Operative dentistry

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Dental Pins:

When gross destruction of tooth structure present, extra retention means are needed including pins.

Pins are indicated:-

1) Where there has been excessive loss of tooth substance and there is insufficient mechanical retention remaining to retain restorative material in a cavity.
2) When a single cusp is missing, for placing a core before restoring with a cast restoration or for placement of a temporary amalgam restoration in a tooth requiring endodontic treatment under rubber dam.

Advantages:-

1- Conservation of tooth structure. The preparation of pinholes is more conservative than slot and lock retention. Also the pin- retained amalgam is more conservative than the preparation for a cast restoration.
2- Appointment time, one visit.
3- Resistance and retention may be significantly increased.
4- Economic. Compared to cast restoration the amalgam restoration is a relatively inexpensive restoration procedure.

Disadvantages:-

1- Dentinal micro-fracture "drilling pinholes and placing the pin create craze line or fracture" as well as internal stresses in dentin.
2- Microleakage: has been demonstrated around all types of pins. However, such microleakage is no greater than that occurring at the interface of the R.M and the cavity walls.
3- Decrease of strength of amalgam: pins don’t reinforce amalgam and therefore don't increase its strength, tensile strength decrease.
4- Pin retention increases the risk of perforating into the pulp or the external tooth surface.

Pins fall within one of two categories:-

1) Those with diameters are slightly smaller than the drills that prepare their channels (cemented pin).
2) Those whose diameters are slightly larger than corresponding drill; friction locked and self-threading pins.

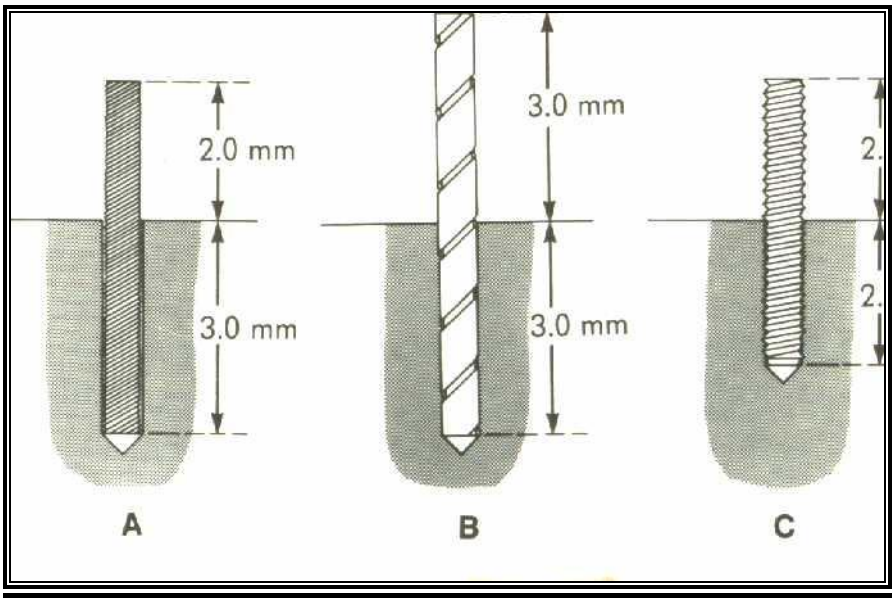

Fig.(1)

<u>Cemented pin (Markely 1958):-</u>

It's serrated stainless steel pin or wire, cemented into pin holes prepared by 0.025-0.05 mm larger than the pin diameter (a twist drill is used to prepare the hole). The depth of the pinholes is 3-4 mm. Pin is cemented with ZPC or polycarboxylate. Fig.(1-A)

***Advantages**:*

1- cheap
2- No risk of tooth fracture.
3- Pin can exactly countered before insertion.

Disadvantages:

1- Minimal retention gained.
2- Can't be altered after insertion.
3- Requires cements.
4- Leakage at tooth-pin interface.

Friction lock (Goldestien 1966):-

It's horizontally grooved stainless steel pin. The diameter of the hole is smaller than the diameter of pin by 0.025 mm. The depth in dentin is about 3-4 mm. The pins are tapped to place, retained by resiliency of dentin. Fig.(1-B)

Advantages:

1- It's 2-3 times more retentive than cemented type.
2- Relatively easy to place and less expensive than self-threading.
3- No irritant cement is required.

Disadvantages:

1- Difficult to place in posterior teeth.
2- Difficult to contour pins after placement.
3- Less retentive than self-threading pins.

Self-threading pin (Going 1966):-

The pinhole diameter is 0.038-0.1 smaller than the diameter of the pin. The threads engaging the resilient dentine retain the pin. The depth of the pinhole varying from 1.3-2 mm depends on the size of the pin. Fig.(1-C)

Advantages:

1- Ease of placement especially in posterior teeth.
2- Excellent retention.
3- Can be bent and contoured after insertion.
4- Pins can be inserted safely and easily using a handpiece, or manually by special wrench.
5- No irritant cement is required.

Disadvantages:

Expense, craze lines and stress concentration can develop about the pin. The most widely used TMS (Thread Mate System) several type available according to the diameter of pin.

Factors affecting pin retention:-

1) Type: self-threading is the most retentive one (3-6 more retentive than cemented type).

2) Surface characteristics of pin: the number and depth of threads influence retention of the pin in amalgam.

3) Orientation, number and diameter:

- Retention is increased when placing the pins in a non-parallel manner, slight but not excessive bending also increases the retention.
- Retention is proportional to the number of pins placed, but as the number of pin increases:

i- Crazing of dentin and potential of fracture increases.

ii- Available dentin between the pins will decreases, minimizing inter-pin distance is 3-5 mm.

iii- The strength of the restoration decreases.

In general, place one pin per lost cusp. We should place pins in flat surface and non- in the same level. Fig.(2)

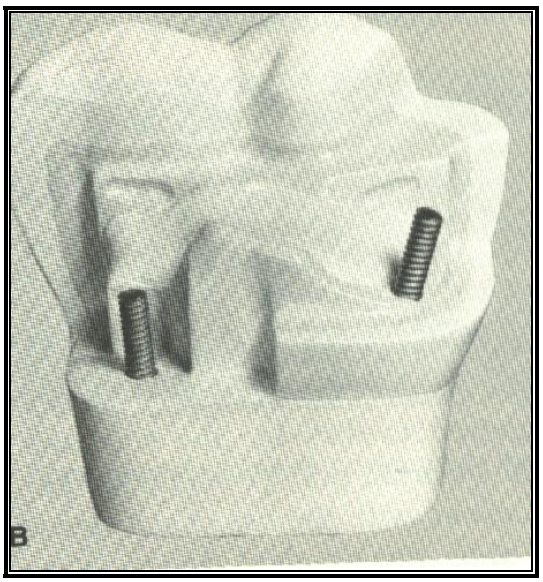

Fig.(2)

- Extension into dentin and amalgam: 2mm embedded in dentin, 2 mm into amalgam, (put pin in area that receives large mass of filling) the tip of the pin should be covered by 2 mm of amalgam.
- The diameter of pin increases the retention in dentin and amalgam increases.

Tooth factors affecting pin placement:-

1) Dentin width: 1 mm of dentin is required to surround the pin. Therefore at least 2.5 mm of dentin is required between the enamel-dentin junction and the pulp.
2) The direction of the pinhole should be parallel with outer tooth surface, so particular care should be exercised during pin placement when a tooth is rotated or tilted. Fig.(3-B)
3) It should be away from the furcation area (risk of perforation into the periodontal membrane is increased).Fig.(3-A)

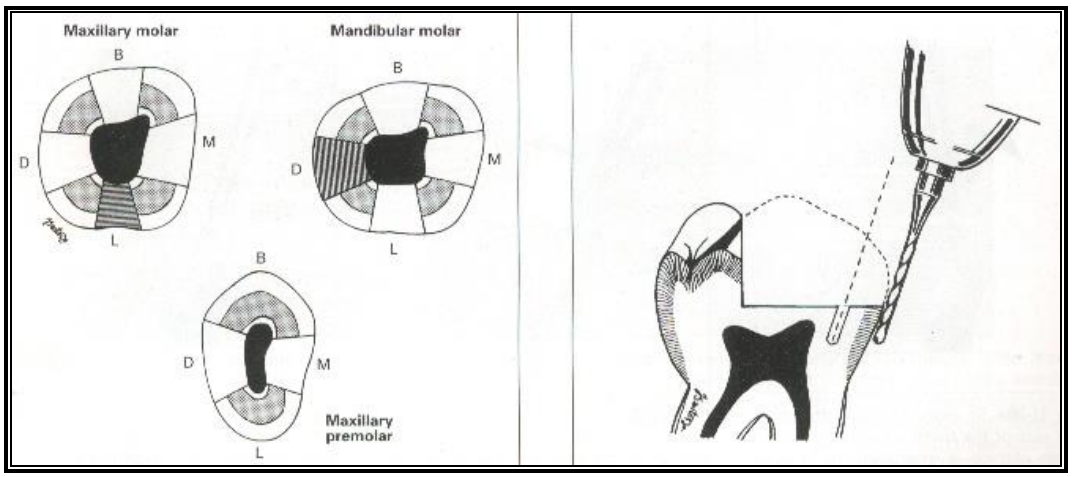

Fig.(3-A) Fig.(3-B)

A twist drill is used for drilling pinholes; it's made of high-speed tool steel that is swaged into aluminum shank, which acts as a heat absorber.

Twist drill cut only in clockwise direction.

There are 2 types of twist drill:

I) Standard: 4-5 mm in length.
II) Depth limiting: 2 mm in length.Fig.(4)

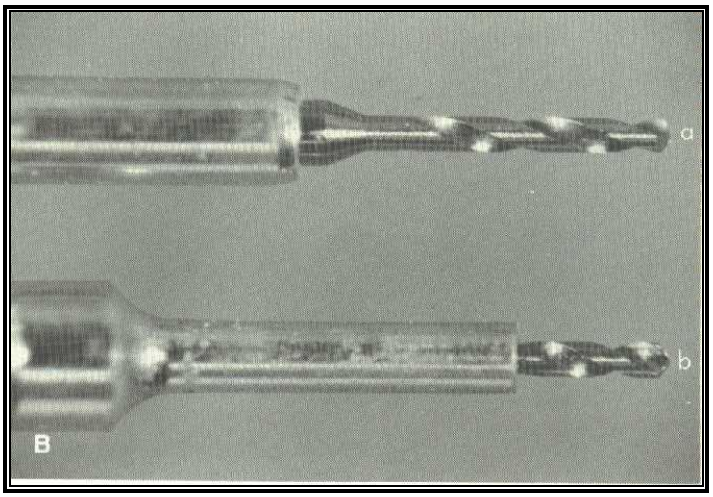

Fig.(4)

Several things should be kept in mind when using twist drill:

- Run the drill at a slow speed.
- Be sure that the drill is sharp.
- Maintain good hand bracing.

Pin insertion:-

2 instruments for insertion of threaded pins are available:

1) Conventional latch-type contra-angle handpiece.
2) TMS hand wrenches. Fig.(5)

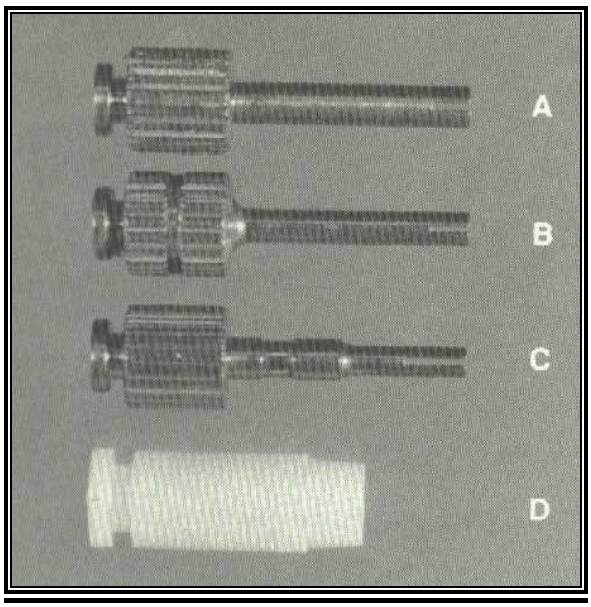

Fig.(5)

Failure of pin- retained restorations:

The failure of pin –retained restoration may occur at any of five different locations: Fig.(6)

I) Restorative material fracture.
II) Separation of pin from the restorative material.
III) Fracture of pin.
IV) Separation of pin from dentin.
V) Fracture of dentin.

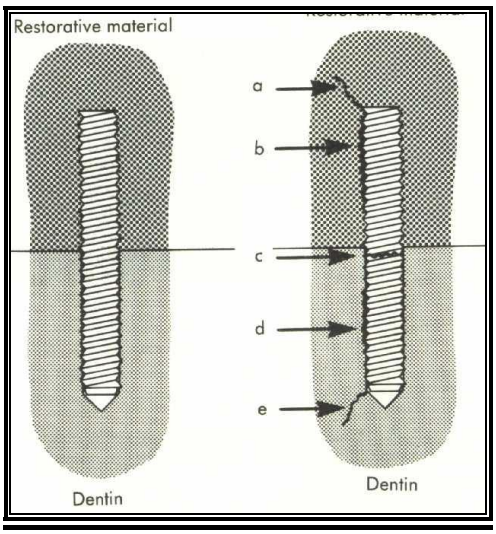

Fig.(6)

Hazards of pin placement:-

1) Broken drills and broken pins; leave it and design another one 1.5 mm away from the first.
2) Loose pins; it arises as a result of using a blunt drill, failure to brace the hand piece (changing in the angulation during drilling), over preparation of channel the pin. We can use next size of self-threading pin, if it is not successful, so we can do cementation to the pin or design another one.
3) Pulpal penetration: dryness put $Ca(OH)_2$ and drills another pinhole. The tooth should be evaluated.
4) External perforation.

Thank you