Dental technology is a discipline of dentistry concerned with the custom manufacture of dental devices to meet the prescription of a dentist. From the earliest times missing teeth have been replaced with dentures or crowns made from a wide variety of materials including gold, human or animal teeth, bone and tusks, and wood. Natural teeth were used for dentures, collected from battlefields, hospitals or by grave diggers, these were mounted in carved dentures of walrus or hippopotamus ivory, or on gold (1). By the late 18th century dentures fused porcelain teeth were introduced, dentures could be carved from blocks of ivory or carved fixed to a gold plate by gold pins. In the mid 19th century the first artificial denture base materials were introduced, vulcanite (or hard rubber) and celluloid, superseded in the 1940s with the introduction of polymethyl methacrylate. During the 20th century base a wide range of new materials and techniques have been introduced to dentistry, including precision lost wax casting for dental alloys, a wide range of precious metal and base metal alloys, and dental ceramics (2).

Dentures were often made by the dentist who extracted the teeth, or their apprentice, sometimes the dentures were made by craftsmen such as jewellers or silversmiths. As clinical dentistry progressed a mechanical assistant specialising in the making of crowns and dentures developed. Dentistry became regulated form the late 19th century onwards and gradually national legislation restricted the practice to qualified dentists only. In 1921 the Dentists’ Act, which restricted clinical practice to qualified dentists, stimulated the British Army to begin training dental mechanics, the first formal courses in dental technology were offered in London in 1936 (3). Initially known as the dental mechanic the term dental technician was first used in the 1930s. Dental technology qualifications were generally craft based

8. Dental Tool Technology

8.1 Introduction

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and gradually progressed to more technically and scientifically based programmes of study from the 1970s onwards, the first-degree programmes were approved in a number of universities in the 1990s. This educational basis of dental technology has resulted in few publications in the scientific literature documenting or evaluating materials and techniques and currently a limited research base.

Dental technology has evolved over the last 100 years from the mechanical assistant to a professional discipline, with an estimated global turnover in the billions of dollars it is however still largely unregulated in many countries. Emerging markets such as China are providing competitive challenges to dental laboratories in the west, particularly in the USA. Internationally the levels of regulation vary, across Europe all dental laboratories must be registered with national medical devices agencies. In the UK statutory registration with the General Dental Council is expected to commence in the summer 2006. There are estimated to be up to 250,000 dental technicians across Europe. In the UK there are approximately 2700 dental laboratories and 8–10,000 people working in dental technology. In the USA there are about 12,000 dental laboratories, which employ about 46,000 technicians. About 40 percent, of the laboratories, are single-handed. It is estimated that the laboratory industry in the USA is responsible for about $6 billion to $8 billion of productivity annually with growth expected to increase by about 6 percent per year for the next several years (4).

Devices are custom-made, largely by hand, and require individual machining with small burs. Before the introduction of lost wax casting, metal crowns and components were made using wire or swaged plate and soldered, filed, polished and buffed using hand files and rotary tools that would be found in jewellery making. The rotary tools will have included bowstring drills using hand cut tools. Power drills for clinical dentistry were slow and difficult to work with were developed from spinning wheels, carpenters drills, jewellers’ drills and clockwork mechanisms (5,6). James Beal Morrison, who patented the dental chair in 1867, patented the foot-treadle drill in 1871 (possibly influenced by the Singer sewing machine introduced in the 1850s) and in 1875 added a flexible shaft (7). Later developments included electrically powered motors directly powering the drill, or via belts or flexible drives to the drill handpiece. The flexible shaft