Controversies

Implant Connections

Original Screw-Vent
45deg. Conical
Connection

NobelActive
78deg. Conical
Connection

NobelReplace
TriLobe Connection

Straumann
Octagon Conical
Connection

Nobel N1
Ovoid
Connection

Straumann 83deg.
TorqFit Conical
Connection

Keystone
TiLobe
Connection

A Technology Report for Discerning Dentists

by Gerald A. Niznick, DMD, MSD

Here is a 12 page Technology Report that addresses the many controversies and misconceptions related to the design of the implant-abutment connection. From 1983 through the end of the 1990's external hex connections (Branemark Implant) were considered by many as the gold standard. Because of its history of bone loss, implant fractures, loose screws and micro-leakage, it was replaced by internal conical connections, first introduced in 1986 with the Screw-Vent implant (Niznick US Pat. #4,960,381).Internal connections have dominated the implant industry in the last 20 years, some with tube-in-tube designs (Keystone's Genesis and Neoss) but mostly with lead-in bevels. The definition of a "conical" feature is "having the shape of a cone. " NobelBiocare popularized the term "conical connection" with its 78 degree lead-in bevel on its NobelActive implant. The term Conical Connection is not dependent on whether the cone or lead-in bevel is 45 degrees like the original Screw-Vent (often referred to as the Standard connection), 74 degrees like Neodent's Grand Morse implant, 78 degrees like NobelActive or 83 degrees like the Straumann BLX. To assure a seal at the top of the internal shaft, the angle of the bevel on the mating surface of the abutment is 1 degree steeper, therefore the length of the bevel does not add to stability. This 12 page report and review of the literature addresses the many controversial issues related to implant connections:

(1) Angle of the lead-in bevel,

(2) Platform Switching,

(3) One Platform for all diameters,

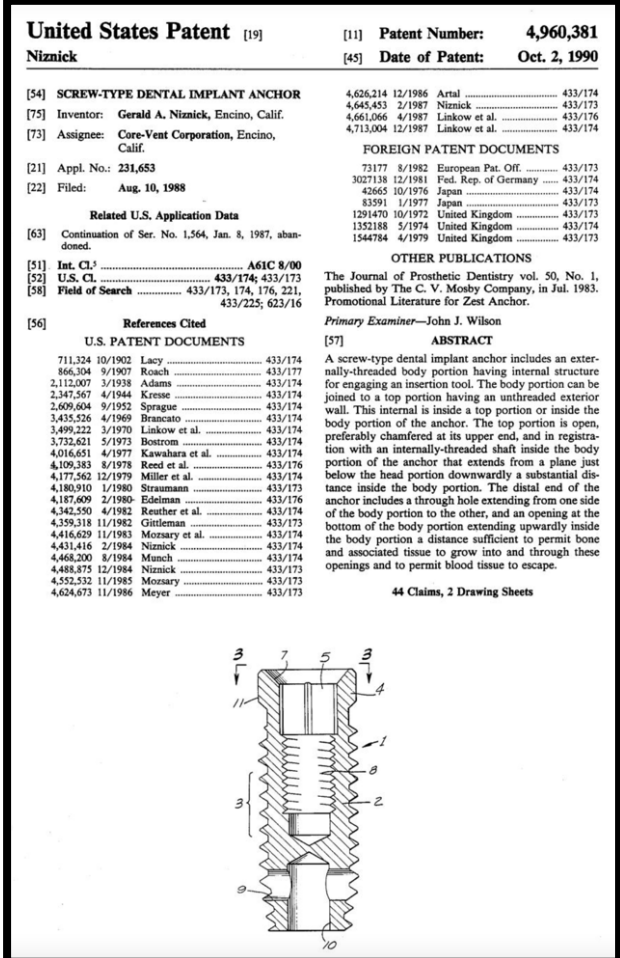
(4) Subcrestal Placement,

(5) Friction-fit connection,

(6) hex, tri-lobe or slots for wrench-engaging surfaces

It is time to separate clinical reality from marketing rhetoric.
https://lnkd.in/gAJwhAnS

In 1986, Dr. Gerald Niznick, through his Core-Vent implant company, introduced the straight Screw-Vent® dental implant with a unique, internal connection consisting of a 45 degree lead-in bevel and internal hex above internal threads. In 1999, Dr. Niznick launched the Tapered Screw-Vent and published an article on optimizing initial stability in soft bone by placing a tapered implant into an undersized socket prepared with a straight step drill. 2000 Article: “Achieving Osseointegration in Soft Bone: The Search for Improved Results”



United States Patent [19]
Niznick

[11] **Patent Number: 4,960,381**
[45] **Date of Patent: Oct. 2, 1990**

[54] **SCREW-TYPE DENTAL IMPLANT ANCHOR**

[75] Inventor: **Gerald A. Niznick**, Encino, Calif.

[73] Assignee: **Core-Vent Corporation**, Encino, Calif.

[21] Appl. No.: **231,653**

[22] Filed: **Aug. 10, 1988**

Related U.S. Application Data

[63] Continuation of Ser. No. 1,564, Jan. 8, 1987, abandoned.

[51] **Int. Cl.**[5] **A61C 8/00**
[52] **U.S. Cl.** **433/174**; 433/173
[58] **Field of Search** 433/173, 174, 176, 221, 433/225; 623/16

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4,661,066	4/1987	Linkow et al.	433/176
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The Journal of Prosthetic Dentistry vol. 50, No. 1, published by The C. V. Mosby Company, in Jul. 1983. Promotional Literature for Zest Anchor.

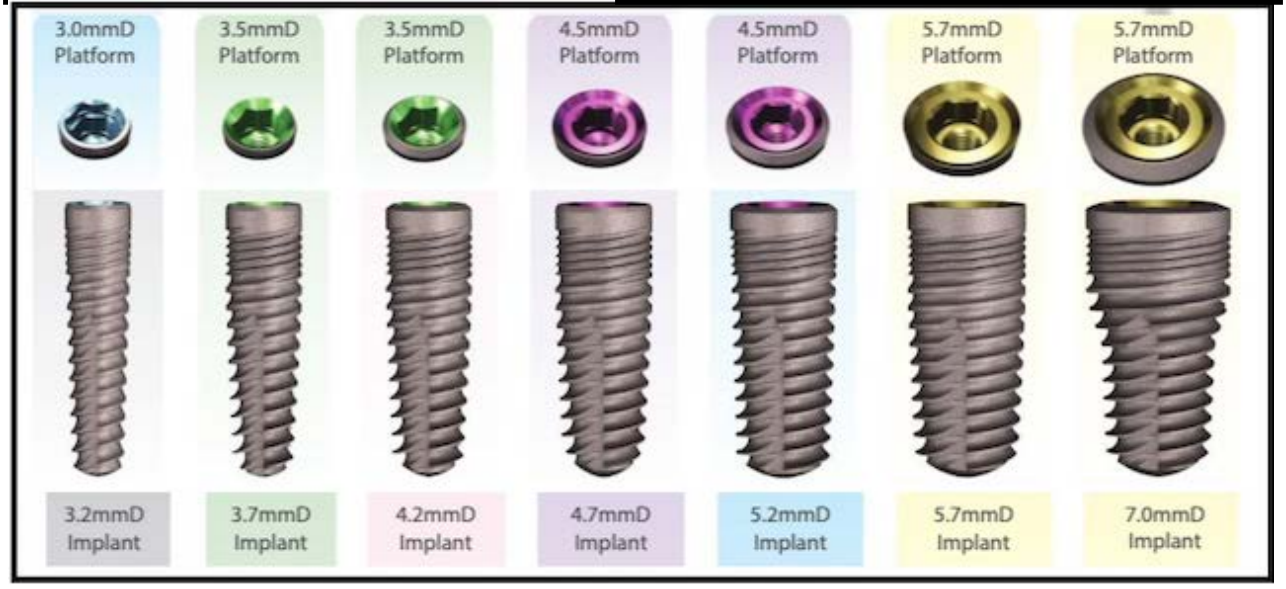
Primary Examiner—John J. Wilson

[57] **ABSTRACT**

A screw-type dental implant anchor includes an externally-threaded body portion having internal structure for engaging an insertion tool. The body portion can be joined to a top portion having an unthreaded exterior wall. This internal is inside a top portion or inside the body portion of the anchor. The top portion is open, preferably chamfered at its upper end, and in registration with an internally-threaded shaft inside the body portion of the anchor that extends from a plane just below the head portion downwardly a substantial distance inside the body portion. The distal end of the anchor includes a through hole extending from one side of the body portion to the other, and an opening at the bottom of the body portion extending upwardly inside the body portion a distance sufficient to permit bone and associated tissue to grow into and through these openings and to permit blood tissue to escape.

44 Claims, 2 Drawing Sheets

The Screw-Vent incorporated the same thread design and diameter (3.75 mm) as the Branemark implant, but featured a 1.5 mm-deep internal hexagon with a threaded shaft below it. This patented connection provides the stability needed between the implant and the abutment to prevent screw loosening and thus minimizes long-term prosthetic complications. It also allows screw-retained, two-piece abutments to interlock with the internal hexagon to prevent rotation, which made single tooth replacement a viable option in implant restorations. At the top of the internal hexagon, a lead-in bevel helps stabilize the abutment against lateral forces and reduces the chance of tissue being trapped in the joint, which could result in incomplete seating Below are the Legacy2 Implants with patented micro-threads and patented 2-piece healing collar from Implant Direct.



Clinical Study Comparing Internal Hexagon vs Conical Implant-Abutment Connection: Evaluation of 3-Year Post-loading outcomes.

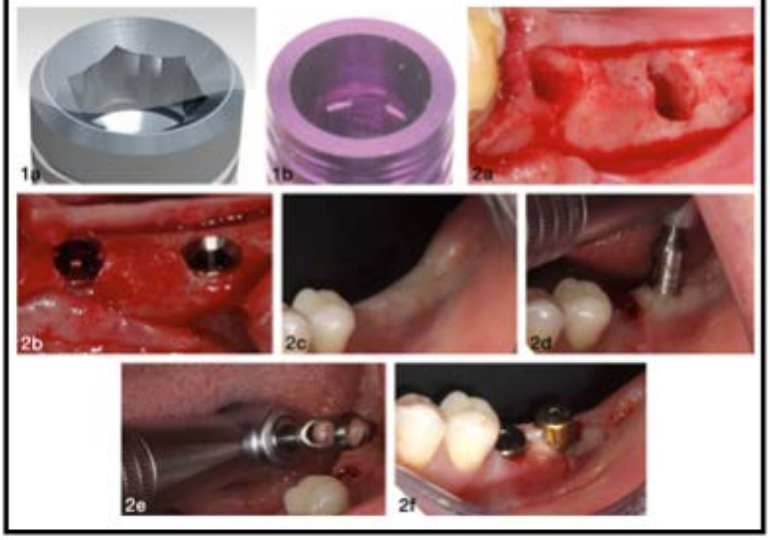
"The results revealed no significant between-group differences."

J Oral Implantol (2021) 47 (6): 485–490.

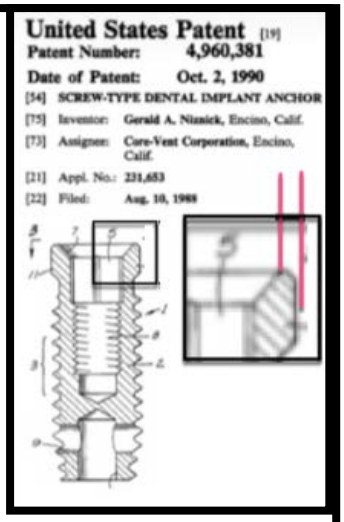
Different types of internal implant–abutment connections, namely hexagon and conical, have been used for implant restoration. However, data regarding the benefits of these internal connections in terms of clinical outcomes are scarce. Accordingly, the aim of this study was to compare radiographic marginal bone loss (RMBL) and associated implant complications between implants with internal hexagon (IH) connections and those with internal conical (IC) connections. Forty-nine patients with 98 implants (2 per patient) placed in the posterior mandible were recruited. All implants were inserted in pairs into solid D2 bone according to a randomized sequence; the first patient received an IH connection implant on the mesial side, while the second patient received an IC connection implant on the mesial side. Each patient received 1 implant with an IH connection and 1 with an IC connection, placed side by side. Four months after placement, all implants were loaded with single screw-retained ceramic restorations with IH or IC connections. RMBL and complications, including implant/prosthesis failure, were recorded at the time of implant loading (baseline) and at 6, 12, and 36 months after loading.

The results revealed no significant between-group differences in RMBL (P = .74), gingival bleeding on probing (P = .29), and complications (P = .32). Thus, the type of internal implant–abutment connection did not affect clinical outcomes, including RMBL and implant/prosthesis failure.

Figures 1 and 2.



The history behind the Platform Switching theory is that Implant Innovations (3i) in the early 1990s introduced a 5mmD wide external hex implant as an addition it its 4mmD Branemark clone implant. It did not have enough of a selection of 5mmD wide abutments so dentists started to attach the 4mmD abutments which left 1/2mm of the shoulder exposed at the top of the implant. Dr. Tarnow theorized that by medializing the gap between the implant and the abutment, the effect of micro-leakage would be reduced and thus help preserve the crest of the ridge. The answer to minimize or entirely prevent micro-leakage and improve stability to reduce screw-loosening was the introduction of the conical connection in 1986 with the Screw-Vent (Niznick Patent 4,960,381). The Patent was not limited to any particular type of internal wrench-engaging surface or angle of bevel, although the preferred embodiment was an internal hex and a 45 degree bevel. As shown on this patent drawing, medializing the interface is inherent in conical connections. To promote manufacturing only one diameter internal connection over a range of implant diameters, manufactures claim this adds simplicity. One connection allows manufactures to reduce the number of items it needs to manufacture but it creates deep platform switching with larger diameter implants. This compromises creating an esthetic and hygienic emergence profile needed for crown and bridge restorations. Simplicity can be achieved by All-in-1 packaging and color coding the implant platforms and abutments components.



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[75] Inventor: Gerald A. Niznick, Encino, Calif.
[73] Assignee: Core-Vent Corporation, Encino, Calif.
[21] Appl. No.: 231,653
[22] Filed: Aug. 10, 1988

Effect of platform switching on peri-implant bone levels.

"The present randomized clinical trial could not confirm the hypothesis of a reduced peri-implant bone loss at implants restored according to the concept

Abstract

Objective: The concept of platform switching has been introduced to implant dentistry based on observations of reduced peri-implant bone loss. However, randomized clinical trials are still lacking. This study aimed to test the hypothesis that platform switching has a positive impact on crestal bone-level changes.

Material and methods: Two implants with diameters of 4 mm were inserted epicrestally into one side of the posterior mandibles of 25 subjects. After 3 months of submerged healing, the reentry surgery was performed. On the randomly placed test implant, an abutment 3.3 mm in diameter was mounted, resulting in a horizontal circular step of 0.35 mm (platform switching). The control implant was straight, with an abutment 4 mm in diameter. Single-tooth crowns were cemented provisionally. All patients were monitored at short intervals over the course of 1 year. Standardized radiographs and microbiological samples from the implants' inner spaces were obtained at baseline (implant surgery), and after 3, 4, and 12 months.

Results: After 1 year, the mean radiographic vertical bone loss at the test implants was 0.53 ± 0.35 mm and at the control implants, it was 0.58 ± 0.55 mm. The mean intraindividual difference was 0.05 ± 0.56 mm, which is significantly <0.35 mm ($P = 0.0093$, *post hoc* power 79.9%). The crestal bone-level changes depended on time ($P < 0.001$), but not on platform switching ($P = 0.4$). The implants' internal spaces were contaminated by bacteria, with no significant differences in the total counts between the test and the control at any time point ($P = 0.98$).

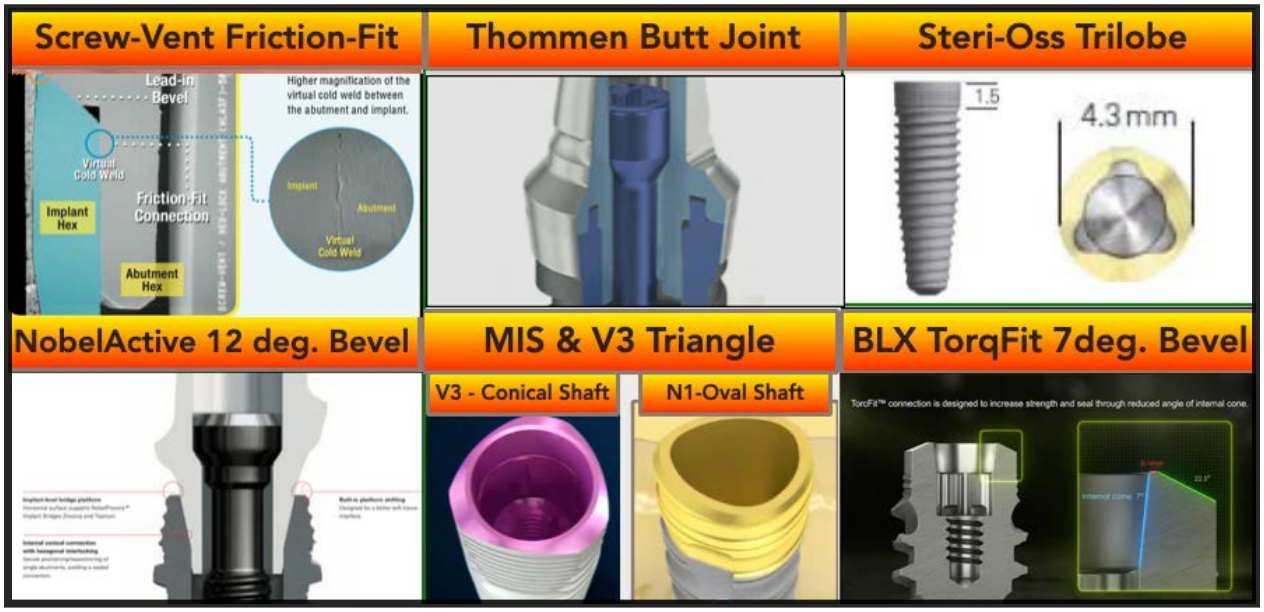
Conclusions: The present randomized clinical trial could not confirm the hypothesis of a reduced peri-implant bone loss at implants restored according to the concept of platform switching.

Influence of Implant Placement Depth on Crestal Bone Stability.

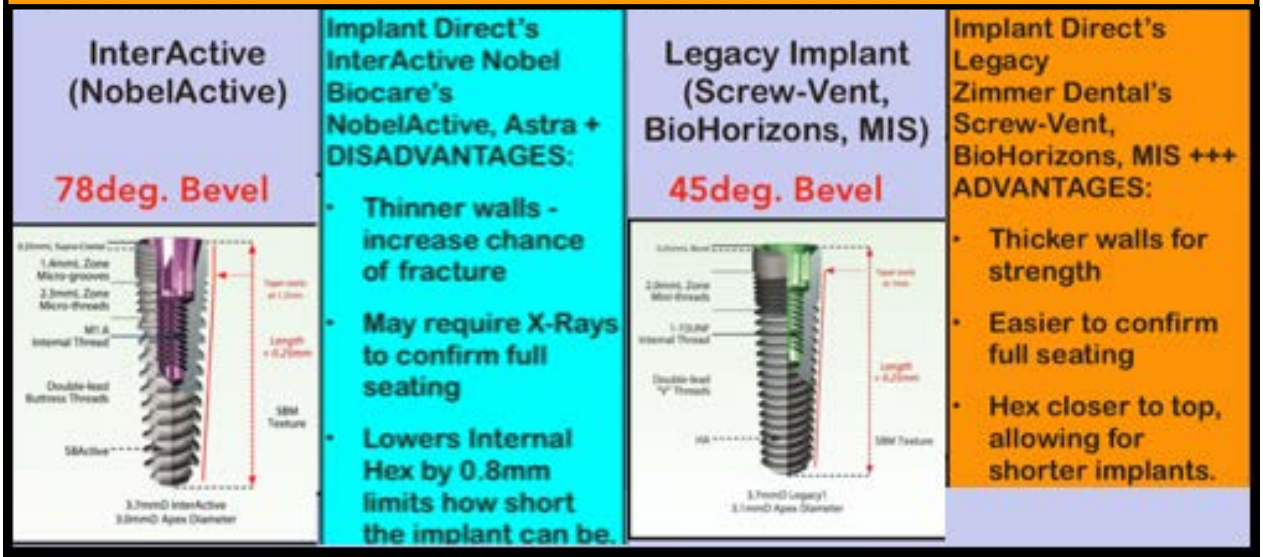
Platform switched implants placed in a subcrestal position …showed statistically significant more bone loss than non-platform switched implants

This case control study measured early crestal bone changes around subcrestally placed platform-switched implants surrounded by thin soft tissue and compared them with regular, matching-platform implants placed in a supracrestal position and surrounded by thick soft tissue. Sixty-six patients received two-piece internal hex dental implants. Control group patients (n = 33) received implants that had a horizontally matching implant-abutment connection and were placed approximately 0.5 to 1 mm supracrestally. Test group patients (n = 33) received platform-switched implants that were placed about 1.5 mm subcrestally. Clinical examinations were conducted, intraoral radiographs were taken, and statistical analysis was performed. After 2 months, the mean bone loss was 0.2 mm (SD: 0.22 mm; range: 0.1 to 1.2 mm) in the control group and –0.69 mm (SD: 0.65 mm; range: 0 to 2.6 mm) in the test group; this difference was found to be statistically significant (P < .05). After 1 year, mean bone loss was 0.28 mm (SD: 0.36 mm; range: 0.1 to 1.63 mm) in the control group and –0.6 mm (SD: 0.55 mm; range: 0.05 to 1.8 mm) in the test group. Platform-switched implants placed in a subcrestal position in vertically thin soft tissues showed statistically significantly more bone loss than non–platform-switched implants placed supracrestally with vertically thick tissues. Int J Periodontics Restorative Dent 2021;41:347–355. doi: 10.11607/prd.5256

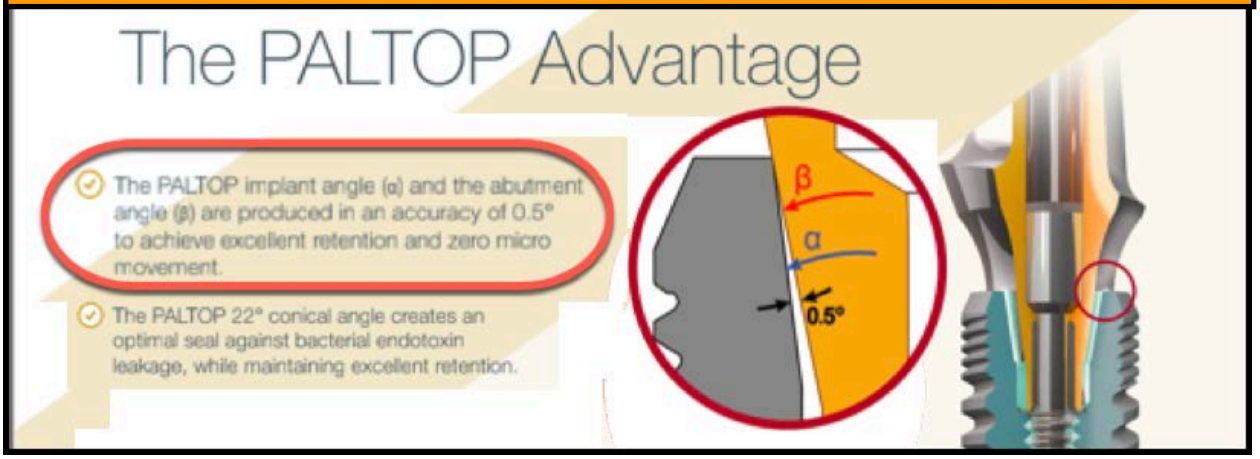
Fig 2 (a) *Control group patients had implants placed in a supercrestal position, and* (b) *test group patients had implants placed in a subcrestal position.*



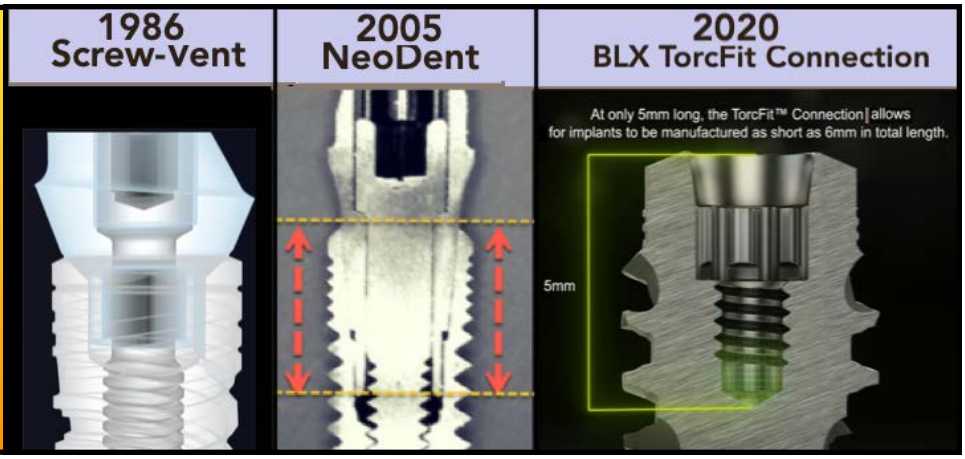
NobelActive popularized the 78 degree "conical connection". It offers no advantages over the Standard 45 degree 1986 Screw-Vent Connection

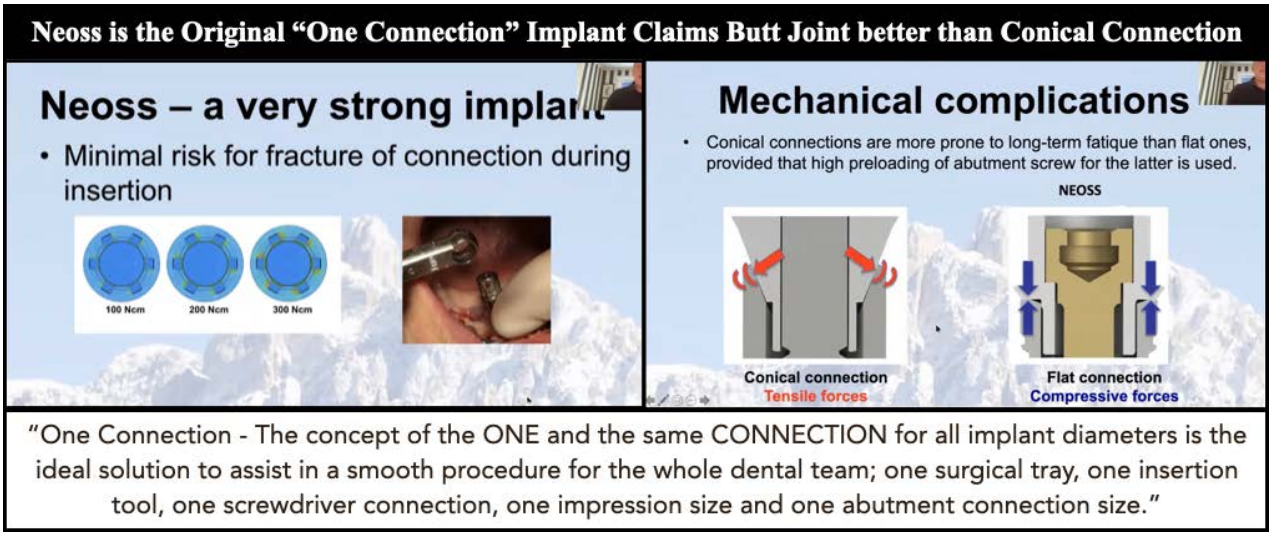


The 78deg. & 45deg. lead-in bevels create a conical connection by definition. Regardless of the implant angle, the mating abutment angle is about 1/2 deg. less to assure a sealed contact at the top of the internal shaft.



The angle of the lead-in bevel determines the depth of the connection and thinness of the walls. Deep connections preclude making 6 mm long implants.

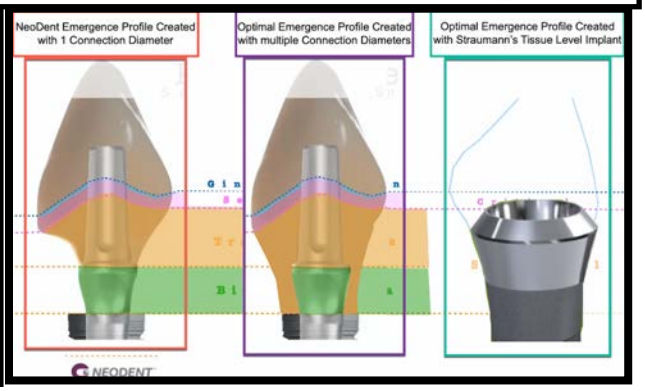




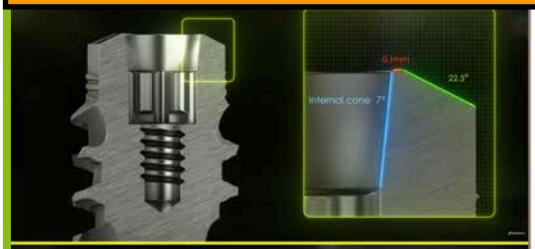
Many implant systems offer only one connection diameter for all diameters of implant, claiming an advantage by reducing the number of abutment options

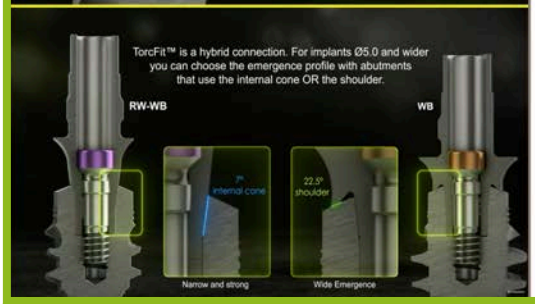
Companies with 1 Platform include Neoss, Neodent, Straumann's BLX & TLX, BioHorizon's Conelog, and most of the Israeli Screw-Vent Clones including Noris, Cortex and Paltop

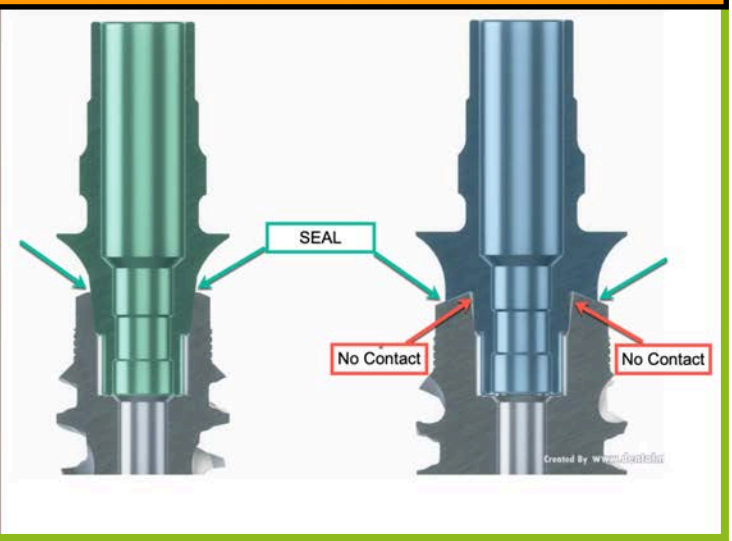
Straumann's Tissue Level implant introduced in 1986 with a trans-mucosal smooth, flared neck provided an ideal emergence profile for hygiene. With only one diameter connection, creating an esthetic and hygienic emergence profile to the abutment is compromised

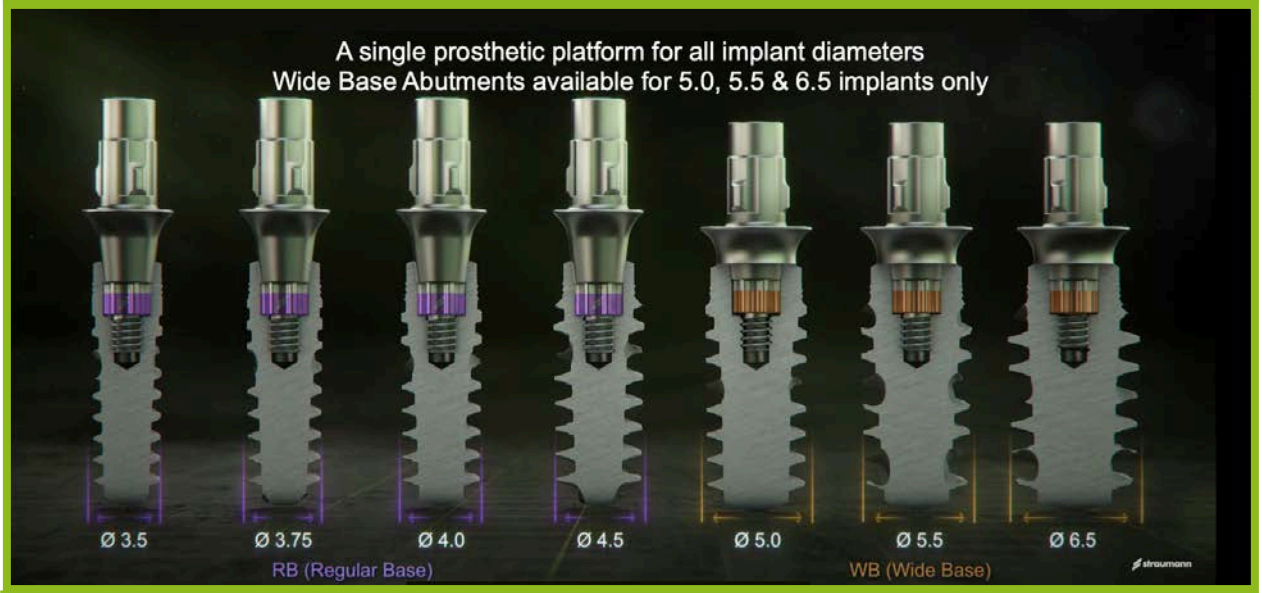


Straumann's BLX/TLX System offers only 1 internal conical connection diameter for 7 implant diameters. For wider implants, a wider abutment sits on shoulder



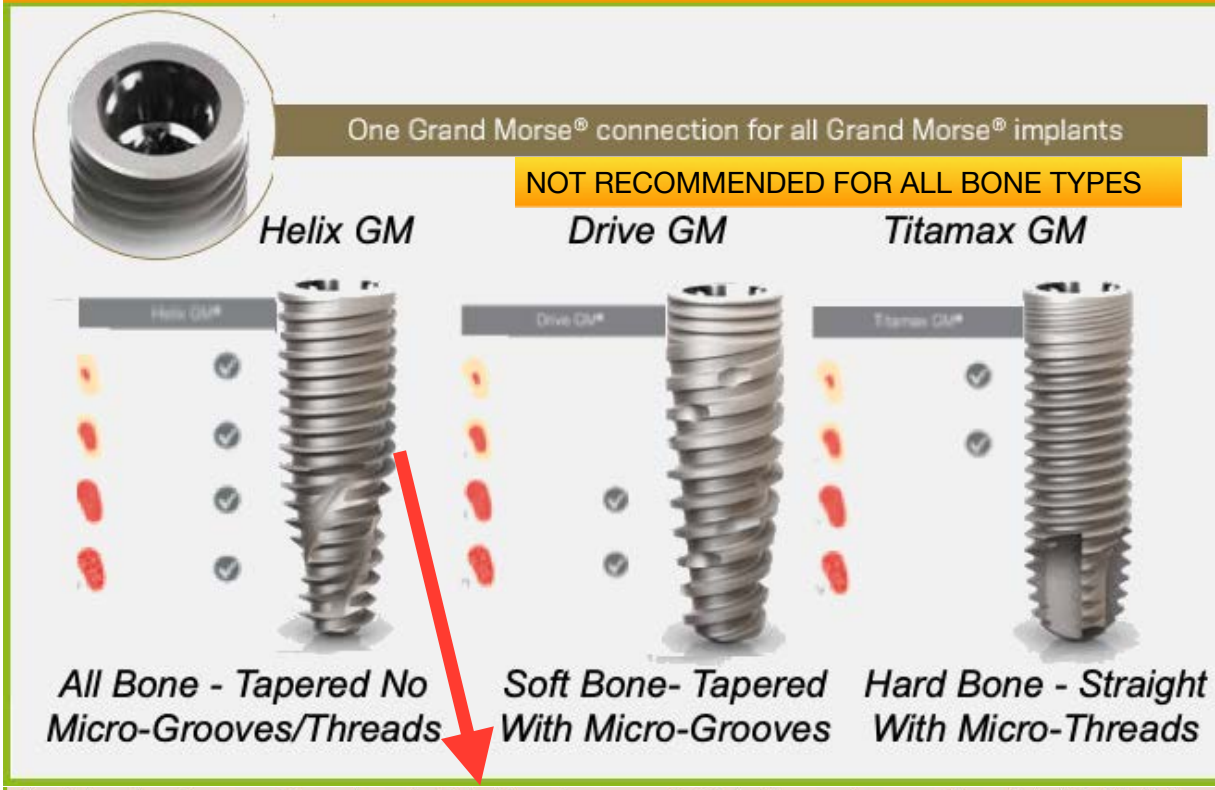






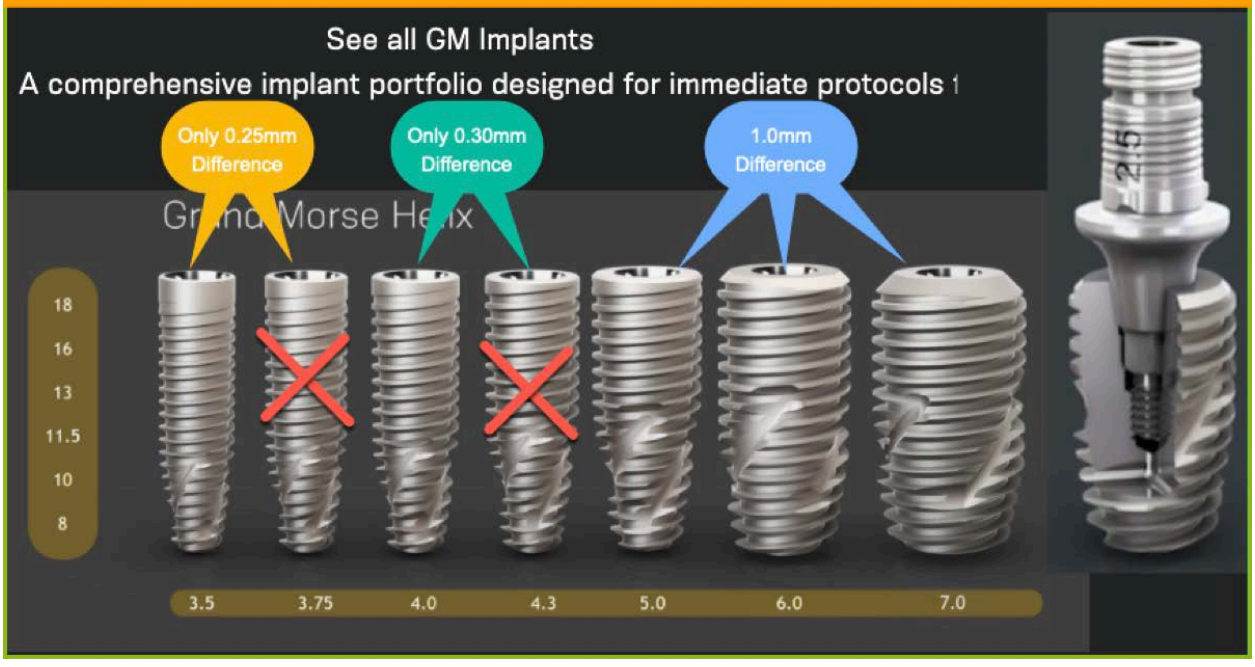
Stability is optimized by engagement of the conical connection, not the flat top surface of the implant. Ideal emergence profile requires an abutment that matches the diameter of the implant platform.
SOLUTION: Cad milled abutments with friction-fit connections

NeoDent is Straumann's Brazilian Implant Company - three designs with the same 74 deg. connection for all diameters.



1. *Made from Grade 4 P Titanium - 60% the strength of Ti6Al4V*
2. *Threads to top of implant - No micro-grooves or micro-threads*
3. *Single Platform - Limitations on creating ideal emergence profile*
4. *Use of Grade4 Titanium precludes narrow (3.2mmD) implants*
5. *Deep internal connection - precludes 6mm implant length*
6. *No progressively deeper threads for increased area & stability*

2 OF THE 7 DIAMETERS DIFFER IN SIZE BY ONLY THE THICKNESS OF A FEW HAIRS



NeoDent calls its 16 degree connection "Grand Morse". Engineering requirements for a Morse Taper Frictional connection is 1-1.5 degrees.

Neodent claims a number of advantages to this implant system:

- ***Precise abutment positioning protection against rotation and easy handling*** ***This is a common advantage with all internal conical connections.***
- ***Platform Switching.*** ***This is common to all internal conical connections and has no proven clinical advantage.***
- ***Deep Connection "allows a large contact area between the abutment and the implant for an optimal load distribution."*** ***In fact, all conical connection interfaces make contact only at the opening to the internal shaft.***
- ***16 degree Morse Taper connection "designed to ensure tight fit for an optimal connection sealing."*** ***The fact is that regardless of the angle of the lead-in bevel, to assure a seal, contact is only made at the shaft opening.***

Dr. Niznick filed a patent in January 1987 on the internal conical connection. The angle of the lead-in bevel and the form of the internal wrench-engaging surfaces were not specific to the 45 deg. bevel or the internal hex in the preferred embodiment. The NobelActive could not be sold in the US until this patent expired in October 2007.
In July, 1992, Dr. Niznick filed a patent on the first Transfer component with hex indexing and that patent also contained a claim for a taper on the male hex (1 degree) to create an interference fit with the implant's internal hex. Only by screwing the components together at 20+Ncm would the abutment fully seat in the hex, creating a friction fit for stability.

United States Patent [19]
Niznick

[11] **Patent Number: 5,334,024**
[45] **Date of Patent: Aug. 2, 1994**

[54] **TRANSFER ABUTMENT**

[75] Inventor: **Gerald A. Niznick**, Encino, Calif.
[73] Assignee: **Core-Vent Corporation**, Las Vegas, Nev.

[21] Appl. No.: **909,119**
[22] Filed: **Jul. 6, 1992**

Related U.S. Application Data

[63] Continuation of Ser. No. 497,110, Mar. 21, 1990, abandoned.

[51] **Int. Cl.**[5] **A61C 8/00**
[52] **U.S. Cl.** **433/173**; 433/172
[58] **Field of Search** 433/173, 174, 176, 201.1, 433/202.1, 172

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2199502	7/1988	United Kingdom	433/174

Primary Examiner—John J. Wilson

What is claimed is:

1. An endosseous dental implant having an internal, multi-sided top opening wherein the sides of said internal top opening are substantially untapered, and are substantially parallel to the longitudinal axis of said endosseous dental implant, and an abutment adapted for use with said dental implant, said abutment including a hollow tubular member of a size and shape adapted for use as an abutment, said tubular member having, at one end, unthreaded retention means for anti-rotationally engaging, interlocking and interfitting with said internal, multi-sided top opening, said unthreaded retention means on said abutment tapering downwardly and inwardly from said one end and locking into said internal, multi-sided top opening when seated in said internal, multi-sided top opening, said tubular member including an internal passage adapted to receive fastener means for engaging complementary fastener means inside said implant.

Dr. Niznick sold Core-Vent to predecessor of ZimVie in 2001.
ZimVie produced a video commemorating the 20th anniversary

Ruumi Daruwalla · 1st
Managing Director at Synahealth Singapore Pte...
1h

Gerald Niznick DMD, MSD what is the height of your lead in bevel and what is the purpose you had designed it for?

Gerald Niznick DMD, MSD
Author
26m

The Screw-Vent/Legacy uses a 44.5 degree lead-in bevel. I got the idea from crown preparations on natural teeth where a bevel or chamfer gives a better sealed margin than a butt joint that was only used on all porcelain jackets 50 years ago for esthetic restorations of anterior teeth. Using 44.5 degrees maintained the strength of the walls and only required about 0.50mm of depth. By making the bevel of the abutment mating hex slightly greater (45 degrees), the first point of contact occurres at the opening to the shaft, assuring a tight seal and good lateral stability. The big difference between internal and external hex connections is that with internal, the fixation screw is protected from lateral forces by the walls of the male hex engaging the lateral walls of the implant's internal hex resisting lateral forces - the fixation screw does not flex, as it does with external hex connections, allowing opening of the butt joint margins and loosening of the screw. NobelBiocare did not introduce the NobelActive conical connection into the US until 2008 after my patent expired October 2007.

Paul L. Child, Jr., DMD, CDT · 1st
Surgical Prosthodontist, Certified Dental Techni...
8h

Thank you Jerry! This is a must read for any student "or proclaimer" of being an expert in implantology. Filled with great examples, pics, and always a heavy dose of Jerry. I'm ok with the extra dose my friend, you deserve it at this point. Always excited to read your candid, no-limits comments on any topic you want to chime in. I've learned that knowing history in depth about whatever topic or person in question, goes miles in growing as an individual and truly learning from others mistakes. Kudos, my friend!