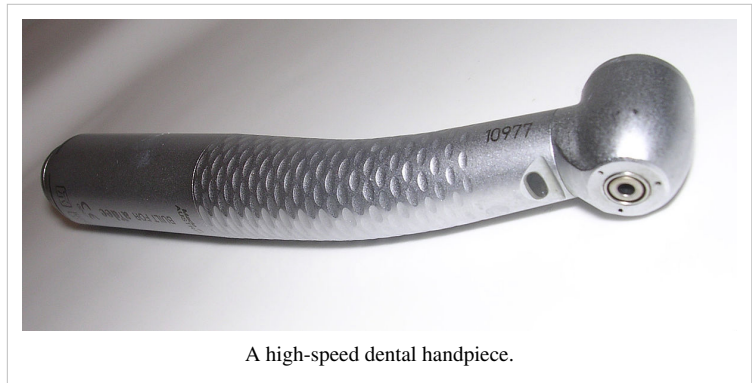


# Dental drill

A **dental drill** (or **dentist's drill**) is a small, high-speed drill used in dentistry to remove decayed tooth material prior to the insertion of a dental filling. Dental drills are used in the treatment of dental caries. The term "dental drill" is considered the more colloquial form of the term "**dental handpiece**," although it can also be construed as to include the power source for one or more handpieces, a "**dental engine**." "Handpiece" and "engine" are more generic and euphemistic terms for generic dental tools.



A high-speed dental handpiece.

Modern dental drills can rotate at up to 400,000 rpm,<sup>[1]</sup> and generally use hard metal alloy bits known as burs. Dental burs come in a great variety of shapes designed for specific applications. They are often made of steel with a tungsten carbide coating, or of tungsten carbide entirely. The bur may also have a diamond coating.

Dental drills, which have a distinctive, shrill sound, are often a prominent factor in many people's fear of dentistry.

## History

The Indus Valley Civilization has yielded evidence of dentistry being practiced as far back as 7000 BC.<sup>[2]</sup> This earliest form of dentistry involved curing tooth related disorders with bow drills operated, perhaps, by skilled bead craftsmen.<sup>[3]</sup> The reconstruction of this ancient form of dentistry showed that the methods used were reliable and effective.<sup>[4]</sup> Cavities of 3.5 mm depth with concentric groovings indicate use of a drill tool. The age of the teeth has been estimated at 9000 years. In later times, mechanical hand drills were used. Like most hand drills, they were quite slow, with speeds of up to 15 rpm. In 1864, British dentist George Fellows Harrington invented a clockwork dental drill named *Erado*. The device was much faster than earlier drills, but also very noisy. In 1868, American dentist George F. Green came up with a pneumatic dental drill powered with pedal-operated bellows. James B. Morrison devised a pedal-powered burr drill in 1871.

The first electric dental drill was patented in 1875 by Green, a development that revolutionized dentistry. By 1914, electric dental drills could reach speeds of up to 3000 rpm. A second wave of rapid development occurred in the 1950s and 60s, including the development of the air turbine drill.

The modern incarnation of the dental drill is the air turbine handpiece, developed by John Patrick Walsh (later knighted) and members of the staff of the Dominion Physical Laboratory (DPL) Wellington, New Zealand. The first official application for a provisional patent for the handpiece was granted in October 1949. This handpiece was driven by compressed air. The final model is held by the Commonwealth Inventions development Board in Canada. The New Zealand patent



Foot-powered dental drill

number is No/104611. The patent was granted in November to John Patrick Walsh who conceived the idea of the contra angle air-turbine handpiece after he had used a small commercial-type air grinder as a straight handpiece. Dr. John Borden developed it in America and it was first commercially manufactured and distributed by the DENTSPLY Company as the Borden Airtor in 1957.

Current iterations can operate at up to 800,000 rpm, however, most common is a 400,000 rpm "high speed" handpiece for precision work complemented with a "low speed" handpiece operating at a speed that is dictated by a micromotor which creates the momentum (max up to 40,000 rpm) for applications requiring higher torque than a high-speed handpiece can deliver. <sup>[5]</sup>

## Dental bur

A **dental bur** is a type of burr (cutter) used in a handpiece. The burs are usually made of tungsten carbide or diamond. The three parts to a bur are the head, the neck, and the shank. <sup>[6]</sup>

The head of the bur contains the blades which remove material. These blades may be positioned at different angles in order to change the property of the bur. More obtuse angles will produce a negative rake angle which increases the strength and longevity of the bur. More acute angles will produce a positive rake angle which has a sharper blade, but which dulls more quickly.

There are various shapes of burs that include round, inverted cone, straight fissure, tapered fissure, and pear-shaped burs. Additional cuts across the blades of burs were added to increase cutting efficiency, but their benefit has been minimized with the advent of high-speed handpieces. <sup>[6]</sup> These extra cuts are called crosscuts.

Due to the wide array of different burs, numbering systems to categorize burs are used and include a US numbering system and a numbering system used by the International Organisation for Standardisation (ISO).



A collection of various burs used in dentistry.

## Alternatives

Starting in the 1990s, a number of alternatives to conventional rotary dental drills have been developed. These include laser ablation systems and air abrasion devices (essentially miniature sand blasters).

## Other uses

Dental drills and burs are commonly used by jewellers and hobbyists for high-precision drilling work.

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## External links

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