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Concentricity is a direct measurement of the symmetry of the bur head itself. It measures how closely a single circle can be passed through the tips of all of the blades. Thus, concentricity is an indication of whether one blade is longer or shorter than the others. It is a static measurement not directly related to function.

Runout, on **the other hand, is a dynamic test measuring the accuracy with which all blade tips pass through a single point when the instrument is rotated.** It measures not only the concentricity of the head, **but also the accuracy with which the center of rotation passes** through **the center of the head.** Even a **perfectly concentric head will exhibit substantial runout if the head** i s off center on the axis of the bur, the bur neck is bent, the bur is not held straight in the handpiece chuck, or the chuck is eccentric relativeto the handpiece bearings. The runout can never be less than the concentricity, and it is usually substantially greater. **The runout is the more significant term clinically,**

because it is the primary cause of vibration during cutting and is the factor that determines the minimum diameterof the hole that can be prepared by a given bur. It is because of runout errors that burs normally cut holes measurably larger than the head diameter.

Bur Blade Design. The actual cutting action of a bur (or a diamond) takes place in a very small region at the edge of the blade (or at the point of a diamond chip). In the high-speed range, this effective portion of the individual blade is limited to no more than a few thousandths of a centimeter adjacent to the blade edge. is an enlarged schematic view of

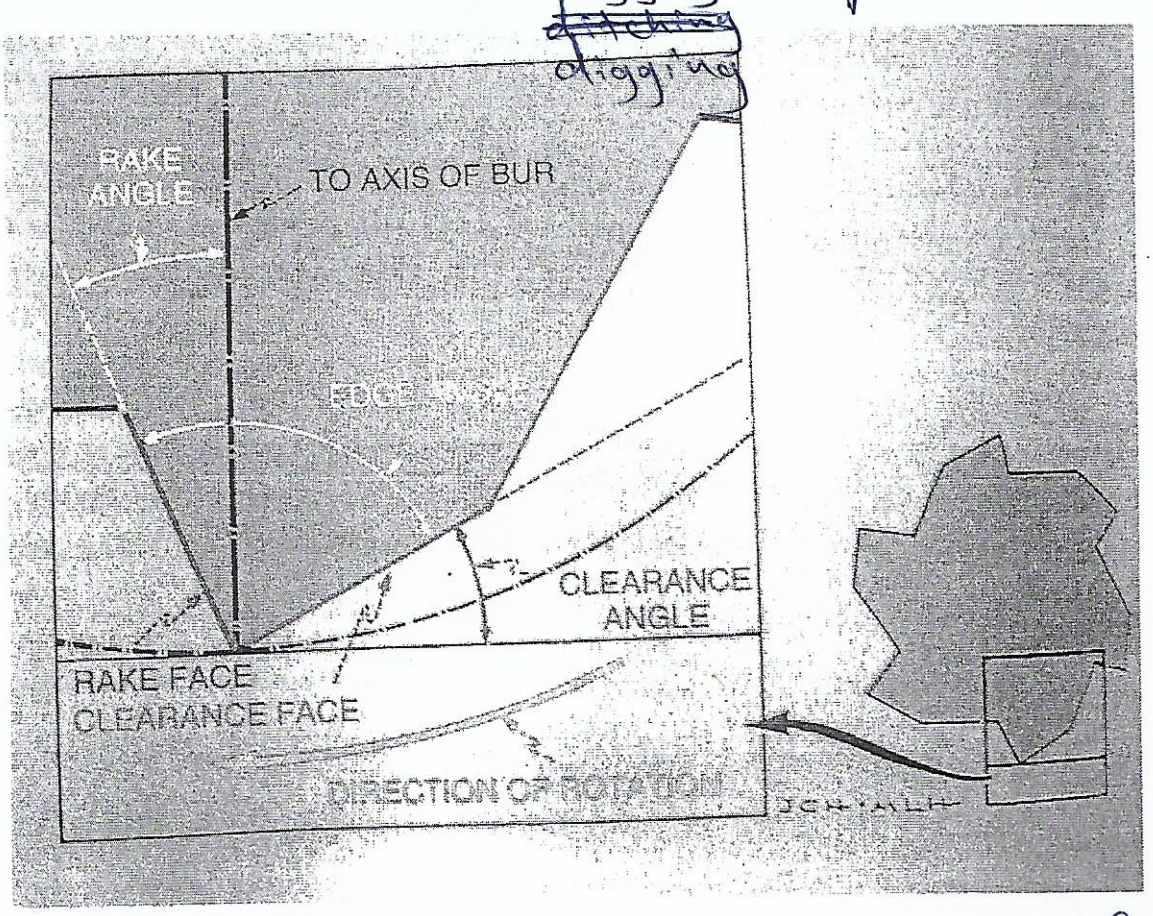
eccentric causes:-
① fracture tooth
② fracture bur
③ fibration
④ Noise

this portion of a bur blade. Several terms used in the discussion of blade design .

Each blade has two sides, the *rake face* (toward the direction of cutting) and *clearance face,* and three important angles, the *rake angle,* the *edge angle,* and the *clearance angle.* The **optimal angles are dependent on such factors as the mechanical properties of the blade material,** the mechanical properties of the material being cut, the rotational speed and diameter of the bur, and the lateral force applied by the operator to the handpiece, and thus to the bur.

The rake angle is the most important design characteristic of a bur blade. For cutting hard, brittle materials, a negative rake angle minimizes fractures of the cutting edge, thereby increasing the tool life. A rake angle is said to be negative when the rake face is ahead of the radius (from cutting edge to axis of bur). Increasing the edge angle reinforces the cutting edge and reduces the likelihood for the edge of the blade to fracture. Carbide bur blades have higher hard hardness and **are more wear resistant, but they are more brittle** than steel blades and require greater edge angles to minimize fractures. The three angles cannot be varied independently of each other. An increase in the clearance angle, for example, causes a decrease in the edge angle. The clearance angle eliminates rubbing friction of the clearance face, provides a stop to prevent the bur edge from digging into the tooth structure excessively, and reduces the radius of **the blade back of the cutting** edge to provide adequate flute space or clearance space for the chips formed ahead of the following blade. Carbide burs normally have blades with slight negative rake angles and edge angles of approximately 90 degrees. **Their clearance faces either are curved or have two surfaces to provide** a low clearance angle near the edge and a **greater clearance space ahead of the following blade.**

*Edge give stiffness
* Rake angle important when Rake face is the terminal of ½ dia
* clearance avoid ~~digging~~ and fracture



① parallel to long axis
② equal teeching for blades to surface

Rake angle:

Negative rake angle occurs when the rake face (the surface toward the direction of cutting) is ahead of the radius. Negative angle is preferable for cutting hard, brittle materials as its increasing the edge angle that make the edge more fracture resistant. *Positive rake angle* decreases the edge angle that make the edge more efficient but less durable because easily dull or broken.

Clearance angle:

The angle between the clearance face (the surface opposite to cutting direction) and a line tangent to the edge. *clearance face* prevent blade from digging into tooth excessively. *Clearance angle* eliminate rubbing friction of clearance face. *Clearance face* either curved or two planes to increase edge angle that decrease the likelihood for edge fracture, and offer a greater clearance space ahead of the blade to provide sufficient room for the cut chips.