



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

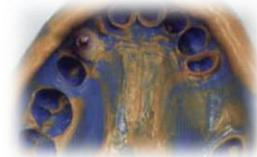
- ♦ **Replica of:**

- 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



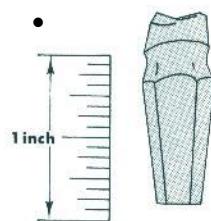


✖ Disadvantages

- ◆ 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

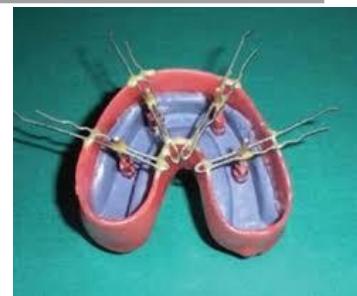
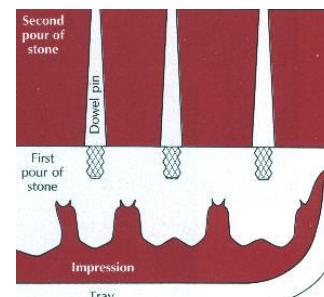
1. Dowel pin technique
2. Pindex system
3. Di-Lock tray technique
 **Dowel Pin Technique = Pre-poured**

🔗 Tools used:

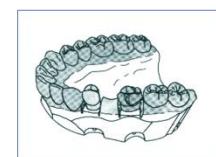
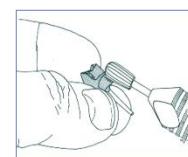
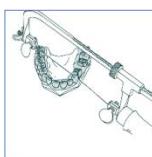
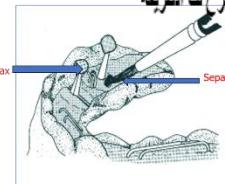
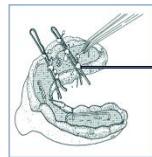
- Bobby pins
- Straight pins
- Paper clips
- Sticky wax
- Utility wax
- Separating medium

 **Pin orientation**

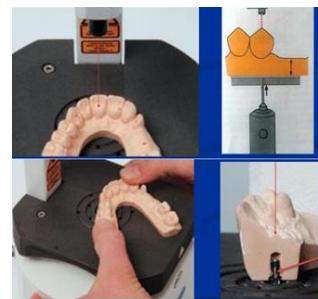
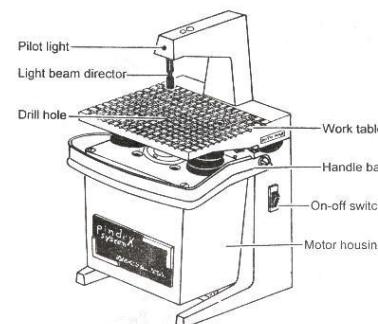
- ✓ Parallel to long axis of preparation
 ✗ Must NOT touch the impression



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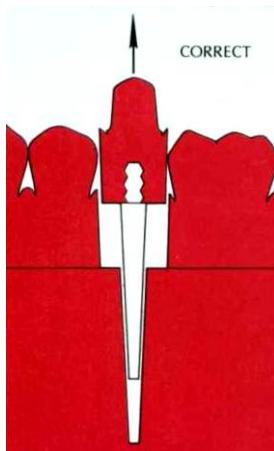

 **Pindex System = Post-poured**

- ✓ High precision
 ✓ Accurate repositioning



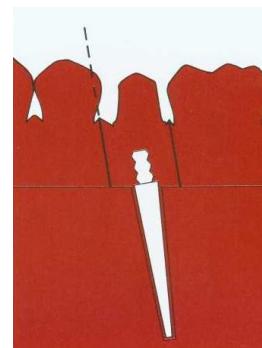
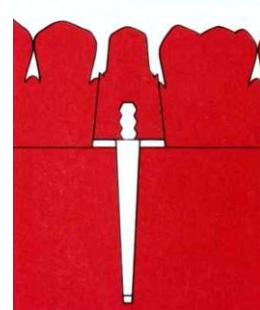
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Correct



Incorrect positioning

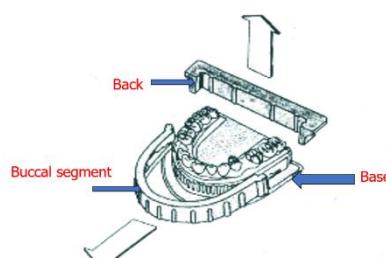
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Di-Lock Tray Technique

◆ Tray components:

- Back
- Buccal segment
- Base



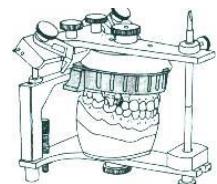
✗ Disadvantages

- ✗ 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

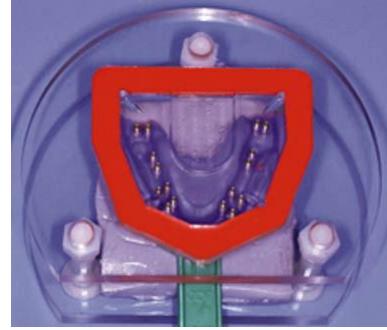


DVA System

Pre-manufactured base system

Two tapered round brass pins per die — 7mm

Step-by-Step Procedure



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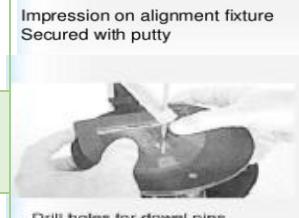
Impression on alignment fixture: Secured with putty.



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.

