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Review Article

A JOURNEY THROUGH IMPLANTS: A HISTORICAL REVIEW

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ABSTRACT

Archeologists have found evidence of dental disease and tooth loss among all ancient and prehistoric people. It is hard to document exactly how much anatomical knowledge the ancients had. Perhaps they knew, as we do, that toothlessness impairs the health of the gums and weakens the remaining teeth-if any. In spite of the numerous shortcomings, animal teeth were still the best substitutes : available, and their use persisted throughout the Middle Ages.

The concept of implant dentistry started with stone implants and went through transplanting slave teeth and later finding out a biocompatible material for the purpose of implanting a foreignsubstance. The history of implants evolved learning from the mistakes as it went along the years.

The nineteenth century saw the introduction of denture materials and techniques that are, with some modifications, still in use today. But still the implant dentistry remains in the twilight zone.

INTRODUCTION

A full esthetic smile is the need of every individual. Losing one or more teeth affects the confidence along with its functionality. The initial concept amongst us, will be the replacements using dentures. But, dentures cannot replace the natural teeth and the answer to this was well proved way back in 1795 during the period of George Washington. His dentures were joined by springs and he felt difficulty in eating and talking (Fig 1)(Van Horn J, 2016). Such dentures were also noisy and could be broken easily. It also caused painful pressure in the jaws. Hence, George Washington wrote a letter to his dentist that said "***My dentures are uneasy in the mouth".*** The Council on Dental Therapeutics, American Dental Association also reported that

"***Ill-fitting denture appliances may impair your health".*** Dentures evolved through the medieval period and further. The modern dentures doesn't have springs, but still they have a lot of disadvantages . Simultaneously, there was a rise in the field of oral implantology from a scientific point of view. The 'new school' of dentists believes that the implant dentistry was introduced by the Swedish physician and orthopaedic surgeon, Dr. P.I. Branemark at Noblepharma in 1985. But this article will take you through the journey of implants that began thousands of years ago and that it wasn't just an accidental invention like many others.

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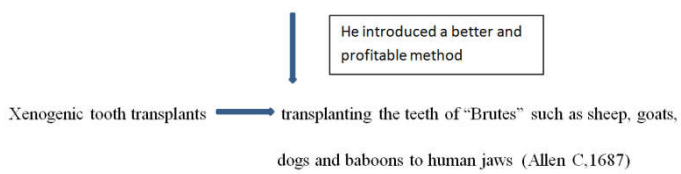
Fig 1 George Washington's Dentures - 1795

Ancient Dental Implant History (2000 BC - 1800 AD)

In early times, Ancient Egyptians, Greeks, Etruscans, Romans, Chinese, Indians and Arabs used tooth transplantation procedures. They would extract teeth from the poor for a fee and place it in rich people's mouth. This concept was popularizing in the mid-16th century. Then known great pioneer, Allen , agreed with the concept of reimplantation but disagreed with the idea of extracting teeth for HAVES (rich) from HAVE NOTs(poor).



During the same era, Indian relics were also found with transplants of gold and jade inserts. In amuseum in Peru, there exists a skull with 32 individual quartz and amethyst teeth implants dated800 AD, over 1200 years ago.

Probably the first person credited with a written paper of transplants as a means of replacing teeth was the Arabian surgeon, Albucasis de Condue. He stated that when a maxilla was broken, and its teeth came out of their sockets, it is necessary to place them back into their original sites and keep them there by means of small bamboo rings intertwined by gold and silk threads.

During the era of mayan civilization, they used bow drills to create cosmetic fillings on natural teeth and live individuals. They also created variant shapes based on regions and tribes. Those inlays were purely for esthetic purposes and were made of a variety of materials of different colours such as quartz, turquoise, serpentine and cinnabar (Aldovrandi C,1949, Smith, Herman-1996). (Fig 2)

Fig 2 Mayan bow drills and esthetic fillings

In 1728, a French dentist, known as the father of dentistry, Pierre Fauchard, introduced few protocols for the first time for reimplantation procedures, that the patient should be young with a healthy gingiva and the transplant should be completed as early as possible. Another pioneer John Hunter disagreed with Fauchard over the use of teeth that had been extracted a long time previously. Fauchard's reimplantations lasted for an year whereas Hunter's lasted for four years (Asbell, Milton B-1988, Ananth H *et al* -2015). The reason for the failures in these attempts were then unknown because of their lack of knowledge about immunology and thus they believed that the failures were due to poor mechanics and techniques.

1785 and 1786 - Le Mayeur (a dentist from Philadelphia) implanted 170 teeth.

Another pioneer, James Gardette claimed not a single one was successful and that he couldremove all of those implants with his fingers alone (Leonard I Linkow-2010).

Early Dental Implant history (1800 To 1950s)

By 19th century, removable dentures and fixed bridges type of dental replacements were flourishing. But the dentists were dissatisfied with these prostheses since in most cases, two healthy teeth were cut down to anchor one replacement tooth. Thus the struggle for a successful implant was born and this period was into the trials and evolution of various materials used as transplants that included vulcanized rubber, porcelain and many different metals.

The first modern implant was made in 1809, by J.Maggioli , a dentist in France, who published his works on forcing a metallic tooth root made of 24 carat gold into the socket of an extracted tooth. The implant consisted of a small tube with three prongs at its end that was bent in on themselves to provide retention. It also has a hole in its upper part, where the post could be inserted and was made firmer with silk threads. (Fig 3) He modified this model later for better retention by drilling a horizontal hole through the post and crown and inserting a pin through it to hold the crown and the post (Maggiolo G-1809, Pasqualini U, Pasqualini Me-2009).

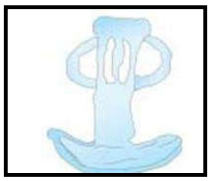


Fig 3 J.Maggioli's implant-1809- The First Modern Implant

Table 1 Further discoveries of this era are (Leonard I Linkow-2010)

Year	Pioneer	Discovery
1809	Maggioli	Tooth implant materials such as gold roots (First Modern Implant), iron roots
1885	Younger	Inserted dried tooth into an artificially extraction socket
1886	Dr. S.M. Harris(California)	Created an artificial socket and implanted a porcelain crown mounted on a porcelain post around which lead was melted in a mold and roughened a bit for further retention. This implant was functioning for almost 27 years later .
1886	Younger	Platinum roots
1887	Harris	Implanted porcelain crowns fixed upon a platinum post around which lead was melted in a mold to resemble a tooth root.
1887	Berry	
1889	Edwards Edmonds (New York)	Platinum rootsLead
1915	Widiman	Autotransplantation of unerupted maxillary canines
1934	Cserefalvi	First tooth bank was set up in Hungary and then the idea spread across Phoenix, Arizona, Europe and many more countries.
1950s	Miller, Apfel, Hale and Clarkand his co-workers	Transfer of partially developed third molars into the extractionsites of first molars.

The early attempts in 1880s and 1900s were discouraging because of the use of improper materials which were mostly gold, gutta percha, porcelain and platinum. Various animal experiments were also simulateonusly conducted in the need for a suitable material.

Other Works of Few Great Pioneers

In 1913, American dentist, Dr. Edward Greenfield, developed an endosseous implant – "Greenfield's cage". He precisely measured a hole in the alveolar bone and drilled it using trephine. An implant of the same size as that of the drilled hole was placed. His implant was hollow, lattice cylindrical and was made of irido platinum wire. The upper portion of the implant had a same sized small plate made of 24 carat gold soldered to it, that later accepted the crown . (Fig 4) The rationale behind the technique was to allow new bone to grow through the intersticesof the implant and unite with the bone of the center core. According to Greenfield: "This bony center of the root-socket is one of the chief factors in the success of this process of implantation". Though a few of Greenfield's implants were successful , he faced failures especially when he loaded it for large bridges from implant to implant and finally discovered that trephined bone would break easily from its base and was a loose core of bone (Greenfield Ej,1913)

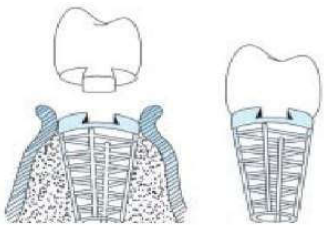


Fig 4 Greenfield's cage – endosseous implant -1913

In 1920, Leger-Dorez introduced a four piece tubular extension implant. As the name suggests, the four pieces are the screw(S) when inserted into the neckpiece (N) already placed into the shaft (J) causes the lower portion (LP) to flare and that braces the surrounding bone. The abutment portion (P) would be placed later to accept the restoration. Inspite of its careful engineering of the design, the implant was a failure due to many reasons out of which the perforation of the cortical plates at narrow sites while flaring was dangerous and also it showed additional bone resorption (Leonard I Linkow-2010, Pasqualini U, Pasqualini Me-2009). (Fig 5)

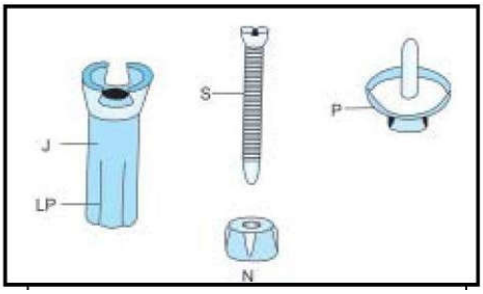


Fig 5 Leger- Dorez implant -1920

The search for an appropriate implantable material continued, when a major breakthrough occurred in the year 1935 when the two surgeons, Drs. C.S. Venable and W.G. Stuck introduced the "VITALLIUM" which was a chrome-cobalt molybdenum alloy suggested by one of their dentist friends . It was initially introduced as an insert screw placed in bone through gingival tissue and was used to support a single isolated cases (Leonard I Linkow-2010, Venable C.S., Stuck W.G., Beach A-1937)

Venable's principles included:

- Stabilization
- Maintenance of surgical aseptic conditions
- Screw should not be too thin
- Occlusion of the crown should not be in traumatic position.

The so called "Venable screws" were then implanted in the extraction sockets of dogs and humans and was later studied for an year, radiographically and clinically. This was the first true histologic evidence of bone growth around metallic implants in animal studies.

In 1939, Dr. A.E Strock also implanted venable screws into human mouth (Strock A.E, 1939).(Fig 6)

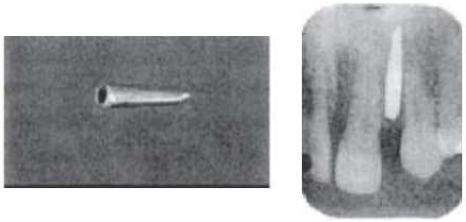


Fig 6 venable screw in humanmouth – Dr. A E Strock

In historical series, Dr.Strock had placed the first successful human dental implant.

By mid 1940s, prototypes of a few of the most successful screw type of endosseous implants was found by an Italian Manlio, S.Formiggini and thus he was recognized as the "Father of modern European Implantology" But, ideally the title belonged to Dr.Strock for his success in1938 (Leonard I Linkow-2010).

Formiggini's implant consisted of an inert metal wire made of stainless steel or tantalum, in the form of a spiral. (Fig 7). This design allowed the tissues to grow around the implants. Theoretically, the design seemed a success but failed clinically mainly due to drawbacks in itsmechanical factors.

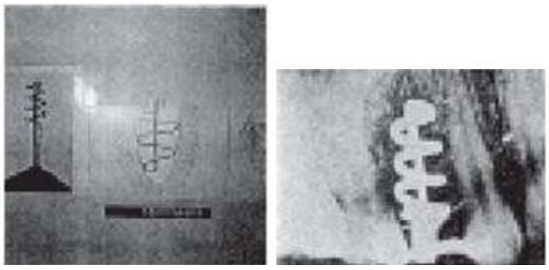


Fig 7 Formiggini's implant and radiograph revealing bone loss aroundthe implant.

Formiggini's design was later successfully modified by another Italian Pioneer, Zepponi who converted the spirals and the protruding shaft into one unit with the extra tissular part modified for screwing of the prosthesis.(Fig 8) He also took a great step forward by casting the spiraled implant that decreased the chances of creating weak points. Zepponi was the first to produce thehistologic and macrographic works, thus proving the safety and efficacy of the formiggini type implants.

Fig 8 Zepponi's implant

Current Dental Implant History (1940 To 2019)

1958- Raphel Chercheve was another great pioneer to develop the Submergible "SLEEP AWAY" implants which was another successful modification of Formiggini's original design(Leonard I Linkow-2010, Pasqualini U, Pasqualini Me-2009).

The implant was cast chrome cobalt spiral design that consisted of a hollow screw with internal threading that would be set underneath the alveolar crest and allowed to heal for several months. The area would be then re- entered inorder to place a screw bearing prosthesis. But the prostheticstep led to the damage of that site. (Fig 9)

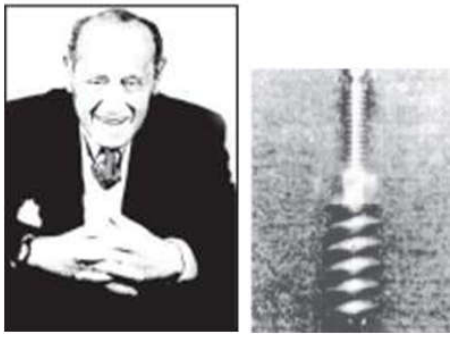
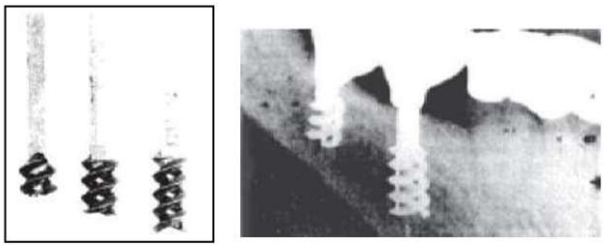


Fig 9 Ralph Chercheve and hissleep away implant -1958

In 1959, Chercheve further modified his implant by creating double helix spiral implant made ofvitallium. In this he gave more importance to the spacing between the spirals. But this design was also a failure because the helical spirals were too thin and would snap off while inserting theimplant.(Fig 10)



In 1961, Chercheve introduced the Buried spring implant.

In the following years, another pioneer Pretto's trombone and adjustable ringlet implants were introduced. The design was made with an idea of regrowing bone through the incorporated winglet band (Leonard I Linkow-2010).

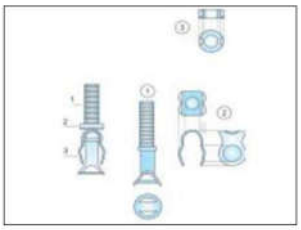


Fig 11 Pretto's trombone and adjustable ringlet implants

1. Implant shaft
2. Winglet band
3. Disk

This invention was followed by the development of Max Jeanneret's superstructure rounded bar that was bent to fit through the loops and were screwed into the internally threaded implants. It was also called as Jeanneret's three piece implant. The implant was a failure as its thickness was the main flaw though the spirals were adequately spaced (Pasqualini U, Pasqualini Me, 2009) (Fig 12)

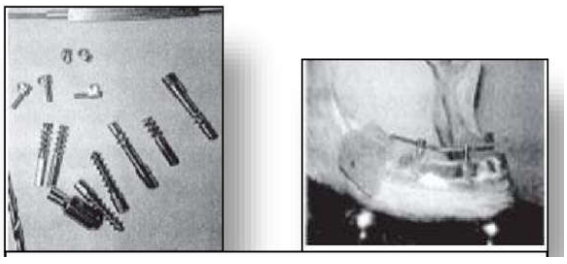


Fig 12 Max Jeanneret's three piece implant

1963 – the great contribution of Leonard Linkow, who developed the first self- tapping root formimplant with sluice ways, cervical threads and an apical basket for the accumulation of bone particles during placement . He named it as Vent Plant and it also had the property of eliminating excessive pressure to the surrounding bone. The first two implants placed in the patients were made of tantalum and next generation were made of titanium (Linkow L.I, 1966). (Fig 13)

Fig 13 Leonard Linkow

The Titanium Story

A Benrus watch manufacturer who was already working for producing Linkow's implants informed Linkow about the availability of a new material that was being extensively used by the space industry and had very interesting biomedical properties. Hence, Linkow invented his first root form implant made of titanium in 1963. Linkow modified his Vent plant in many ways so that it could be suitable for almost any site and could be utilized in many edentulous area.

In the 1950s, research was being conducted in the Cambridge university in England to study about the blood flow in vivo. This was done with "Rabbit-ear chamber" made of titanium, that was embedded into the soft tissue of the rabbit's ear. Simultaneously, Dr.P.I.Branemark, a Swedish physician and orthopedic Surgeon was interested in learning more about bone healing and regeneration Dr. Branemark adapted this chamber and used in it rabbit's femur. After several months of successful study, he tried to retrieve the chamber, but failed to do so and noticed that bone had grown into such a close approximation to the metal that it almost became an integral part of it. (Fig 14) (Brånemark PI, Lindström J,1963)

Fig 14 Dr.Branemark's study on rabbit's Femur

In 1960, he did further studies by embedding tiny titanium implants into the arms of volunteers subjects. He also did extensive research in animals by modifying the shapes and sizes of titanium implants by working with an engineer Richard Skalak. All of his trials were successful that the implants were closely locked to the bone and that sometimes the bone fractured or the implant broke before it could be removed. Following his observations, he introduced the term "OSSEOINTEGRATION" to describe the state achieved when titanium fixtures were placed into the bone .By 1965, Dr.Branemark was ready to put his implants into clinical tests . He chose dental repair as his first test area and gave an explanation to it as:

"Our original idea was to work with knee joint and hip joint surgery, with the victims of Motorcycle accidents, for example. But working in the mouth turned out to be much better for the initial clinical patients in need of dental reconstruction. Secondly, from the scientific point of view, the oral cavity is the perfect location for controlled clinical trials. It is the only area of the body where, exploratory procedures

are unnecessary. Ask your patient to open his or her mouth and you can inspect the reconstruction region without any difficulty at all." (Leonard I Linkow, 2010)

His first patient was a man with jaw deformities and completely edentulous (Gosta Larsson of Gothenburg, Sweden). (Fig 15)

Fig 15 Dr.Branemark with his first patientGosta Larsson.

Unfortunately, Gosta Larsson passed away in 2006 having used all his implants for over 40 years. This shows the success of Branemark's implant. Sven Johannson of Gothenburg, Sweden was Branemark's second patient who received the implants at the age of 42 and is currently 91 with all his implants intact. He has had the oral implants for the longest time than anyone else onthe earth (Nobel Biocare News, 2012) Branemark developed the Nobel pharma company of Gothenburg, Sweden and introduced his first commercial implant in 1982, made of pure titanium. These implants quickly gained popularity and became the standard by which all root form implants and manufacturers were tobe measured. He then introduced the Branemark system and developed its surgical protocol following which he refined and defined his term Osseointegration as "a direct structural and functional connection between ordered, living bone, and the surface of a load carrying implant"(Leonard I Linkow,2010).

The original Branemark was a cylindrical one that was later modified into tapered ones and then the screw designs from 1982 to1993. Thus Branemark implant became a classic and commercially pure titanium screw shape with an external hex. (Fig 16)

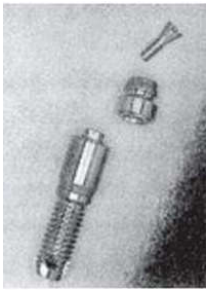


Fig 16 Dr.Branemark's implant

By 1980s, different types of screw type implants became popular, one being Strauman TPS Screw system (Straumann Usa Llc 2014). (Fig 17)

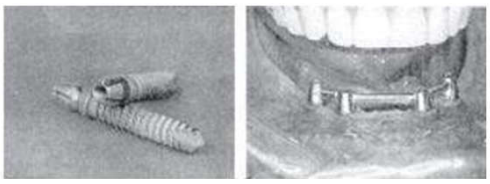


Fig 17 Strauman TPS screw system

In the following years Niznick, a clever prosthodontist from California, produced his implants that had an internal hex threaded design that was about 2 times longer than the external hex on the Branemark implant. These implants and surgical system was significantly produced at a lesser cost. (Dr. Gerald A)

Table 2 Other discoveries of this era

Year	Pioneer/company	Discovery
1985	Calcitech	Smooth cylinder design implant coated with Hydroxyapatite (Abraham CM,2014)
1986,1987,1989	Niznick	Other implant designs and the Spectra Philosophy ofusing differently designed implants for specific types of bone (Dr. Gerald A)
1989	Dr.Matts Anderson	First ceramic CAD/CAM coping
1990	Dentsply took over Corevent Corporation	• A two-piece anti-rotational abutment with aninternal hex for greater strength. • Decreased the wobble factor by 2 ½ to 6 ½times.
1992	Dentsply	• The hex-lock abutment by tapering the maleportion of the hex one degree (1°), that allowed a friction fit connection of the abutment with the implant. • Virtually eliminated rotational wobble, leading cause of screw loosening prosthetic failures. ⇓ • 15° and 30° angled three piece hex-lock

Evoultion of Implants as A Treatment Modality

Endodontic Stabilizers (Leonard I Linkow,2010)

Year	Pioneer	Contributions
1943	Strock brothers of Boston	First studies on Endodontic, transradicular or intraosseous implants having the purpose of stabilizing teeth.
1947	Malaquiaz Souza	Developed the stabilizers
1952	Jorge Bruno and Juan De Alsina	Continued the studies started by Souza.
1960	Hans G Orlay (Europe)	First publication on this subject after doing tremendous work on this.(Fig 18)
1963	Giordano Muratori(early design)	Spiral implant encircling two narrow vertical uprights and surmounted by an internally threaded shaft. This latter part had the same diameter as the spiral portion ⇓ Bone resorption and soft tissue breakdown
Middle 1960s	Bordon-Azoulay	Bifid – implants (Fig 19) The shaft narrower than the spirals and rounded.
1967	Giordano Muratori (Modifieddesign)	Made of titanium ⇓ Highly successful.(Fig 20)

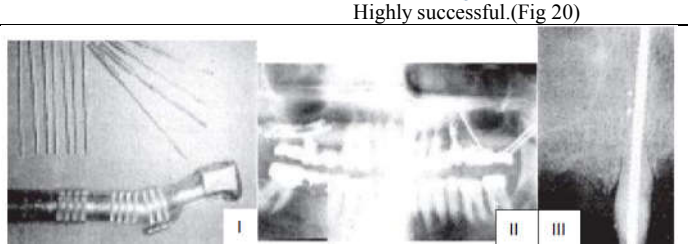


Fig 18

- Hans G Orlay'sendodontic stabilizers
- A case done by Linkow in 1965 using an endodontic stabilizer through the left Bicuspid, a vent-plant in the second bicuspid region and a tripodial support system posteriorly
- A threaded endodontic stabilizer supporting a bicuspid tooth

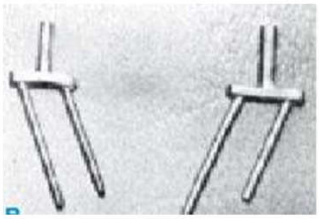


Fig 19 - Bifid Implants

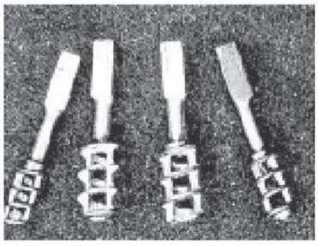


Fig 20 - Giordano Muratori's implant

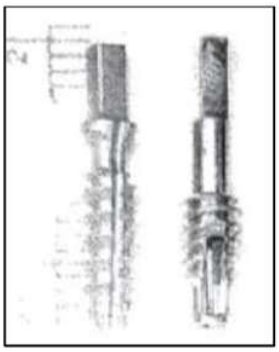


Fig 21 Isaiah Lew -solid vitallium screw

Non-Metallic Implants Crystalline Bone Screw (CBS)

Simultaneous to other inventions, development of non metallic implants were also on its pace. The first trial was done by Sandhaus by developing non metallic implants such as crystalline bone screws consisting of mainly aluminium oxide. This idea was mainly introduced for its advantage of reducing electrogalvanism that can cause a small percentage of failure. Sandhaus claimed that there was no formation of a false periodontal membrane and the bone grew right up to the implant. (Leonard I Linkow-2010, S Sandhaus- 19680 (Fig 22)

Fig 22 Sandhaus crystallinebone screws.

In 1965, a study was done using various combinations of implants such as pure titanium and its alloy, tantalum Linkow vent plants with cobalt chromium spiraled implants, titanium implants of Muratori (Pasqualini U, Pasqualini Me-2009, Muratori G-1971) and Tramonte and spiraled stainless steel along with the non metallic implants , in the same mouth of the patients. Almost in all the cases, the results showed that non metallic implants had problems.

In 1972, Brainin introduced Vitredent implants that were made of vitreous carbon formed around a stainless steel core. The initial studies were done in dogs and later it was marketed. But soon the implant was a failure and were exfoliated generally (Leonard I Linkow, 2010)

Staple Implants

The discovery of Staple implants began in 1973 when Small and Metz developed the mandibular staple fastener system. Staple implants are generally placed into the anterior portion of the edentulous mandible. This acts as a support system and fastener for a mandibular denture. The posterior areas of the denture is then supported by ramus frame implant or total blade or root form case. Unfortunately this technique is not used currently used (Leonard I Linkow, 2010) (Fig 23)

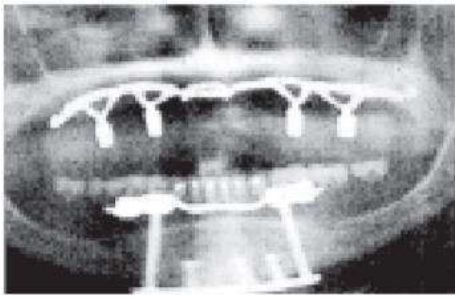


Fig 23 Staple implants

Bladevent Implants

During the era of screw and pin type of implants, Linkow understood that implantologists were being fooled by nature till then as they were placing the implants in a flapless way , directly through the mucoperiosteal tissues. It was Linkow who first did the reflection of a flap during the placement of Bladevent type of implants in 1967.

Linkow's mucoperiosteal reflection techniques brought to his notice regarding the varying dimensions of the underlying bone. He noticed that there were thin and shallow ridges with multiple labial and buccal perforations. Thus he designed an implant that would use the horizontal dimensions of the bone rather than the vertical dimensions. The design looked like a flattened form of his Vent Plant Screws (Leonard I Linkow, 2010) (Fig 24)

Roberts also developed a disc like bladevent implant in 1967. (Fig 25)

Various modifications in the form of size and shape of bladevent implants evolved based on the morphology and anatomy of the bone situation. The initial bladevent implants were made of Vitallium and later in an year they replaced it with titanium material.

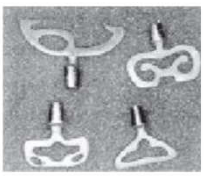


Fig 24 Linkow's early bladevent implants

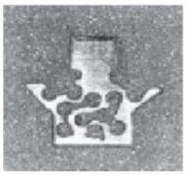


Fig 25 Roberts disc likeblade implants

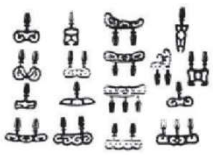


Fig 26 Edelman's submergible bladevent.

By early or middle 1970s, first submergible bladevent implant was developed by Edelman.(Fig 26)

The bladevent implant was placed by gently tapping it into the ridge where its wedge shape spread the bone mechanically outward, but though a bone regeneration was observed after 6-8weeks, the ridge had widened.

Ramus Implants

Another breakthrough in history of dental implantology was in 1970 with the development of Ramus implants by Roberts and a ramus frame implant in 1972. These implants were helpful for the implantologists when there were no alternatives for Linkow's bladevent implant or due to the presence of mandibular, inferior alveolar nerve or mental nerve dehiscences where subperiostealimplant is contraindicated.

Table 3 Other Ramus Implant modifications

Year	Pioneer	Contributions
1976	Linkow	Pure titanium ramus implant system
1980	Christopher Lavelle *et al*(Svare Cw,1975)	His article discussed the importance of internal irrigation and the severe consequences of frictionalheat generated. 50^0C is associated with impairment of mechanical properties of bone. 56^0C is associated with irreversible necrotic changes to the bone.
1982	Hilt Tatum (Leonard I Linkow,2010)	A sinus lift implant that raises the Schneiderian membrane and immediately place blade type implant for prosthesis support.

Plastics

In 1960s polymeric materials were first introduced by Hodosh to overcome the disadvantages of metallic corrosion and ceramic brittleness. The most used plastic was porous polymethylmethacrylate (PMMA). The tissue compatability of plastic was considered acceptable though it was not inert. Ashman concluded that various tissues could be compatible if a porous plastic material is used and also tissue ingrowth will occur with the possibility of bone conduction or stimulation if porosity of the plastic is standardized (Leonard I Linkow-2010, Svare Cw,1975).

Ceramics

The use of hydroxyapatite since years in periodontal surgery led to the experimentation of similar materials with implants. A study done by Driskell in 1968, used single tooth implants of high purity aluminium oxide and placed them in fresh extraction sockets (Driskell Td, Heller Al, 1977) The histologic studies showed that a bone implant interface developed where a serrated root configuration was used. In 1975, Driskell placed the first ceramic tooth implants in humans in United States (Driskell Td et al, 1973).

Subperiosteal Implants

1940 Gustav Dahl inserted the first lower subperiosteal implant made of Vitallium mesh. Full and partial arch designs were used to distribute the loads and screws were used to connect the, abutments to the mesh frame (Gustav Dahl,1956)

1946 taught his techniques to a group of US dentists that included Norman Goldberg and Aaron Gershkoff. They introduced this technique in United States in 1948. Their early implant designs were a failure since they had not taken direct bone impressions. Later after many years of modifications, they began taking direct bone impressions and were successful. Around 1951, Isaiah Lew started reflecting the mucoperiosteal tissues in order to take direct bone impressions and make a subperiosteal casting that can be later fitted directly over the underlying bone and held firmly with the bone screws. This began as a new trend then (Leonard I Linkow, 2010). (Fig 27)

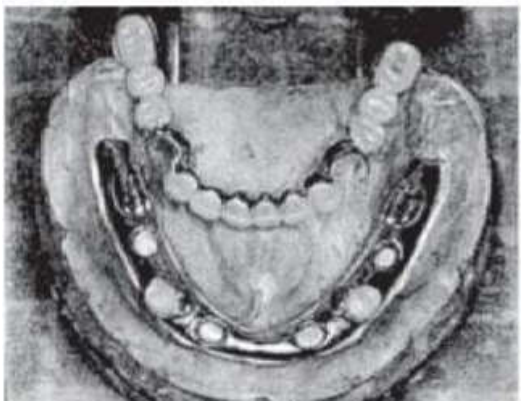


Fig 27 Subperiostealimplant

There was further modification done by Berman, ie Berman's meshwork that prepared from a direct bone impression and fashioned on a stone model. On trials, the site was exposed again two or three weeks later and the meshwork was fitted beneath the periosteum. Four or five weeks after the implant placement, it was noticed that bone growth had occurred through the perforations that adhered the implant to the bone (Berman N,1951) (Fig 28)

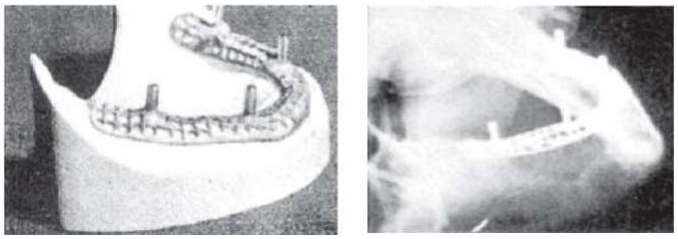


Fig 28 Berman's subperiosteal meshwork implant

Intramucosal Snap Insert Technique

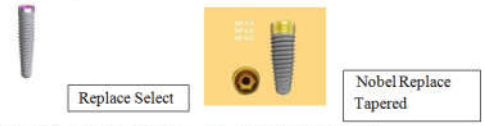
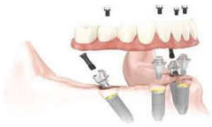
These are the techniques generally used to improve patient stability of traditional dentures or when endoosseous oe subperiosteal implants are unfeasible or to improve patient's clinical condition.

Mucosa inserts are work on this principle, where the prosthesis with intramucosal inserts made of titanium buttons are surgically placed into the keratinized mucosa of the palatal side of the alveolar ridge and then it is incorporated into the upper denture. These inserts have been very useful in patients with cleft palate and cleft lip deformities or diseased jaws (Cranin AN, Craning SL, 1961). (Fig 29)

Fig 29 Intramucosal Inserts

Other Latest Evolutions

Table 4 The other implants of Branemark's Nobelpharma (Nobelbiocare)

Year	Implant
1997	First tapered implant that mimicks the shape of the natural tooth root 
1998	First immediate implant solution – All on 4 treatment concept 
2000	TiUnite – moderately rough anodized surface for osseonitegration. 
2005	First guided surgery system – Nobel Guide – digitized dental implantology 
2008	NobelActive – allows immediate function 

CONCLUSION

The evolution of implants is a fascinating journey through time. As the new school of dentists believed the implant history began with Dr.Branemark, this article clearly tells us its origin way back from the Mayan civilization and then a wide range of contributions from Great Pioneers inthe hunt for a successful implant. Many great contributions by Leonard Linkow makes him oneof the legends of implant dentistry. As time marches, many more discoveries in the materials , forms , surface coatings have refined inorder to find the best replacement for the natural tooth and thus in this journey we have now reached the Mucointegration Era.

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