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Short Communication

High speed handpieces

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Abstract:

High speed instruments are versatile instruments used by clinicians of all specialties of dentistry. It is important for clinicians to understand the types of high speed handpieces available and the mechanism of working. The centers for disease control and prevention have issued guidelines time and again for disinfection and sterilization of high speed handpieces. This article presents the recent developments in the design of the high speed handpieces. With a view to prevent hospital associated infections significant importance has been given to disinfection, sterilization & maintenance of high speed handpieces.

Key Words: Design, disinfection, handpieces, infection control, sterilization

High speed handpieces

The high speed handpiece is a precision device for removal of tooth tissue efficiently and rapidly with no pressure, heat or vibration and cut the tooth like butter. However these handpieces have to be used with caution.

The slow speed handpieces resulted in heat, pressure and vibration mostly resulting in death of the pulp and the clinicians were looking for higher speeds not only to speed up the procedures but also to avoid injury to the pulp.

In an effort to increase the speeds of the rotating bur various automatic chucking mechanisms were also developed. Thus came the friction grip burs into circulation. With the increased speeds the amount of heat generated also increased and the clinicians had to look for a suitable coolant. All high speed handpieces incorporate an air or water spray as a coolant- the latest innovation is a multiport spray emanating from the head of the hand-piece. The spray has to be adjusted in such a way to form a halo to cool the rotating bur at such high speeds. With the increased speeds and water coolants the area of cutting of the tooth structure was blocked by the water spray and hence efforts were made by the clinicians to enhance the vision. Fiber-optics were the first one to optimize operator visibility. The most recent innovation in optics is a LED light bulb to generate a brighter and whiter light. With the introduction of air-water spray, the water collected in the oral cavity had to be evacuated with high pressure evacuation systems.[1]

The air driven high speed handpiece rotates at a speed of around 2 lakh to 8 lakh r.p.m. The actual cutting speed and the rotational speed are two different aspects of high speed turbine or airotor handpiece. The cutting speed is usually 30% less than the rotating speed. It is also called as Free Speed and Active Speed. Free speed is the true rotating speed while active speed is the cutting speed. There is a safety mechanism introduced in the high speed handpiece system. The bur stalls if pressure is applied more than what is required for cutting. There is also a basic difference between conventional micro-motor bur rotation and high speed bur rotation. With the high speed instruments the bur continues to rotate even after the clinician removes his foot from the pedal controlling the air-water spray, this is called the Coast Speed. Most high speed handpieces have two holes and it is called the Borden two hole handpieces. It was in 1950, Dr. John Borden's pioneering work resulted in the air driven high speed handpiece. As the years passed manufacturers came out with the three hole handpiece and the third one acted as a vent to let out the excess air that is collected in the head of the handpiece so that the coast speed is substantially reduced and the bur comes to a halt at the earliest. Today manufacturers have come out with 4 and 6 hole handpieces also. Clinicians exposed to high level sounds emanating from high speed handpiece can result in damage to the hearing apparatus. Increased noise levels in the clinic can also result in patient discomfort and increased anxiety, at present handpieces with lower noise levels between 58 to 71 decibels are made available. In the 90's came the miniature bearings suspended in the head of

the handpiece. This reduced the noise that was produced by the earlier handpieces and also reduced the heat output. There are several head sizes of high speed handpieces are available ranging from 9.8 x 8.5 mm to 14.5 x 13 mm. Mini head size handpieces are available for pedo patients as well as for adults to increase visibility.

With the micro-motor burs once the foot is removed from the pedal, it comes to a standstill. While with high speed, bur rotates for a few seconds after withdrawing foot from the pedal. This is the reason why the clinician has to wait for a few seconds before withdrawing the handpiece from the oral cavity to allow the bur to come to a standstill. Tissue injury with high speed handpieces is routine with the beginners.[2] One can damage the soft tissues including the lips, tongue, gingival tissues and the buccal mucosa and hence one has to note that the bur has to come to a standstill before taking the handpiece into the oral cavity and while withdrawing. Rubber dam becomes an integral part of all conservative procedures, basically to avoid injuries to the gingival tissues. The bur in the head of the high speed handpiece can get heated up due to no water running in the tubing's either due to non-supply of water or block in the tubules connected to the water source. This is the reason why one has to check the water spray outside the patient's mouth and also be aware that anytime the heat in the head of the handpiece can increase due to block in the water flow through the tubing's.

The air driven handpiece usually has two main components, the body or the shell and the turbine. The most common materials used to manufacture the body of the handpiece is brass with a cosmetic protective coating over it. Another common material used is stainless steel. Stainless steel is stronger and heavier than brass and manufacturing cost is also higher. However today manufacturers and clinician's prefer Titanium which is much lighter than stainless steel, stronger and more resistant to repeated cycles of sterilization.

The international standards specifications allow up to 0.03mm of eccentricity commonly referred to as run out or bur wobble. However concentricity is defined as the ability of the handpiece to produce a cutline consistent with the diameter of the bur.[3]

Maintenance of the high speed handpieces:

During the period of warranty the dentist has to follow the manufacturer's instructions and lubricate the handpiece with the lubricants supplied by the manufacturer.

1. The dentist must note down the number of the handpiece, since every handpiece manufacturer gives a number to the handpiece that he manufactures.
2. During autoclaving or sterilization procedures one must also follow the manufacturer's instructions as far as the temperature to which the handpiece can be subjected to.
3. The handpiece after use should be handed over to the assistant who will follow all barrier techniques.

The association for European safety and infection control in dentistry recommends adequate external cleaning and disinfection in a washer disinfector and in addition some form of internal cleaning and disinfection. Turbines and dental handpieces are very delicate instruments and have to be maintained with extreme care while disinfecting and auto claving. Always follow the manufacturer's instructions for cleaning, lubrication and sterilization. While purchasing a handpiece ask the manufacturer whether the handpiece has the anti retraction valves incorporated for preventing any regurgitation

If the patient is suffering from a known infectious disease, the handpiece has to go to the autoclave rapped in a piece of cloth or bagged before it is handed over to the assistant for routine external cleaning of the handpiece.

Once it is autoclaved the handpiece comes back for routine cleaning and then re-autoclaved. One has to select the lubricant very carefully for proper maintenance of the rotating instrument. The most significant factors while selecting a lubricant is that it should be environment friendly as well as non toxic and non allergenic. It should be heat resistant and should not evaporate. The lubricant should be safe to use in conjunction with steam sterilization at 135 degree Celsius.[4]

As far as lubrication of the handpiece is concerned most clinicians would prefer the bur in the handpiece. Lubrication can be carried out either before or after sterilization.

Before using the bagged autoclaved handpiece, the dentist is expected to run the handpiece for at least 30 seconds to remove the excess oil present in the head of the handpiece.

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