



FIXED PROSTHODONTICS

Lec 1 Study Casts, Working Casts & Dies

|  Item |  Study Cast |  Working Cast |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| Method of fabrication | Obtained by pouring the alginate impression | Obtained by pouring the rubber impression |
| Material used | Gypsum | Stone |
| Accuracy | Less accurate | More accurate |
| Main use | Diagnosis, treatment planning, and study purposes | Used for clinical and laboratory procedures |
| Detail reproduction | Basic anatomical details | Fine & precise details |

Working (Master) Cast

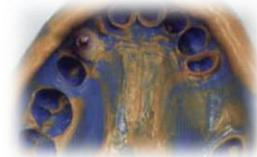
- ♦ **Replica of:**

- Prepared teeth
- Ridge areas
- Dental arch
- Other relevant oral structures



Ideal Requirements of a Working Cast

- ✓ Reproduce all details in the impression with **no defects**
- ✓ Accurately reproduce **prepared & unprepared tooth surfaces**
- ✓ Accurately reproduce **all soft tissues**



Die

- ♦ **Definition**

- A positive reproduction of a prepared tooth, made from a **hard substance** with **high accuracy**.

- ♦ **Materials Used**

- Improved stone
- Resin
- Metal



Ideal Requirements of a Die

- ✓ Must reproduce the **prepared tooth exactly**
- ✓ **No air bubbles or voids**
- ✓ The **unprepared tooth structure cervical to the finish line** must be clearly visible
- ✓ Ideally **1 mm visible** (*minimum acceptable: 0.5 mm*)





Die Materials

هيترح بالتفاصيل في اخر ريكورد



1. Gypsum

- ◆ Dental gypsum products are available in **four ADA types (I – IV)**
- ✓ **Inexpensive**
- ✓ **Easy to use**
- ✓ **Good surface detail reproduction**
- ✗ **Poor abrasion resistance**

 **Solution:**

- ➡ **Gypsum hardeners (colloidal silica)** improve abrasion resistance



2. Resin

- ✓ Overcomes **low strength & abrasion resistance** of stone
- ✓ Types:
 - **Epoxy resin**
 - **Polyurethane**

 **Epoxy Resin**

- ✓ Cures at **room temperature**
- ✓ Much higher abrasion resistance than gypsum
- ✗ **More expensive**
- ✗ Undergoes **polymerization shrinkage**

 **Compatibility**

- ✓ Compatible with **silicone & polyether**
- ✗ **Not compatible** with polysulfide & hydrocolloid



3. Electroplated Die

- 🎯 Used to overcome **poor abrasion resistance of gypsum**

 **Technique**

- Impression coated with **silver or graphite powder** → made conductive
- Placed in **electroplating bath**
- **Silver or copper layer deposited**
- Supported with **Type IV stone or resin**

-  Requires **slow technique**

-  About **8 hours** for cohesive metal layer





- ✓ Extremely **accurate** if done properly
- ✗ Not compatible with all impression materials

Material Compatibility

- ✗ **Silicone** → low surface energy so difficult to be electroplated.
- ✗ **Polyether** → hydrophilic → distortion
- ✓ **Polysulfide** → silver plating possible (copper difficult)

Major drawback:

Cyanide solution toxicity → requires **extreme precautions**

Selection Criteria for Die Materials

| Property | Requirement |
|----------------------------|-----------------------------------------------------------|
| Stability | High stability & dimensional accuracy |
| Strength | High mechanical strength to resist fracture or destroyed. |
| Surface hardness | Resists scratching & abrasion |
| Detail reproduction | Accurate surface detail |
| Manipulation | Easy sectioning & trimming |
| Compatibility | Compatible with impression material |
| Separating agent | Wax must not stick |
| Wax wetting | Easily wetted by wax |
| Color | Contrasts with wax → clear margin visibility |



Working Cast & Die Systems



1. Working Cast with Separate Die

Advantages

- ✓ Easy fabrication
- ✓ Maintains **fixed abutment relationship**
- ✓ Acts as a **guide during contouring**
- ✓ Gingival tissues remain intact



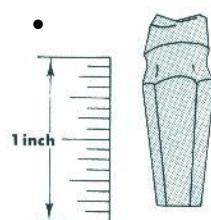


✖ Disadvantages

- ◆ Difficult transfer of wax patterns
 - Complex or fragile wax patterns are **difficult to transfer** between the **cast and the die**, with risk of distortion.
- ◆ Improper seating of wax pattern
 - Wax pattern may **not seat accurately** on the **master cast**.
 - **Reason:** the **second pour** is slightly **larger** than the first.
 - **Solution:** slight stone relief before **occlusal evaluation**.
- ◆ Material limitation
 - Technique is used **only with elastomeric impression materials**.
- ◆ Reversible hydrocolloid issue
 - Requires **separate impressions** for **master cast** and **die**.

🔧 Technique

- First pour (most accurate) → trimmed into **die with handle**
- Second pour → complete arch cast
- Mounted on an **articulator**
-



㉑ 2. Working Cast with Removable Die

☑ Requirements

- ✓ Dies must return to **exact original position**
- ✓ Dies must remain **stable even when inverted**
- ✓ Cast must be **easy to mount on articulator**

☑ Advantages

- ✓ Wax patterns or copings can be removed without **distortion** and need not to be removed from their respective dies when they are transferred to the working cast

✖ Disadvantage

- ✖ Risk of **error** if die does **not reseat accurately**



 Techniques of Removable Die

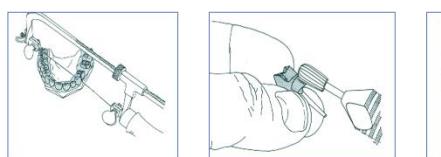
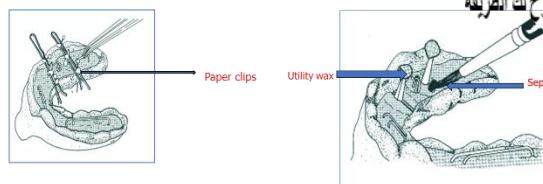
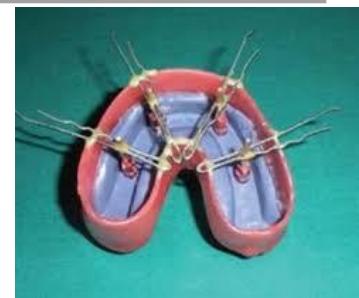
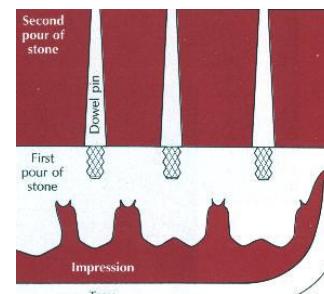
1. Dowel pin technique
2. Pindex system
3. Di-Lock tray technique
 **Dowel Pin Technique** = Pre-poured

🔗 Tools used:

- Bobby pins
- Straight pins
- Paper clips
- Sticky wax
- Utility wax
- Separating medium

 **Pin orientation**

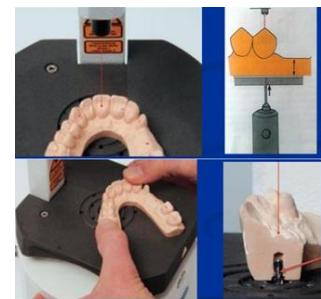
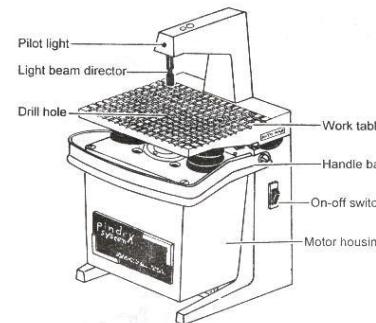
- ✓ Parallel to long axis of preparation
 ✗ Must NOT touch the impression



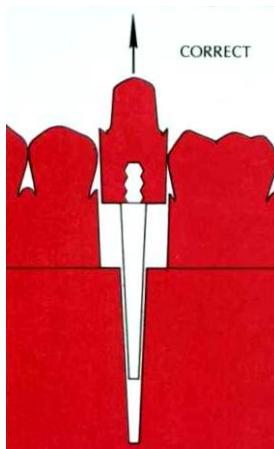
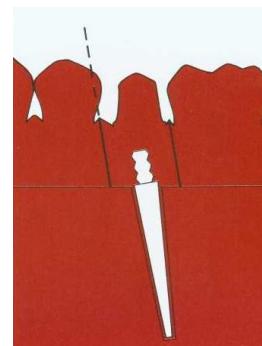
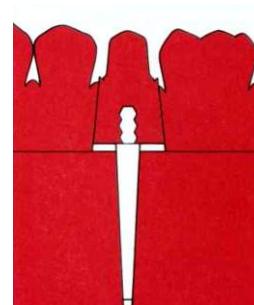
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 **Pindex System** = Post-poured

- ✓ High precision
 ✓ Accurate repositioning



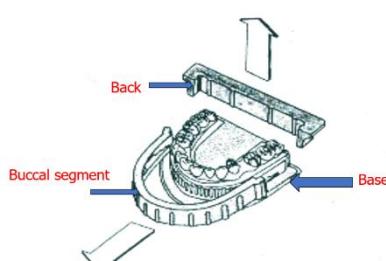
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Correct

Incorrect positioning


Di-Lock Tray Technique

- Tray components:

- Back
- Buccal segment
- Base



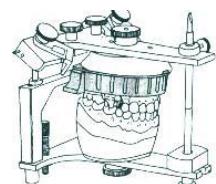
✖ Disadvantages

- ✖ Oversize articulation
- ✖ Difficult pin positioning & manipulation



🕒 Techniques

- Pre-poured → pin oriented in impression before pouring = Dowel Pin Tech.
- Post-poured → pin attached after cast is poured = Pindex System



3. Single Die

- Made using **single copper band impression**

- Impression materials:

- Impression compound
- Rubber base

🧱 Die Materials

- Stone die
- Amalgam die
- Acrylic / epoxy die
- Electroplated die (silver / copper)

★ Quick Comparison – Die Materials. اشرح بالتفاصيل في صفحة 2

| Material | Advantages | Disadvantages |
|---------------|-------------------------------------|--------------------------------------|
| Gypsum | Cheap, easy, good detail | Poor abrasion resistance |
| Resin | High strength & abrasion resistance | Expensive, shrinkage |
| Electroplated | Excellent accuracy | Toxic chemicals, technique sensitive |

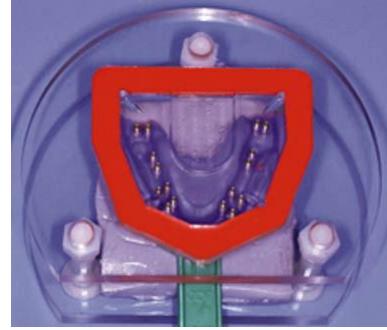


DVA System

Pre-manufactured base system

Two tapered round brass pins per die — 7mm

Step-by-Step Procedure



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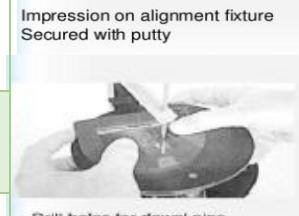
Impression on alignment fixture: Secured with putty.



Marking dowel pin locations: On clear plate with twin tip marker.



Drill holes for dowel pins: Using drilling press.



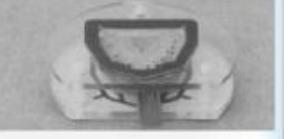
Insert dowel pins.



Impression is poured: And stone is placed around dowel pin.



Alignment fixture is replaced: Over poured impression.



Set cast is removed: From baseplate with gentle tapping.



Cast is trimmed.



Cast is sectioned.



Definitive cast trimmed with DVA model system.

