

HISTORY OF DENTAL IMPLANTOLOGY

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INTRODUCTION

Since the age of prehistoric man, humanity had suffered from dental pathology, decay and advanced tooth wear, due to abrasive diet. Concurrent with these affections had been a desire to substitute artificial devices as replacements for the diseased or lost teeth. The historical evidence suggest that attempts were made to replace missing teeth using homologous or alloplastic materials including stone, carved bone, shell, pieces of ivory, ceramic, human and animal teeth. With the improvements in scientific knowledge; various biomaterials, surgical techniques, equipments, instruments have also improved greatly; and by the 21st century there has been various modalities of tooth replacement, osseointegrated dental implant supported prosthesis being the most advanced form.

HISTORICAL BACKGROUND:

There are six distinct eras in implant dentistry categorized to understand the development of implants.¹

1. The Ancient era (through A.D. 1000)
2. The Medieval era (1000 A.D. – 1799 A.D.)
3. The Foundational era (1800 A.D. – 1910 A.D.)
4. The Premodern era (1910 A.D.– 1935 A.D.)
5. The Modern era (1935 A.D. – 1978 A.D.)
6. The Contemporary era (1978 A.D.-Till date)



Earliest form of Dental Implant (600 A.D.) made of shell

1. Ancient Era

The history of dental implants is as fascinating as it is ancient. Intra osseous implantation of animal teeth and artificial teeth carved of ivory were performed on ancient Egyptian dynasties. Lost teeth were considered as handicap prior to mummification or preparation for burial, so artificial or animal teeth were implanted in the corpse's jaw to assure proper preparation for the afterlife. The skull dating to A.D. 600 belonging to Mayan civilization was discovered with three tooth shaped pieces of shell which had been implanted in the sockets of missing lower incisors. Radiographs showed compact bone formation around two of the implants suggesting that these implants were in situ long enough to permit some type of bone healing.²

2. Medieval Era

The medieval era of implant dentistry was primarily concerned with the transplantation of teeth. Alabucasim, an Arab surgeon (936-1013), fabricated

implants made from ox bone and described transplantation procedures. In Japan, during the 15th and 16th centuries, wooden dental prosthesis were designed to function as a dowel crown. The pin of the prosthesis was inserted into the root canal of a nonvital tooth whose crown was missing. This is evidence of an early endodontic implant supported prosthesis³. Transplantation became fashionable in the European sphere for the nobility and for military officers. "If a high ranking officer had a condemned tooth, he had it extracted. Then from the ranks of the soldiers, one would be chosen whose tooth matched the officers in terms of size and color. The chosen soldier having no chance to object, would lose his tooth". However, because of the very high failure rate as well as the danger of transmission of diseases eg tuberculosis & syphilis, such transplantation came under increasing criticism.

3. Foundational Era

Endosseous oral implantology truly began in the 19th century. **Maggilio**, in 1809, inserted a gold implant into a freshly extracted tooth socket. This implant was not truly submerged, but the tissues were allowed to heal passively without a crown. The crown was attached only after the tissues appeared to be healthy.

Harris in 1887 reported in "Dental Cosmos" that he implanted an artificial porcelain tooth crown on a leaded root in a socket that was artificially formed in the jaw. The porcelain crown was fixed on a platinum post and around this, lead was melted in a mold to resemble a tooth root and was slightly roughened to afford a retaining hold for new tissues in the socket.

Berry in 1888, wrote concerning the need to obtain teeth free of danger of communication of disease, a response to the dangers of implantation or replantation of natural teeth. He suggested that possibly porcelain teeth with roots of wood, tin, or silver would be retained if skillfully placed, but lead

is generally tolerated in the body without trouble, that is, best material for implantation⁴.

Hartman was the first to expand the indication for implants beyond single tooth replacement. He in 1891 proposed that denture could be affixed to implanted alloplastic tooth roots by means of screws. However large rate of failures with such screws form implant lead to the demise of the procedure.

4. Premodern Era

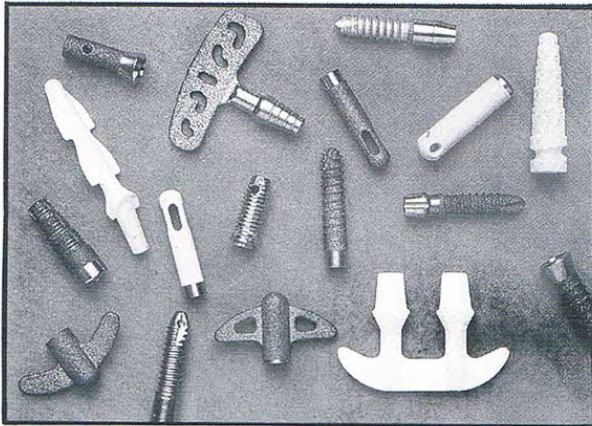
Two innovative clinicians, **R.E. Payne** and **E.J. Greenfield**, dominated the first two decades of the 20th century as related to the field of oral implantology.

Payne in 1901 presented his capsule implantation technique at the clinics of the Third International Dental Congress. **Payne** wrote of extracting the root, enlarging the socket with a trephine, and the trial fittings of the capsule. He then placed grooves on both sides of the socket, filled two thirds of the socket with rubber, fitted a crown with a porcelain root into the capsule, and set it with gutta-percha.

Greenfield was the first to carefully document an original implantation procedure in the scientific literature with accompanying photographs and diagrams. **Greenfield** described his procedure as follows : ".....When everything is ready, cleanse the gum with alcohol, take out the gum tissue, use a cone shaped engine knife to cut the bone tissue; then finish the socket with a reamer. Then the root is placed and a splint is cemented until a sufficient deposit of bone cells has filled in between the spaces. Only after there was evidence of embedding of the implant cage in the jaw, usually after 3 months, was the splint removed and the crown placed...". Thus the historical recording of 3 months period of unloaded healing of the buried implant root with the concept of osseointegration and submerged implants was given by **Greenfield**⁵.

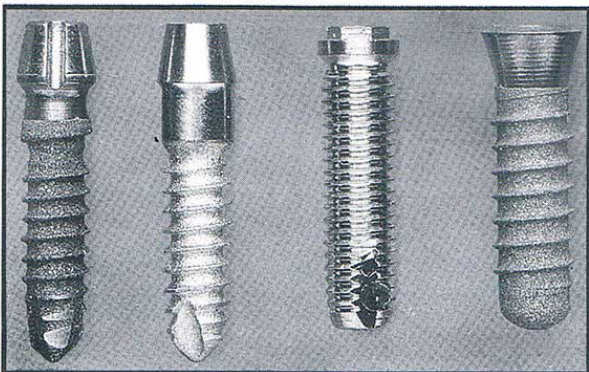
5. Modern Era

The modern era of implant dentistry began in the late 1930s with the work of Venable, Strock, Dahl, and Goldberg.



Various types of commercially available Dental Implants

Venable in 1937, developed the cast cobalt-chromium-molybdenum alloy now known as Vitallium. This metallic alloy made possible the innovative implant and prosthodontic procedures of the succeeding decades⁶.

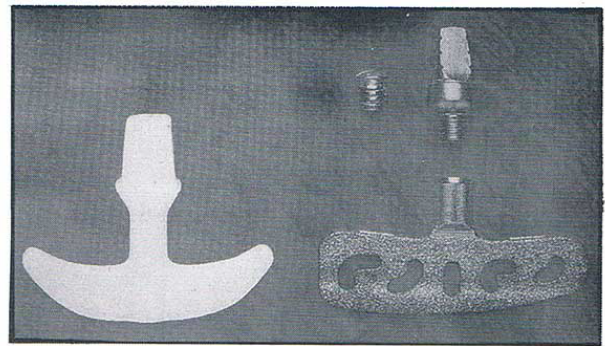


Screw form of Dental Implants

Strock in 1939 attempted to change the shape of dental implant from that of a tooth root. He used Vitallium alloy to create a dental implant with a threaded body.

In France, Scialom (1902) recommended needle implants inserted into the bone of the jaw as dipoles, tripods or arranged in a row like a "street of needles".

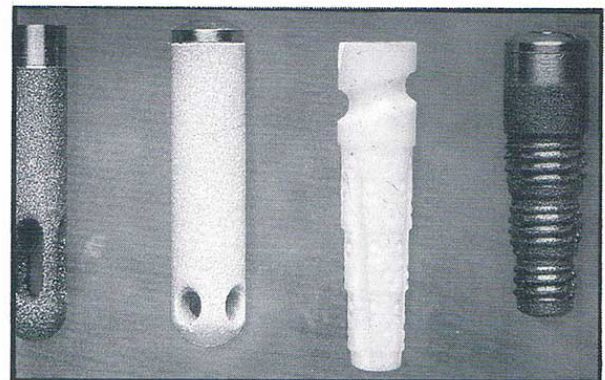
Linkow in 1968 introduced implants as the shape of special blade made of titanium.



Blade form Dental Implants

6. Contemporary Era

Experimental studies performed by Branemark from 1952 to study the behavior of bone marrow healing on animals with vital microscopic technique led to the development of the concept of bone fusing to titanium. Pure titanium was used as microscopic chambers for that experimental purpose, but after some months, Branemark accidentally found that titanium chambers had become completely



Cylinder form Dental Implants

incorporated into the bone. This findings led the application of titanium dental implant in dog in early 1960 and without significant adverse reaction to hard and soft tissues. Studies in human began in 1965 and were followed for ten years and reported in 1977. Branemark first coined the term, osseointegration, to denote structural and functional contact between orderly living bone and surface of load bearing implants. He advocated the possibilities of using osseointegrated dental implants for prosthodontic purpose⁷.

CONCLUSION:

Treatment modalities in dentistry changed markedly when dental implant became the basis with predictable outcome for rehabilitation of stomatognathic system. Currently, there are more than 100 different implant systems commercially available worldwide⁸. They differ mainly in shape, bone surface involvement biomaterials, design, surgical and prosthodontic procedures, time of placement and loading. Some commonly used systems with clinical and experimental research follow up are Branemark, IMZ, Frialit, ITI, Lederman, Core Vent, Steri-Oss, Astra and Intregal.

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