
ROTARY CUTTING INSTRUMENTS IN OPERATIVE DENTISTRY

Learning outcomes

By the end of this lesson, students should be able to:

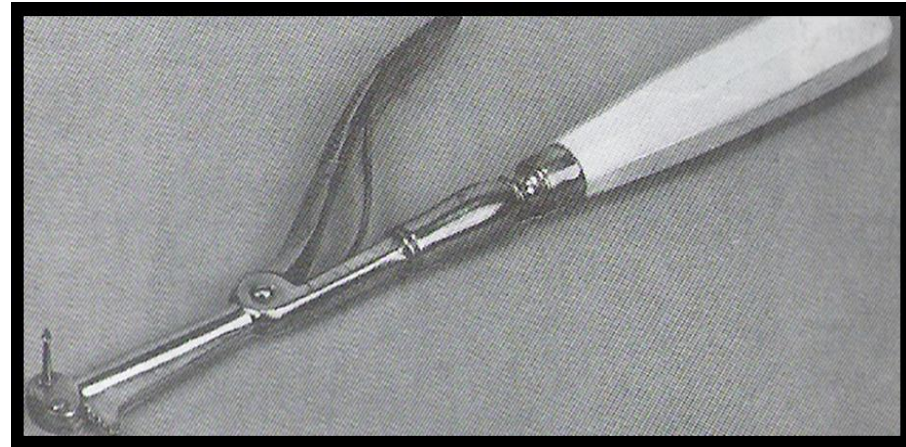
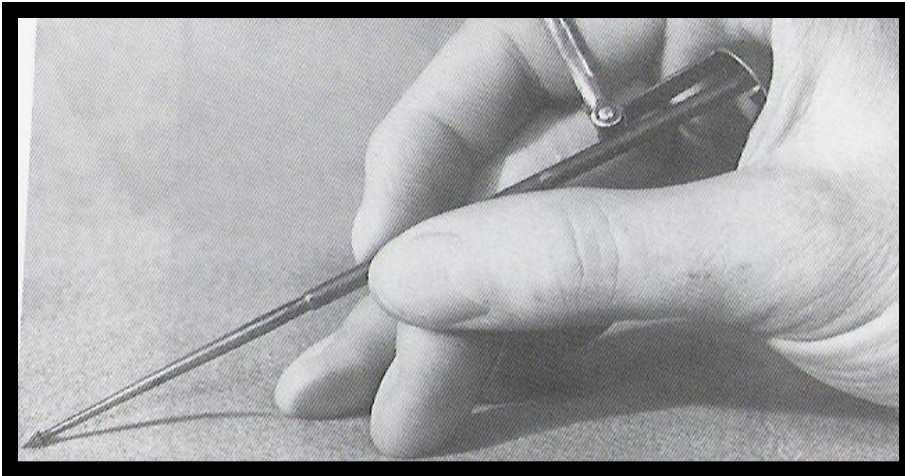
1. List the advantages and disadvantages of rotary instrument speeds used in operative dentistry
2. Label the parts of dental burs in operative dentistry
3. Recognize the different types of burs used in operative dentistry

Learning Resources :

1. Sturdevant's art and science of operative dentistry 5th edition Page no ;340 – 363

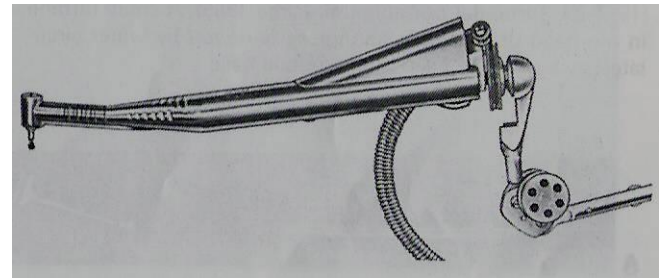
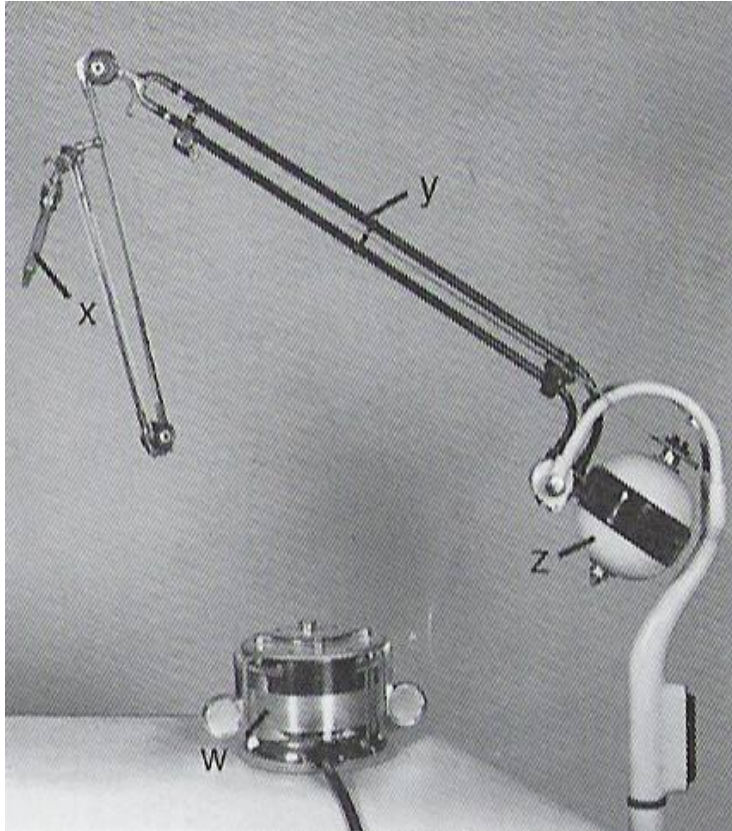
Historical development

- 1728 -HAND ROTATED INSTRUMENT.
described them as "bur drills".



Year	Instrument	Speed(RPM) Revolutions per minute
• 1728	Hand-rotated instruments	300
• 1871	Foot engine	700
• 1874	Electric engine	1000
• 1914	Dental unit	5000
• 1942	Diamond cutting instruments	5000
• 1955	Belt driven handpiece	1,50,000
• 1994	High speed handpiece	3,00,000

Belt driven handpieces



Contemporary air turbine handpiece



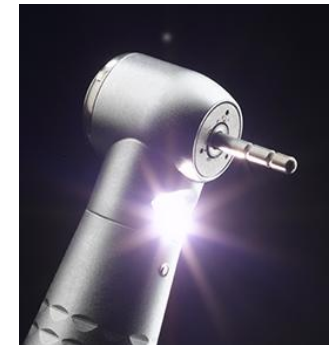
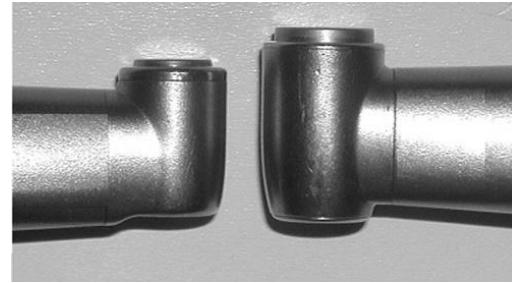
Hand piece

A handpiece is a device for holding rotating instruments like burs, transmitting power to them and for positioning them intraorally.



Latest improvements in handpiece

- Smaller head sizes
- Lower noise levels
- Fiberoptic



Rotary speed ranges

According to Sturdevant

- Low or slow speeds (Below 12000 rpm)
- Medium or intermediate speeds (12,000 to 200,000 rpm)
- High or Ultrahigh speeds (above 200,000 rpm).

Low speeds



INDICATIONS

- Caries excavation in deep carious lesions
- Finishing & polishing of restorations
- Polishing the teeth

ADVANTAGES

- Better tactile sensation, especially useful in management of deep caries lesion



DISADVANTAGES

- More heat production (Always use coolant as water)
- Vibration
- Time consuming
- Not efficient for cutting



High speeds

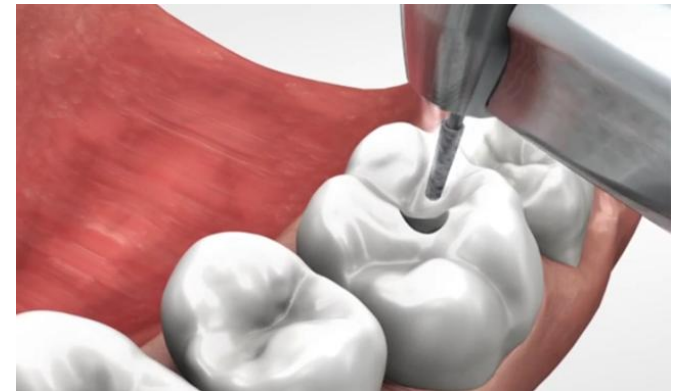
INDICATION

- ✓ **Tooth/cavity preparation**
- ✓ **Removing old restorations**



ADVANTAGE

- ✓ **Faster tooth structure removal**
- ✓ **Less heat production**
- ✓ **Less vibration**
- ✓ **Ease of operation**
- ✓ **Time saving**
- ✓ **Diamond & carbide instruments stay longer**



DENTAL BURS

COMMON DESIGN CHARACTERISTICS



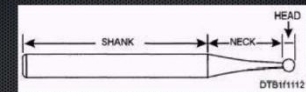
Three parts:

- (1) Shank: which is inserted into the handpiece, is usually the longest part of the bur
- (2) Neck: connected between shank and head
- (3) Head : working end of the bur

Parts of dental bur

The dental bur has 3 basic parts :

- Shank
- Neck
- Head

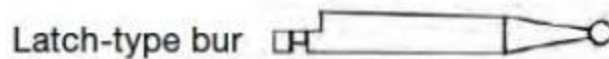


Bur Classification Systems

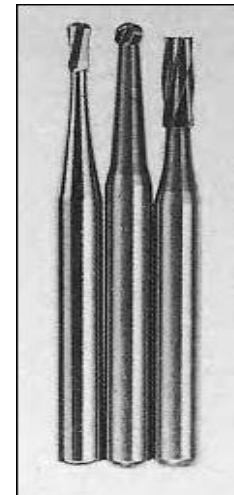
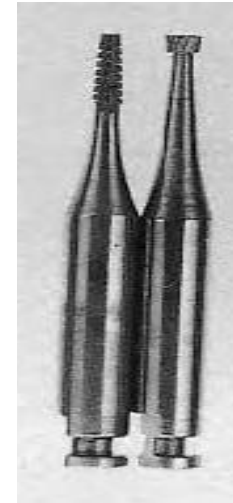
Sturdevants art and science of operative dentistry 5th edition page no – 349

1. BASED ON MODE OF ATTACHMENT TO HANDPIECE:

- Latch-type shank: Low speed burs



- Friction-grip: High speed burs



2.COMPOSITION:

- Stainless Steel
- Tungsten carbide burs
- Combination
- Diamond



Steel burs perform well, cutting human dentin at low speeds, but it dulls rapidly at higher speeds or when cutting enamel.

Carbide burs perform better than steel burs at all speeds, and their superiority is greatest at high speeds.

In most burs now days, the carbide head is attached to a steel shank and neck by welding or brazing.



- Diamond burs are made from diamond grit. They are very powerful and precise, can grind through hard tissue with great precision.
- The diamond bur grind is rather coarse and usually leaves a "rough" surface.
- Whereas carbide burs create smoother surface than diamond burs.

3.LENGTH OF THEIR SHANK:

- Long
- Regular
- Short



4. USES:

- Cutting burs: Used for cavity preparation

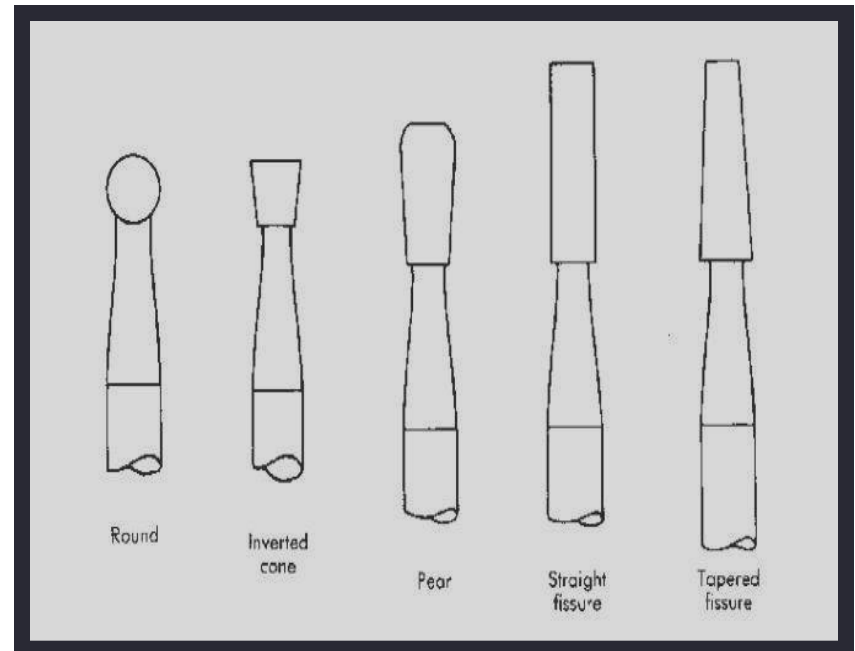


- Finishing & polishing burs: For finishing and polishing



5. Head shapes

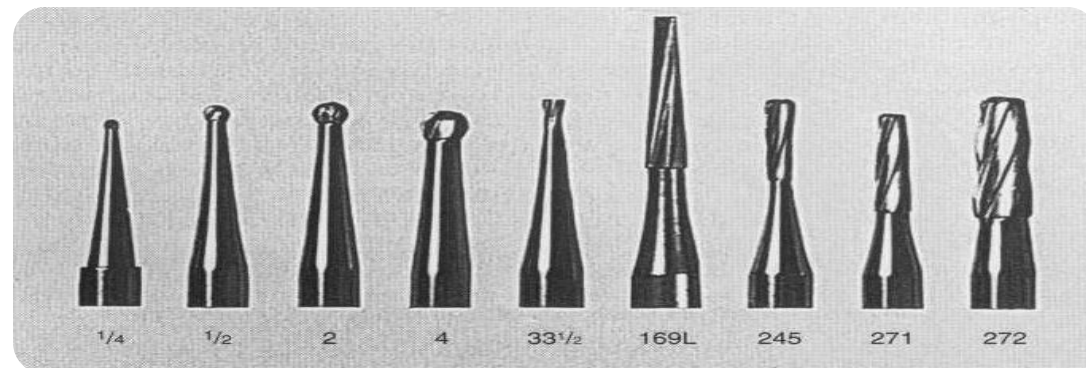
- *Round*
- *Inverted cone*
- *Pear*
- *Straight fissure*
- *Tapered fissure*



Round bur

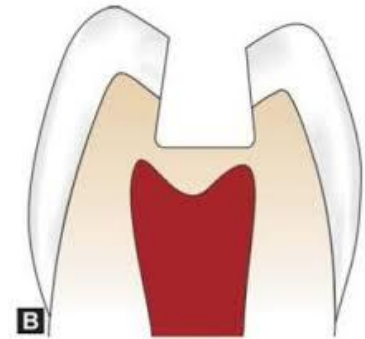


- Spherical .
- Uses
 - ✓ Initial entry into the tooth
 - ✓ Extension of the preparation
 - ✓ Preparation of retention features/and soft caries removal.
- Numbered from $\frac{1}{4}$, $\frac{1}{2}$, 1, and 2 to 10 .

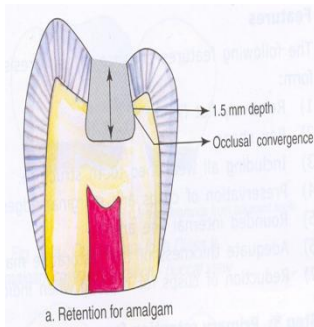




Inverted cone bur



- Used for giving undercuts (Occlusal convergence of walls) in cavity preparations.
- To flat and smooth pulpal floor of tooth preparation
- Numbered from 33¼, 33½, 34, 35 to 39.



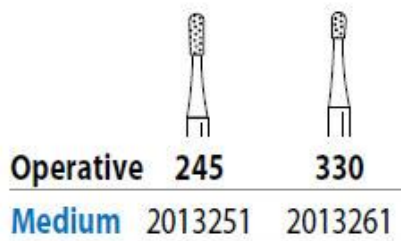
Pear-shaped bur



- A normal-length pear bur – No 330 (Length slightly greater than the width) is advocated for use in Class I tooth preparations for gold foil .
- Long-length pear bur – No -245 (Length three times the width) is advocated for tooth preparations for amalgam.





Length - 3 mm

Width – 0.8 mm



Straight fissure bur

- Elongated cylinder.
- Used for most of the cavity preparation.
- They are numbered from 555, 556 to 560 .

FG CARBIDES		STRAIGHT FISSURE CROSSCUT				
OPERATIVE						
BUR #	FG	556	557	557L	558	
		FG 556	FG 557	FG 557L	FG 558	
Head Dia. (mm)		0.8	1.0	1.0	1.2	
Head Length (mm)		3.2	3.8	4.9	3.8	



Tapered fissure bur

- Slightly tapered cone with the small end of the cone directed away from the bur shank.
- Tooth preparations for indirect restorations(Cast gold Inlays and Onlays)
- They are numbered from 168, 169 to 172.



Number of blades in a bur

- The number of blades on a bur is usually EVEN

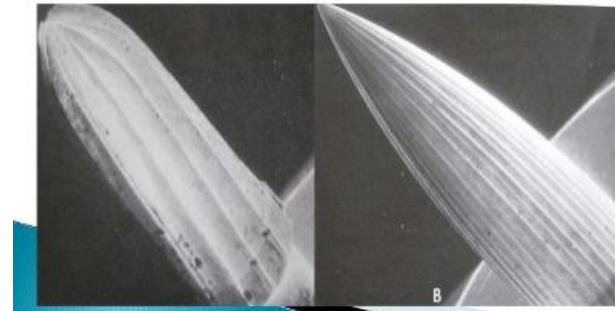
The blades on a

Cutting bur are usually 6 to 10

Finishing bur are usually 12 to 40.

12 BLADE BUR

40 BLADE BUR



Fluted carbide burs

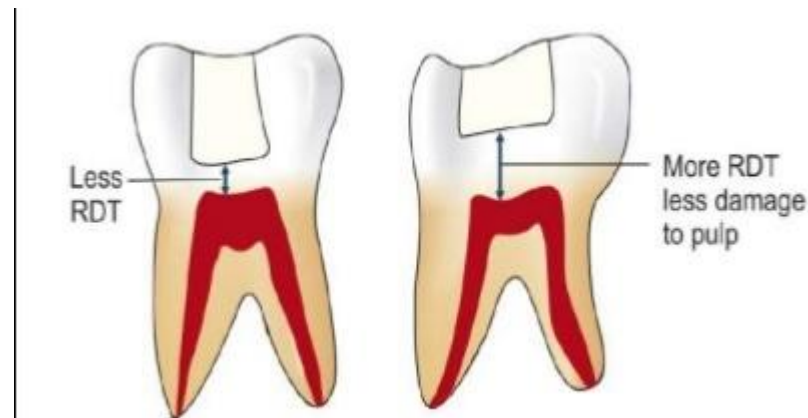


HAZARDS WITH CUTTING INSTRUMENTS

- PULPAL PRECAUTIONS
- SOFT TISSUE PRECAUTIONS
- EYE PRECAUTIONS
- EAR PRECAUTIONS
- INHALATIONAL PRECAUTIONS

PULPAL PRECAUTIONS

- The use of cutting rotary instruments can harm the pulp by exposure to mechanical vibration and heat generation.
- As the thickness of the remaining dentin decreases, the chances of pulpal injury from heat increases.



- The longer the time of cutting and the higher the local temperature produced, the greater is the risk of thermal trauma.
- How to avoid pulpal trauma from rotary instrument -The most common instrument coolants are air-water spray



SOFT TISSUE PRECAUTIONS

- The lips tongue and cheeks of the patient are the most frequent areas of soft tissue injury.
- A rubber dam is very helpful in isolating the operating site.

A sudden reflex movement by the patient such as gagging, swallowing or coughing could result in serious injury.



- If an **accident does occur** in which soft tissue is damaged, the **dentist should remain calm** and control any hemorrhage(bleeding) with a pressure pack.
- The **patient should be told what has happened,incident report must be filed**, and medical assistance should be given if needed.

EYE PRECAUTIONS

- The operator, assistant and patient should wear glasses with side shields to prevent eye damage from airborne particles during operative procedures utilizing rotary instrumentation.



EAR PRECAUTIONS

- An objectionable high-pitched sound is produced by some air-turbine handpiece at high speeds.
- Aside from the annoying aspect of this noise, there is some possibility that hearing loss can result from continued exposure.
- The effect of excessive noise levels depends on exposure time
- Reduce continuous exposure to rotary handpiece
- Never use damaged handpiece which gives higher noise

INHALATIONAL PRECAUTIONS

- A rubber dam protects the patient against oral inhalation of aerosol or vapors, but nasal inhalation of vapor and finer aerosol may still occur .
- Disposable mouth masks worn by dental office personnel filter out bacteria



Sterilization of handpiece

- For infection control, all dental handpieces are now sterilized, but the process is associated with some challenges.
- Most handpieces require reoiling after sterilization, and excess oil may be sprayed during the start-up operation.
- It is recommended to run the handpiece for a few seconds before initiating a dental procedure in which the deposition of oil spray onto tooth structure might interfere with processes, such as dental adhesion

Conclusion

- Many treatment procedures in restorative dentistry substantially involve rotary instrumentation.
- The use of these rotary cutting instruments have made the job a lot easier for the practitioner as well as a lot comfortable for the patient besides saving precious time.

References

- Art and science of operative dentistry 5 th edition

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