

The History of Dental Implants-A Sequential Review

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Abstract:

The historical outlook begins with ancient civilizations and spotlights superlative dentists and their aidings to implant evolution through time. From the ancient period to the present modern time's replacement of missing teeth with artificial teeth has been a goal of humankind. This review aims to understand the overview of implants, the designs, and materials used from the past to the present date, and to provide a piece of in-depth knowledge about the history in sequential order.

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I. Introduction:

A dental implant (also recognized as an endosseous implant or fixture) is a surgical element that interfaces with the bone of the jaw or skull to support a dental prosthesis such as a crown, bridge, denture, facial prosthesis or to act as an orthodontic anchor.¹ Dental implants are not a current discovery, their chronicle goes back to eras ago. It has always been a method of replacing teeth in one form or the other.² Currently for missing teeth, dental implants are considered as the leading advanced solution. A long term success rate of 97% is achieved by a few dentists. The aesthetics of a full smile and returning the function of possessing the capability to chew food has encouraged people to replace missing teeth throughout the history of civilization.² Before the epoch of osseointegration, there were various dental implant designs and frameworks, and they had used materials like porcelain, cobalt-chromium, iridioplatinum. After the invention of osseointegration by Dr.Branemark, biocompatible materials like titanium were used.² This article will exhibit the sequential review of the dental implant history.

II. Sequential Review:

2500 BC onwards:

The ancient Egyptians were regularly involved with the use of ligature wire made of gold to stabilize teeth. At around the same time frame, periodontally involved teeth were supported using gold wire by the Phoenicians; these creative people used teeth sculpted out of ivory and then it was supported by gold wire to build a fixed bridge at around 300 AD. The Mayan community have the credit of founding the first indication of dental implant at around 600 AD, where they used pieces of shells as implants as a replacement of mandibular teeth. In the 1970s, radiographs were taken of the Mayan mandibles and they showed compact bone development around the implants-bone that astonishingly looks very alike to that seen around blade implants. Ancient Honduran culture developed a stone implant and placed in the mandible around 800 AD.⁴

1600-1800:

This is the era where surgery had started and there was mention of dental reimplantation and transplantation. A gold implant tube was implanted into a new extraction section by J.Maggiolo in 1809.³ This implant made of 18-karat gold alloy, had three branches into the jawbone, and to fit a porcelain crown as a superstructure. Unfortunately, following the procedure, a widespread gingival inflammation was seen. Numerous substances like corrugated porcelain, silver capsules and iridium tubes were used as implants during this period.²

1900-1950:

A replacement revolution was created when two brothers, Drs. Alvin and Moses Stock, learnt about orthopaedic screw fixtures made out of Vitallium(chromium-cobalt alloy). They had been witnessing physicians successfully place implants in the hipbone, therefore they tried it with teeth. The anchorage was provided by the Vitallium screw at the location of the missing tooth.⁵ They were the initial people to do the first victorious

endosteal (in the bone) implant. An endosseous implant, that was cylindrical and treaded internally and externally was licensed by P.B Adams in 1938. It had a healing cap and a smooth gingival collar. Formiggini and Zepphoni developed post type endosseous implant in the 1940s. The bone was allowed to develop into the metal by the spiral stainless steel form of implant.

1950-1980:

Dr. Raphael Chercheve from France added to the spiral design by creating burs to guide the insertion of the implant for the most desirable fit. As the progression of implant discovery continued, the subperiosteal (on the bone) implant was developed within the 1940s by Dahl in Sweden. In the 1950s, Dr. Bodine witnessed the holes for the screws were situated in regions where the bone had the greatest strength and thickness. This epoch also included the discoveries of Dr. Lee founded the utilization of an endosseous implant with a central post.²

In 1978, Dr. P. Brånemark proposed a two-stage threaded titanium root-form implant; he developed and examined a system using pure titanium screws which he gave the fixtures. These were put in his patients in 1965 originally and they were well-documented and hence the most well-maintained dental implants so far. These implants which were placed within a timeframe of six months remained in situ for the succeeding 40 years. The bone bonded to the titanium surface. Moreover, if a fracture occurred, it always occurred between bone and bone, and never between the bone and the implant. The theory of osseointegration came with this implant. This title was further refined and defined by Brånemark as "a direct structural and functional connection between ordered, living bone, and the surface of a load-carrying implant". Initially, he created it cylindrical, then later he made it in a tapered form.

Modern implantology had two other ground-breaking personalities, Dr. Schroder and Dr. Straumann of Switzerland. They helped fabricate dental implants with metals used in orthopedic surgery. In the initial part of the 1980s, Dr. Niznick founded the Core-Vent implant. It had been a hollow basket implant with a threaded piece in it which helped to engage the bone. The screw-Vent implant had a hydroxyapatite coating on it and was also produced by him. Including the surface coating, there was more opportunity for the immediate modification of the bone to the implant surface. Dr. Niznick continued to develop other systems including the Bio-Vent and the Micro-Vent.

Shortly after, Dr. Driskell within the 1980s introduced the Stryker "root-form" endosseous implant; there are two variants of this-one made with a titanium alloy and another coated with hydroxylapatite. Dr. Kirsch towards the end of the 1970s introduced the IMZ implant which was widely utilized in many countries within the 1980s. The IMZ implant had some novel features; it had a titanium surface spray to improve interface surface area and it also had an intra-mobile detail in it to replicate the mobility of natural teeth.⁶

The Straumann Company launched the ITI implant systemic in 1985. It has particular plasma-sprayed cylinders and screws which are designed to be placed in a one-stage procedure. The most latest dental implant innovations involve the utilization of fluoride, antibiotics, growth factors, and laminin.⁷

1980-2000:

In 1982, the Toronto Conference on Osseointegration in Clinical Dentistry created the first guidelines for what should be regarded as successful implant dentistry.

In 1993, in the Journal of Oral and Maxillofacial Implants, Dr. David Scharf issued data attesting that implants can have an equally high success rate when installed in a dental office setting under aseptic circumstances as to when they are placed in an operating room. This progression cleared the way for the conventional practice of placing dental implants in the office rather than a high-priced hospital operating room setting.²

2000-2015:

In 2002 there was wide recognition of dental implants as the favored method of tooth replacement, recognized in a survey conducted by ADA. In 2004 Genget al. defined four common thread configurations: v-thread, thin-thread, reverse buttress, and square thread. These were very note-worthy regarding stress distribution and solving problems. In 2013 Mehraliet gave a notable design of implants for porous bone displays biological adaptation and are termed functionally graded materials (FGMs). In the newest trends, Fine Element Analysis and Computer-aided design, and computer-aided manufacturing technology are used in the production of implants. The computerized three-dimensional models have been largely used to predict the properties of stress distribution in the bone enclosing implants. The implant designs are influenced by both the implant dimensions and the biomechanical bond formed between the bone and the implant.

In the recent clinical studies, Blaschke et al reported that dental implants made from zirconia are a worthwhile alternative to titanium dental implants. In enhancement to excellent cosmetic outcomes, zirconia implants provide a degree of osseointegration and soft tissue response that is preferred to that of titanium dental implants.²

2015-2020:

The installation of a dental implant only profits through proper imaging. Among the latest technology in dental imaging is Cone Beam Computed Tomography (CBCT) which uses 3D images from various planes like axial, coronal, and sagittal views.⁹

Image-guided implant placement has experienced revolutionary improvement. There are two main types of image-guided implant surgery which involve the implant planning on assigned software to determine the angulation and position of the implants to be installed, the avoidance of the intrusion into the maxillary sinus, and the avoidance of contacting the inferior alveolar nerve. The variation in both is, one is a real-time navigational implant surgery and the second one is the insertion of implants using a stereolithographic.⁸

Mini dental implants are small diameter dental implants, they are also known as small diameter dental implants and narrow-body implants. Their diameter is less than 3 mm. Transitional implants are narrow-diameter implants that were formed to support provisional fixed restorations during the period of osseointegration of the definitive implants and are usually placed concurrently with definitive implants. One-piece implants were also introduced. They are implants manufactured from a piece of titanium that includes both the implant body and an integrally fixed abutment in a single component.¹⁰

III. Conclusion:

The history and the recent developments in the field of Implant Dentistry have been a wonderful journey. They are noticed and are widely accepted in clinics. Research works to improve biocompatibility, peri-implant tissue has increased the success rate of implants. Latest advances in Dental Implant imaging has led to precision implant delivery and better prognosis.

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