DIE SYSTEMS IN FPD : A REVIEW

Manmeet Singh Gulati [1], Manmohit Singh[2], Pratik Gupta[3], Aalok Mishra[4], Kashish Malhotra[5]
Professor &Head [1], Professor [2], Reader [3], Senior Lecturer [4] , PG student [5]
Department, department of Prosthodontics and Implantology, Desh Bhagat Dental College and Hospital, Mandi Gobindgarh, India.

Abstract

An accurate working cast with removable dies is essential to make a well fitting restoration. The prepared tooth, the surrounding soft tissues & the adjacent & opposing teeth should be accurately reproduced to decrease the number of clinical steps and to improve the accuracy of working cast/die system. A cast die system captures the necessary information so that it can be transported to the laboratory.
Keywords: DI-lock, Pindex, Accutrac, Die systems, Dowel pins.

Introduction

Removable die systems are frequently used to facilitate the manipulation of dies during the laboratory phase of fixed prosthesis fabrication[1]. The successful construction of long span fixed partial dentures and implant prosthesis depends on the accurate fabrication of the removable die. The removable die technique requires an accurate reproduction of the prepared tooth, the surrounding soft tissues, the adjacent and the opposing teeth. The die system captures this necessary information so that it can be transferred to the laboratory for fabrication of wax pattern. Precise relocation of the die in the master cast is critical to the system's success[2].

The fabrication of removable dies is an important step in the realization of the master cast, and it is necessary to know the existing systems available with their respective qualities and imperfections. Many methods for the indirect technique of constructing a working cast with removable dies have been reported in the literature, and some investigators have experimentally established the accuracy and comparative stability of the different systems.

A die has been defined as the positive reproduction of the form of a prepared tooth in any suitable material.

A cast is defined as a life size likeness of some desired form. It is formed within or is a material poured into a matrix or impression of the desired form.

Prerequisites for a good cast

- It should duplicate both prepared and unprepared surfaces.
- The unprepared teeth adjacent to the preparation should be free of voids.
- The occlusal surface of unprepared teeth and the teeth involved in anterior guidance should allow proper articulation of both the casts.
- All soft tissues must be properly duplicated in the working cast, that will be involved in fixed prosthesis.
- Edentulous space & residual ridge contours)

Prerequisites For A Good Die

- The prepared tooth must be excatly reproduced.
- All surfaces should be duplicated accurately.
- There should be no bubbles or voids.
- The unprepared tooth structure immediately cervical to the finish line should be easilyvisible on the die, (0.5-1 mm).
- There should be adequate access to the margin.

Requirements Of Cast & Die Materials

- They should allow a dimensionally accurate cast.
- Die materials should be strong&resistant to abrasion.
- It should be compatible with separating agent.
- All the surface delatails should be reproduced accurately.
- Should get easily wettable by wax.
- It should be compatible with impression materials.
- Die materials should have a contrasting color.

Classification of dies:

According to the material used for fabrication of die:

- **Non metallic**

A. Gypsum dies

B. Resin dies
C. Silicophosphate dies
D. Ceramic dies
E. Flexible dies

- **Metallic dies**

A. Electroplated dies
B. Low fusing alloys
C. Amalgam dies
D. Metal sprayed dies

Cast And Die Systems

There are two basic cast and die systems availabe.

- A working cast with a separate die which is also referred to as sold cast with immovable die/ multiple pour technique.
- A working cast with a removable die.

Working Cast With A Separate Die

Advantages

- It is the simplest means of fabricating a working cast &die, because no procedures are required to create a die other than making a sectional cast and a full-arch cast.
- The relationship between abutments is fixed & immovable.
- gingival tissue & all other landmarks are intact so it is easier to obtain physiologically harmonious restoration contours while fabricating wax patterns.

Disadvantages

- The disadvantages faced in the use of a working cast with a separate die is that the wax pattern must be transferred from one to the other.
- This technique, unfortunately, can be used only with elastomeric impressions, because hydrocolloid impression materials get torn &distorted easily and cannot be used for accurate second pour.

Steps Of Fabrication:

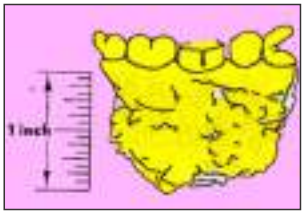
Armamentarium

- 500-cc Vac-U-Mixer & vacuum tubing
- Vibrator
- Water measuring tubes.
- Large & small spatulas
- Die stone (Silky-Rock, Vel-Mix)
- Humidor
- Model trimmer apparatus
- Straight hand piece & pear-shaped acrylic bur
- Bp blade (no.25) and handle
- Tanner carver
- Colorbrite red pencil

Procedure

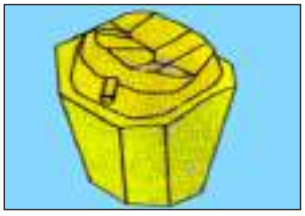
- Impression is made.
- Stone is added to the impression in small increments.

- Stone is build uptoa height of approximately 1.0 inch above the preparation to allow bulk for handle on the die.



- Cast is wet thoroughly and excess stone is trimmed from the working casts on the model trimmer

- The diameter of the handle should be larger than the preparation.
- The handle should be octagonal in cross section and sides should be parallel or tapered.



- Final trimming of the die is done with a sharp 25 no.blade

- A die hardening agent (cyano-acrylate or acrylic resin lacquer)is applied to the finish line area of a die to avoid abrasion by waxing instrumentswhile the fabrication of the wax pattern.

Working cast with a removable die

Advantages

- They are convenient to use becausewhile transferring the wax patterns or copings to the working castthey need not be removed from their respective dies.
- It is important while making ceramic restorations, becauseunfired material is quite fragile.
- A removable die eliminates mismatch between a separate die&working cast that may be caused by impression distortion or deterioration between pours, or by a cast & die made from separate impression which are not identical.
- The main disadvantage of a removable diesystem is in the pattern if the die does not reseat accurately in the working cast.

Systems included are:

1. Wet pinning systems

A. Straight dowel pin
B. Curved dowel pin

2. Dry pinning systems

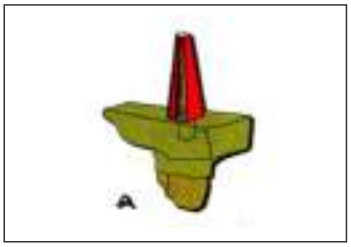
A. Pindex system
B. Dilok system
C. DVA system
D. Zeiser system
E. Accutrac system

Disadvantages

Wet pinning system

A) STRAIGHT DOWEL PIN :-

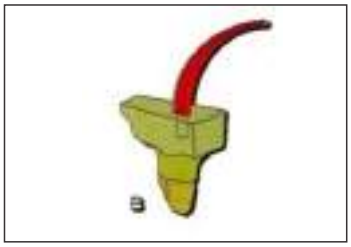
o The brass dowel pin isthe most accurate systeminresisting horizontal displacement and the second lowest in vertical deviation.



o A dowel pin is placed over each prepared tooth in the impression.

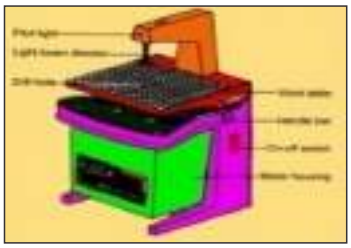
B) curved dowel pin

- o Curved dowelsare inserted into a working cast by fixing the dowels to the impression before it is poured.
- o Andother is by cementing the dowels into holes drilled in a previously poured cast.

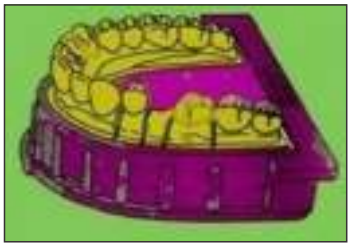


Dry Pinning System

A) Pindex system: In the Pindex system (Coltene/Whaledent, Mahwah, NJ), a reverse drill press is used to create a master cast with dies that can be removed and replaced repeatedlywith great precision.



B) di-lock tray-A snap-apart plastic tray with internal orienting grooves and notches also can be used to reassemble the working cast and die.
- it was found to have the least vertical error7 11 in two studies.



A) Dva And Zieser Model System : These systems use a precision drill and special baseplates are aligned and drilled to provide die removal.

B) Accutrack Model System: This removable die system is a modification of plastic tray with internal orientation grooves and notches (e.g.Accutrac, JF Jelenko, Armonk, NY).

Summary And Conclusion

The choice of a specific technique depends on operator preference, and after assessment of advantages and disadvantages of each method one should choose accordingly.If they are conducted carefully and properly all methods achieve clinically acceptable accuracy.The die of prepared tooth can be made removable by using dowels/pin or a solid working cast & a separate die can be used.

Whatever system is chosen it should articulate excatly with an accurately made opposing cast.

References

1. A Philippe, M Philip. A comparison of the accuracy of two removable die systems with intact working cast. Jprosthet dent 1993:6(6):533-9

2. Working casts and dies. In Rosensteil, S.F., Land, M.F. and Fujimotto J (Eds): Contemporary Fixed Prosthodontics. St.Louis: Mosby, 2001; 431-450.

3. Covo, L.M., Zeibert, G.J., Balthazar, Y., Christensen, L.V. Accuracy and comparative stability of three removable die systems. J. Prosthet. Dent., 1988; 59:314-318.

4. Serrano, J.G., Lepe, X., Townsend, J.D., Johnson, G.H., Theilke, S. An accuracy evaluation of four removable die systems. J. Prosthet. Dent., 1998; 80:575-586.

5. Ahmad M, Balakrishnan D, Narayan AI. A comparative evaluation of linear dimensional accuracy of the dies obtained using three conceptually different die systems in the fabrication of implant prosthesis: An in vitro study. Indian J Dent Res 2014;25:197-203.

6. "Glossary of Prosthodontic Terms". Journal of Prosthetic Dentistry 81.1 (1999): 39-110.

7. Dilts WE, Podshadley AG, Sawyer HF, Neiman R: Accuracy of four removable die techniques, J Am Dent Assoc 1971:83:1081-1085.

8. Miranda, F.J., Duncanson, M.G., Collard, E.W. Comparative stability of two removable die systems. J. Prosthet. Dent., 1976; 36: 326-333.

9. Wee AG, Cheng AC, Eskridge RN. Accuracy of 3 conceptually different die systems used for implant casts. J Prosthet Dent 2002;87:23-9.

10. Sivakumar I, Mohan J, Arunachalam KS, Zankari V. A comparison of the accuracy of three removable die systems and two die materials. Eur J ProsthodontRestor Dent. 2013 Sep;21(3):115-9.

11. Hembree JH, Brown T: Relative accuracy of several removable die systems. J Acad Gen Dent 1974;22:31-33