth, tried in mouth and processed in the usual way.

1997; **Assery and Fakiha;** replica waxed teeth were produced and cold cure denture base as intermediate stage.

1997; **Lindquist et al;** modefingDuthie et al's method by using additional silicon instead of condensation silicon because additional silicon is more accurate, dimensionally stable, can be used several times without loss of accuracy and can capture the necessary details even with over denture abutments,finally it is easy to use and require no special equipments.

CAD-CAM In this method the shapes of the complete dentures of an edentulous patient were measured using non- contact type shape measurement system and morphological data at the interval of 0.25mm were obtained in the X-axis and Y-axis directions, measurements were performed from the occlussal surface and mucosal surface sides based on the 3-dimensional morphological data, cutter pathes for cutting were generated, the 3 steps method consisting of rough cutting, finish cutting and partial finish cutting was used for duplicating the dentures, the modeling wax was cut using a computerized numerical control (CNC)processer and ball-end mills with diameter of 6mm and 1mm.Although further improvements are needed in the measurements and cutting in acute slope areas, the duplication of complete denture appears to be possible using CAD-CAM system **Kawahata et al** 1997.

2006; **Owen** use Appropriatech (appropriate technology) saving cost and time by using box tray and alginate totake impression of the polished surface, putty material for the fitted surface, paper clips as retention mean for plaster support, wax sprue added, and a mix of modeling wax and 10 % sticky wax are mixed and poured into the mould, The 2 halves of mould are separated to reveal a wax replica of the denture, every other tooth is replaced to help maintain arch form and tooth position, final impression of the new denture is made with ZnOx inside the trial base. the technique is cost effective with only 3 visits, but the final impression with wax intermediate dentures of weak point as a high percent of distortion can occure while taking impression and vertical dimension verification.

2014: **Steven Soo, Ansgar C. Cheng** when denture material has simply degradedor has fractured and cannot be repaired satisfactorily, then direct copy may indicated, hence if the denture are modified in any way it is not a "copy" and the term "replica " might be more suitable.

Mould Materials

Different materials were used for the preparation of mould for duplicating dentures.

In the early years; **plaster** and **stone** were used as a mould material, therefore **Beckett, Liddelow, Victor, Colyer and Thomson** all of them used the conventional flasking technique of ordinary denture.

Later; other methods were used with **cold cure acrylic resin** in flexible hydrocolloid moulds. **Wagner** used both reversible and irreversible hydrocolloids for the preparation of the mould.

Reversible and irreversible hydrocolloid were used such as shellac base; alginate by Zoeller, Beeter, Stafford, Huggett, Boos and Carpenter, Wilson, Anderson, Chalifoux, Dukes et al, Nassif and Jumbelic, Krug and Lechner.

Silicon was usedby **Marcroft, Chamberlain, Basker, Manoli and Griffin.**

Duthie et al used **putty silicon;** recently **additional silicon** has been used.

Containers of the mould materials

Various containers were used;ordinary flasks when heat cure acrylic was used, cup flask or perforated tray for holding alginate or flexible mould material, interlocking bowels especially designed for duplication were also used, or special container which has tapered sides out wards from the base to the top with opened base and top to facilitate easy removal of hydrocolloid material, modified denture flask,disposable plastic tray were also used.

Denture base materials

Heat cure acrylic denture base was the material of choicefor denture base of duplicate denture, Later on, evolution of flexible mould materials lead to the use of cold cure acrylic denture base, Pourable resin which is a type of cold cure resin was also used with hydrocolloid mouldmaterial, but with high residual monomer content with inferior mechanical properties and possibility of distortion, inspite of short time of denture removal of denture from the flask, with less effort and less finishing.

Generally; the degree of polymerization achieved by using chemically activated resin is not as high as that achieved when using heat activated system. This indicate that there is a greater

amount of unreacted monomer in denture bases fabricated via chemical activation,and this gives tow major difficulties;tissue irritation and it act as plastesizer**. Anusavice 1996.**

Dimensional Accuracy Of Duplicate Denture

Making denture by duplicating technique the dimentional accuracy of the replica is of a most importance,

Therefore. The different methods of duplicating dentures usually include the use of different material such as acrylic resin heat or cold cure for denture base and teeth, wax, plaster and stone, reversible or irreversible hydrocolloid mould material and silicon mould material; all these materials gives rise to certain amount of dimensional changes, which is very important in the evaluation of the accuracy of duplicate denture.

Marcroft 1962 used silicon material as mould material for denture duplication, he drew to the fact that the silicon rubber wasn't damaged by the processing procedure and that its resiliency allowed further processing to be carried out, it also provide a very smooth surface to the denture,while using this material difficulty was found in obtaining adhesion between the silicon rubber and the invested plaster.

Heath and Basker 1978; considered that inaccuracy of the dimensions might arise not only from the inherent polymerization contraction of the acrylic resin, but also from the variation of the size of alginate mould, since the impression trays appeared to offer very little support to such a flexible investing medium, therefore, they examined the variation in dimension of duplicate dentures prepared by the above method and a method where increased support applied to alginate mould, they found that the dimensional changes were less when alginate mould was supported rigidly by metal flasks than impression trays.

Rudd and Morrow 1980; compared three methods of duplication using reversible and irreversible hydrocolloids then in conclusion they believe that the results obtained with reversible hydrocolloids were superior while the problems associated with the use of irreversible hydrocolloid (alginate) as a mould material were the inability to obtain a bubble free void lessmoulds, failure to achieve an accurate duplication of denture teeth without rounded incisal angels and difficulty in producing an accurate alginate mould and resultant duplicate denture.

Heath and Davenport 1982; shaw that the dimensional accuracy of the method were by replica wax teeth were produced on acrylic resin base plates as the intermediate stage in production of duplicate denture was acceptable and offers considerable technical advantages over other methods when they utilizes acrylic teeth on acrylic base plate.

Polyzois et al 1986; evaluate the clinical accuracy of duplicate dentures made from wax and cold cure acrylic resin in silicon or irreversible hydrocolloid flexible moulds, they found that replica made from modeling wax (all wax replica or acrylic resin base wax teeth replica) demonstrated better dimensional accuracy compared with the all acrylic resin replica which agree with the results obtained by **Heath and Davenport** 1982.

Owen 2006; used appropriatech (new technique) reveal a wax replica of the denture as intermediate duplicate denture, every other tooth of wax is replaced to help maintain arch form and tooth position, final impression of the new denture is made with ZnOx inside the trial base. the technique is cost effective with only 3 visits, but the final impression with wax intermediate denture of weak point as a high percent of distortion can occure while taking impression and verticaldimension verification.

Computer Aided Design –Computer Aided Manufacturing (CAD-CAM) has been applied in the field of prosthetic dentistry since 1980 to further enhance the implementation of CAD-CAM technology to design complete denture, a new method have been developedInokoshi et al 2012.

SUMMARY

Many methods of duplication were described over the last seventy years, some of these methods require no clinical visits, Shaw, Macroft, Chambelain, Basker, Manoli, Griffin Azarmehr and Azarmehr, Shelton, Boos and Carpenter, Brewer and Marrow, Boos, Chalifoux, Dukes et al, Nassif and Jumbelic, where they described as quick and inexpensive method, while others require clinical visits for improving the retention and stability with wash impression and/or recording jaw relation and trying the dentures in the mouth.

Late 2000s…. CAD/ CAM System applied to prosthetic dentistry by 3D imaging technique for more precise, time, effort,saving for both patient and operators.

In this article, we review almost the very beginning of duplication and its evolution from the use of simple equipment and material, continuously with better options of materials that

characteristics are more suitable for advanced techniques and meet the needs of patients till these days where imaging technology reaching high level of time and effort saving.

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34. Chick, Scher and Liddelow 1962, 1964; took wash impression with zinc oxide eugenol in the patient old denture and relied upon articulation with wax or plaster model of the opposing denture to determine the position of teeth.
35. Cooper and Walkinson 1976; employed a wax wafer or squash bite on the articulator to increase the vertical dimension when the acrylic teeth shaw gross wear of the occlusal and incisal surfaces.
36. Other modifications for the duplicate denture is the addition of labial flange to a socket fitted immediate denture; Victor 1953, Heath and Johnson 1981.
37. Reversible hydrocolloid moulds produce Owen, Steven Soo, Ansgar C. Cheng 2006, 2014, used same priciples of duplication with minor changes in retention mean of plaster to the impression of silicon and alginate; or by using a clear acrylic constructed with biostarmachiene to make tray for the intermediate stage and taking an impression with ZnOxeugenol for improving retention of the existing denture.