A PROPOSAL FOR UNIVERSAL NOMENCLATURE IN IMPLANT PROSTHODONTICS

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KEY WORDS

Implant prosthodontics
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Attempts have been made at formulating standardized nomenclature for implantology. Although these classification systems have advanced the concept of universal nomenclature in implantology, they can be improved upon. Most of them present terms in glossary form, which can limit their applicability. Others deviate significantly from accepted basic terminology and can be foreign or ambiguous to the average clinician. This article outlines the semiotic approach to language formulation, discusses slight changes to accepted conventional prosthodontic terminology to better encompass implant dentistry, and introduces the shortform and support-retention-connection-prosthesis classification systems.

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A SYSTEMATIC APPROACH TO LANGUAGE

Semiotics is defined as the theory of signs and symbols.[1] This approach to language construction and terminology uses 3 distinct branches: *syntactics* is the orderly structure of words to form valid expressions; *pragmatics* is how a reader or listener interprets what is stated and what constitutes a proper response to the communication; and *semantics* is the relationship between a symbol and its specific meaning, as intended by its author. A thorough understanding of semiotics allows for construction of a systematic naming system in any highly technical or specific branch of science, such as the one created by researchers and clinicians in dental implantology.

According to semiotic theory, language constuction uses an orderly series of signs. A sign has 2 distinct properties: a signifier and a signified.[2] The *signifier* is the form that the sign takes. An example of a signifier would be the word /toothbrush/. The *signified* is the concept of what the sign attempts to convey. To follow the example, the signified could be the ''mind's eye'' picture of a flat plastic handle with bristles on 1 end. Discordantly, it can also be imagined as a cylindrical motorized handle with an oscillating head. In the formation of a clearly understood system of classification, the signs used must generate a strong link between the signifier and the signified.[3]

A *syntagm* is an orderly combination of interacting signifiers that forms a meaningful whole within a text.[2] In language, a sentence, for instance, is a syntagm of words. A familiar example of such a construction can be seen in the naming system used in

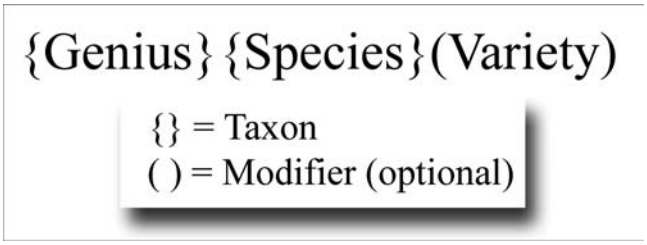


FIGURE 1. A syntagm is used to illustrate construction of a naming system. Linnean taxonomy uses this method to name plants and animals, for example: *Mycobacterium tuberculosis (bovine)*.

taxonomy (Figure 1). In this example, a hierarchy is formed from different levels of classifications of plant and animals, called *taxons.* Taxons represent essential symbols defined by semantics. Added to the diagram are modifiers, which aid in specificity but are not essential to pragmatic interpretation. In the same way, we can form syntagms of characteristic categories to describe implant prosthodontics.

To begin formation of valid syntagms for implant prosthodontics, the concept of a semiotic paradigm must be addressed. A *paradigm* is a set of associated signifiers that are all members of some defining category but in which each signifier is significantly different.[2] For instance, if one considers a paradigm of screwdrivers, the associated signifiers in that paradigm might include the signs of slotted, hexed, and star-grip. In the same way, an attempt is made to identify the paradigm sets required to adequately describe any implant prosthesis. It is imperative for proper classification that every paradigm is exhaustive and that each signifier in each paradigm is mutually exclusive.[4] There must be an appropriate set of signifiers for each paradigm (exhaustivity) but only 1 correct signifier for every signified, with no signifier being a member of 2 paradigms (mutual exclusivity).

One of the advantages of using this system of syntagms and subordinate paradigm sets is that they are easily changed because innovation and evolution of oral implantology takes place by simply appending the signifiers in any given paradigm. Therefore, the ''grammatical'' construction of the system can remain intact.

The classification systems outlined below emulate these semiotic principles in developing a concise, expandable, and translatable ''language'' of implant prosthodontics.

Review of Conventional Terms

For any system of nomenclature to be easily used, it must build on widely accepted basic terminology. *The Glossary of Prosthodontic Terms*, currently in its 7th edition (*GPT-7*), is arguably the most comprehensive and widely accepted reference of prosthodontic dental terminology.[5] The naming system described in this article begins with the terminology presented in the *GPT-7* and proposes slight modifications to better encompass basic implant restorations.

The most basic concept in prosthodontics is *denture*, which is defined as ''an artificial substitute for missing natural teeth and adjacent tissues.''[5] In this simple definition, which has remained unchanged since 1874, there is no specification as to whether it is removable or fixed, whether it is full arch or partial coverage, or what material is used in its construction. The elegance of the signifier /denture/ is in its simplicity, but it is not always fully utilized by clinicians. Solely through the use of descriptors can a denture be specifically signified.

An attempt is made to eliminate slang terms when possible. Although clinicians may commonly use slang, it is inappropriate for proper formulation of nomenclature. This is evident in the use of the slang term *bridge* as substituted for the proper term of *fixed partial denture.*[5] The practice of using *bridge* is not only inappropriate, it is also contradictory to the semiotic method described.

The signifier /fixed partial denture/ has also been misused.[6] Although the descriptor, ''partial,'' denotes that the prosthesis does not cover an entire arch, it has been used in that context to describe some implant restorations.[7,8] This may be partly because the *GPT-7* (or any other similar resource) does not define *fixed complete denture.* Furthermore, the *GPT-7* does not explicitly define the descriptor of ''fixed'' as being nonremovable by the patient. This is important in light of many restorations that are clinician removable but not patient removable. However, it is intimated throughout the *GPT-7* and other references[9,10] that ''fixed'' refers only to the inability of the patient to remove the prosthesis.

To completely standardize nomenclature for all the possible combinations of basic denture restorations, a slight change in the current system is needed. The *GPT-7* properly defines the terms *removable partial denture* and *fixed*

partial denture. In addition to the currently accepted terminology, *removable complete denture* and *fixed complete denture* should be added.

To completely classify all forms of multiunit prostheses, the use of the signifier /overdenture/ must be addressed. The *GPT-7* defines *overdenture* as a removable partial denture or complete denture that covers and rests on 1 or more remaining natural teeth, the roots of natural teeth, or dental implants.[5] It can be inferred (but is not distinctly stated) that this definition intends *complete denture* to mean removable complete denture, following the proposed systematic nomenclature. Therefore, any removable implant prosthesis is technically an overdenture, not just a denture. This also negates the need to state the subtype of removable when using the prosthesis type of overdenture.

Basic prosthesis classification can then be stated through means of a syntagm, as follows:

(Prosthesis Subtype) {Coverage} {Prosthesis Type},

where prosthesis subtype is optional because of the use of overdenture properly defined.

The culmination of this clarification of terms and negation of ambiguity leads to a complete system of nomenclature for the general characterization of all types of prostheses in the replacement of teeth (Table 1). This solid basis of basic nomenclature forms the needed foundation on which implant restorations can be semiotically defined.

TABLE 1
Basic prosthesis classification

	Prosthesis Subtype		
Coverage	Removable (Edentulous Span)	Removable (Teeth, Attachments, Implants)	Fixed
Partial arch	Removable partial denture	Partial overdenture	Fixed partial denture
Full arch	Removable complete denture*	Complete overdenture*	Fixed complete denture*

*Deviation from *The Glossary of Prosthodontic Terms* (7th edition).

APPLICATIONS TO IMPLANTOLOGY

Much confusion exists in the naming of implant restorations.[6] Although attempts have been made at standardizing terminology in implantology,[5,9-13] most of these attempts present terms in glossary form, which does not follow a semiotic approach and limits their applicability to standard usage and future innovation. However, Simon and Yanase[6] have proposed a system of universal implant nomenclature that uses several generic characteristics to ''build'' a description of any implant prosthesis. The Simon and Yanase system is a formidable attempt but lacks consistency with accepted prostheses-naming conventions and semiotic principles, particularly in syntax and pragmatics. Further segregation in terminology has been the result of many implant manufacturers' attempts to ''brand'' component names as part of marketing strategy. This causes the need for a veritable ''rosetta stone'' to unencumber the generic classification of prostheses fabricated with these branded components.[2] The proposed naming conventions contained in this article attempt to correct the difficulties of and expand the Simon and Yanase classification system.

THE SHORTFORM SYSTEM

Implant prostheses can be most widely characterized by their utilization of support. *Support* is defined as ''the foundation area on which a dental prosthesis rests.''[5] The semantics of support in implantology has been historically ambiguous.[6] Frequently used terms such as *implant-assisted*[2,14,15] and *implant-supported*[16,17] are inherently nondescriptive and should therefore be avoided.

In general, implant prostheses derive their support either from implants exclusively or in combination with adjacent load-bearing soft tissue or natural teeth. This notion lends itself to 3 apparent signs in the paradigm for prostheses support. Soft tissue and adjacent teeth may come in contact with an implant-only–supported prosthesis but do not impart significant support to the restoration. Conversely, an occlusally loaded denture base partially supports an implant-tissue–supported prosthesis. This type of support is not possible for fixed restorations because rigid connection to an implant negates the supportive function of resilient soft tissue. Last, an implant-teeth–supported prosthesis is actively engaged to adjacent teeth through the use of either a rigid or a semiprecision attachment.

With implant support distinctly enumerated, all types of prostheses can be identified. Clear yet generalized description of implant prostheses is often useful in communication with colleagues and auxiliary personnel. When descriptions of this nature

TABLE 2
Shortform classification*

Coverage	Nature of Support	Prosthesis Subtype: Removable	Prosthesis Subtype: Fixed
Partial Arch	Implant only	Implant-only–supported PO	Implant-only–supported FPD
	Implant tissue	Implant-tissue–supported PO	NA
	Implant teeth	Implant-teeth–supported PO	Implant-teeth–supported FPD
Full Arch	Implant only	Implant-only–supported CO	Implant-only–supported FCD
	Implant tissue	Implant-tissue–supported CO	NA
	Implant teeth	Implant-teeth–supported CO	Implant-teeth–supported FCD

*PO indicates partial overdenture; FPD, fixed partial denture; NA, not applicable; CO, complete overdenture; and FCD, fixed complete denture.

are indicated, *implant* prosthesis shortform nomenclature can be used. This can be stated as:

{Support}(Prosthesis Subtype)
{Coverage}{Prosthesis Type},

following the previously stated rules for basic prosthodontic nomenclature. An outline of shortform classification can be found in Table 2.

THE SUPPORT-RETENTION-CONNECTION-PROSTHESIS SYSTEM

Many occasions in the communication process arise when a detailed and complete description of implant prostheses is required. Common instances would include chart documentation, case presentation, and particularly communication with dental laboratory personnel. Although the shortform system may provide a general concept of the intended implant prosthesis, more specific information is needed for planning and fabrication. The support-retention-connection-prosthesis (SRCP) system of nomenclature adds comprehensive paradigm sets to shortform nomenclature, resulting in definitive descriptions of any implant prosthesis.

Retention is defined as ''the quality inherent in the prosthesis acting to resist the forces of dislodgement along the path of placement.''[5] Support notwithstanding, retention is another generic paradigm often used to describe the overall functionality of an implant prosthesis. Similar to support, the signifier /retention/ has also been historically abused from a signified standpoint.[6] The term *implant-retained* has been frequently used[18,19] but in itself is nondescriptive—all implant prostheses are retained by their implants in some manner. Other manifestations of retention terminology, such as *fixed-detachable*[20-23] and *fixed-removable*,[24] have been proposed but lack pragmatic clarity.

Implant prosthesis retention can best be signified by defining the mechanism by which it resists dislodgement. Although removability may be surmised in some cases by the prostheses' mechanism of retention, it is better left to definition in the prosthesis subtype paradigm. Including the mechanism of retention in naming prostheses succinctly describes a large portion of the overall engineering and is therefore extremely pragmatic in classification.

The mechanisms of retention paradigm can be distilled down to 4 basic signs. A *screw-retained* prosthesis describes retention of the final restoration to its underlying component via screws. Typically, a screw-retained prosthesis is of the prosthesis subtype of ''fixed'' but has screw-access chimneys through which the practitioner can retrieve the prosthesis for repair or maintenance. Next, a *cement-retained* prosthesis incorporates cement of any type (temporary or permanent) to affix the final prosthetic element to its underlying component. Like screw retention, cement retention infers a fixed restoration but generally lacks easy retrievability. Next is the *friction-retained* prosthesis, which is adherent to its underlying support solely via intimate fit. Instead of cement per se, the friction-retained prosthesis uses multiple points of contact to an underlying component to create a type of adhesion. An often-used example of friction retention is the spark-erosion prosthesis.[20,25,26] Although friction retention has been typically used for removable prostheses, it has recently been incorporated into fixed systems as well.[27] The final mechanism of retention is the *attachment-retained* prosthesis, which describes incorporation of any retentive device in the final prosthetic element. Although these attachments are typically used in removable prostheses, it is possible to describe a fixed restoration as having an attachment-retained abutment[28] (as in an implant-tooth–supported fixed partial denture). As with the implant-tooth–supported fixed partial denture, the mode of retention of the opposite implant abutment

TABLE 3

Support-retention-connection-prosthesis system classification by paradigm

Nature of Support	Method of Retention	Connection Subtype (Modifier)	Connection Type	Design (Modifier)	Composition (Modifier)	Prosthesis Subtype	Coverage	Prosthesis Type
				Milled bar	Metal-ceramic			
Implant-only supported	Screw retained	Prefabricated						
			Implant level	Telescoping	All-ceramic	Removable	Partial	Overdenture
	Cement retained	Custom						
Implant-tissue supported	Attachment retained			Highwater Ovate pontic	Metal-resin Titanium alloy			
Implant-teeth supported	Friction retained	Mixed Prefabricated/ Custom	Abutment level	Others	(Others)	Fixed	Complete	Denture

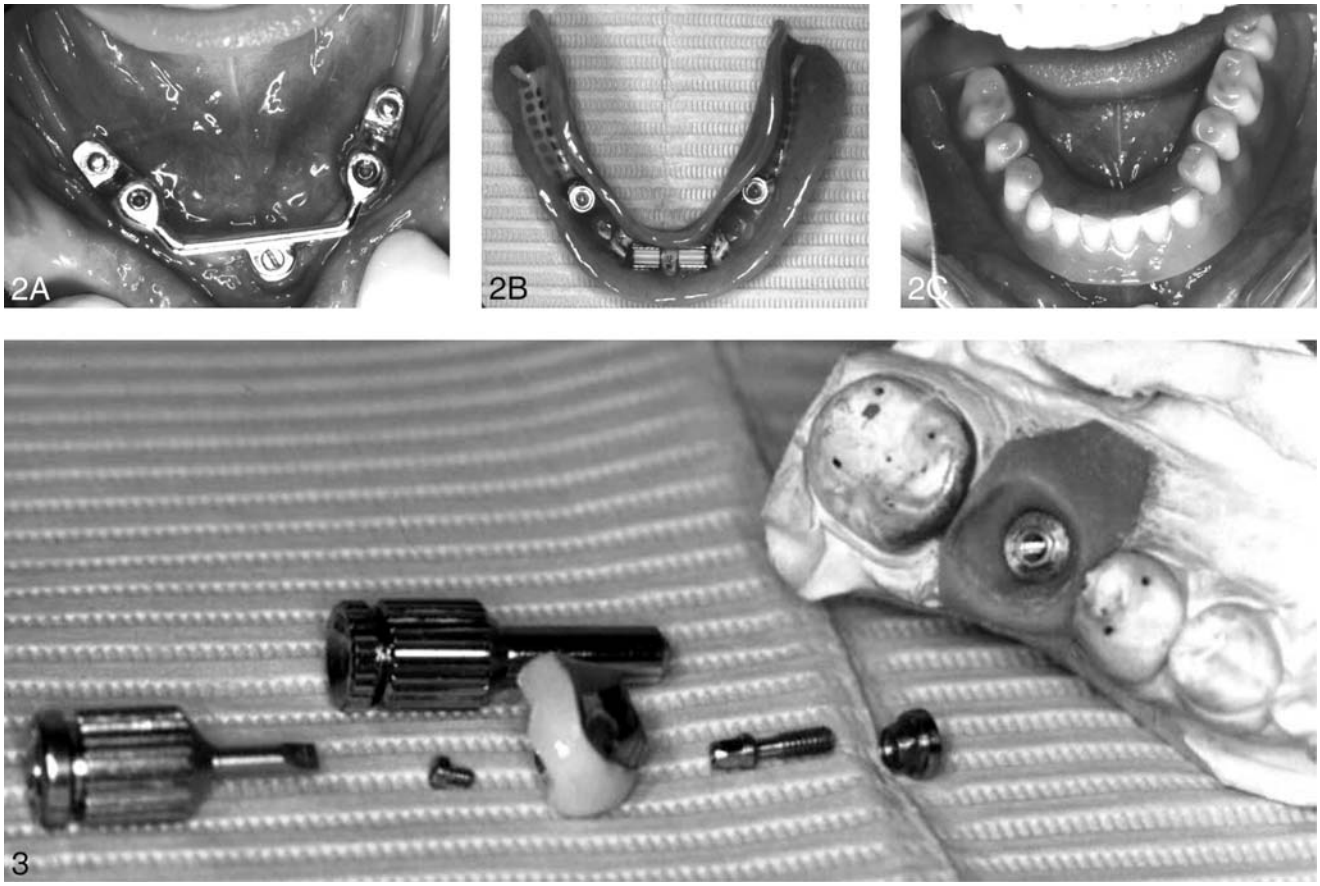
can be described by conjoining 2 or more retention types. For example, if the implant abutment were retained by a screw, the result would be to classify this prosthesis as an ''attachment and screw-retained prosthesis.'' Combining modes of retention for other types of prostheses is evident in recent literature.[29] Virtually any implant prosthesis can be clearly described with permutations of these 4 modes of retention.

Another defining constituent in the engineering of implant prostheses is the use or absence of an intermediate component that connects the implant to the final prosthesis. This connection-type paradigm can be characterized as either implant level or abutment level. *Implant-level* restorations connect the implant directly to the final prosthesis. This type of restoration has been historically called the UCLA-type abutment, lauding its inception at the University of California–Los Angeles in the 1980s.[30] Conversely, the *abutment-level* restoration uses an intermediate component that is separate from the implant and the final prosthetic component.

When the abutment-level restoration is considered, 2 connection subtypes are possible. Many abutment-level restorations are accomplished with the use of ''stock'' intermediate components. These *prefabricated* abutments are typically produced by precision machining to provide a very close fit to both the implant restorative platform and a machined coping that comprises the seat in the final prosthesis. Some prefabricated abutments also allow for a certain degree of ''customization'' via shaping with a high-speed handpiece.[31] Although customizing a prefabricated abutment eliminates the utility of an intimately fitting prefabricated coping (a waxed coping is used instead), it is still considered prefabricated after customization and should not be confused with the next subtype. A *custom* abutment is one that is cast either in part or individually. This is typically accomplished through the lost wax technique with metal alloy but has also been performed recently with alternative materials in conjunction with a CAD-CAM system.[32,33] Custom abutments impart the greatest level of flexibility in designing a suitable intermediate component and are frequently used when either angulation or orientation of the implant restorative platform is less than ideal. These connection subtypes are syntactically considered modifiers because they are omitted for implant-level restorations but should always be stated when an abutment-level prosthesis is classified.

It should also be noted that the 2 connection subtypes in multi-implant prostheses are occasionally used in combination to suit the specific needs of each individual restorative implant platform to achieve a harmonious, esthetic, and passively fitting substructure. In this case, the connection subtype would be classified as ''mixed prefabricated/custom.''

Stating the connection type is important for several reasons. The connection type generally qualifies the complexity of the restoration. Although the need for an intermediate component can be debated,[34,35] inclusion of an intermediate component always adds several parts to a prosthesis. This may also signify a considerable difference in laboratory and materials cost, especially if a custom abutment is



FIGURES 2 AND 3. FIGURE 2. Example of an implant-tissue–supported, attachment-retained, prefabricated abutment level, clip-bar/ERA, metal-acrylic, complete overdenture. (A) Substructure. (B) View of the removable attachments. (C) The prosthesis placed intraorally. FIGURE 3. Exploded view of a screw-retained, prefabricated abutment-level, emergence-profiled, PFM crown.

indicated. Inclusion of an intermediate component may infer the need for angle or vertical correction in the orientation and position of the implant restorative platforms. Because the utilization of an intermediate component may be dictated largely by the preferences of the individual practitioner, it is useful to state the connection type in laboratory communication. Last, contemporary insurance coding distinguishes connection type and very often determines relative costs to the patient.[11,36]

Within the fundamental elements of the SRCP system, 2 other modifier paradigms may be used. A *modifier* is optional specific information that aids in further defining the character of a prosthesis.

The first modifier is design. *Modifiers of design* identify specific components or overall features that may relate to common- or brand-name recognition. Caution should be exercised in using modifiers of design that relate only to unambiguous terms. As an example, it has been popular in the literature to refer to *hybrid prosthesis* as a design concept.[37,38] The *GPT-7* defines a hybrid prosthesis as "slang for a nonspecific term applied to any prosthesis that does not follow conventional design." Therefore, hybrid prosthesis is too general and is an undesirable modifier of design. Better examples of design modifiers include prefabricated gold bar, Locator attachments (Implant Innovations Inc, West Palm Beach, Fla), ovate pontic, and highwater.

The second modifier is composition. *Modifiers of composition* describe the principle materials used in construction of all the components of the prosthesis. Examples include metal-resin, metal-resin-ceramic, titanium alloy–resin, and porcelain fused to metal.

The SRCP classification system can be stated in the following syntagm:

{Support}{Retention}(Connection Subtype) {Connection Type} (Design) (Composition) (Prosthesis Subtype) {Coverage} {Prosthesis Type},

TABLE 4
The simplified support-retention-connection-prosthesis system for single units by paradigm

Method of Retention	Connection Subtype (Modifier)	Connection Type	Design (Modifier)	Composition (Modifier)	Prosthesis Type
Screw retained	Prefabricated	Implant level	Lingual set screw	PFM	
Cement retained			Ridge lapped	High noble metal	Crown
	Custom	Abutment level	Emergence profiled	All ceramic	
Friction retained			Others	Others	

where all previously stated rules apply. A compilation of the SRCP system can be found in Table 3. The SRCP system allows for specific classification of virtually any implant prosthesis, from simple to complex (Figure 2).

THE SIMPLIFIED SRCP SYSTEM

Because the SRCP system of classification is based on a semiotic method, the same syntagms may be used to classify single-unit implant restorations. However, certain assumptions as outlined below may be made when describing single-unit vs multiple-unit implant prostheses. These assumptions comprise further naming rules and simplify the SRCP system to a user-friendly method of classification.

In contrast to various modes of support possible for a multiunit restoration, a single-tooth implant restoration must evidently derive the vast majority of its support from its implant. This negates the need to state the mode of support.

Although current methods may be used to construct a patient-removable single-tooth restoration, its utility is limited. If most single-tooth implant restorations are assumed to be fixed (as defined earlier), the prosthesis subtype paradigm may be omitted. Furthermore, an arch coverage designation is obviously not needed with a single tooth, so its paradigm is dropped as well. Finally, the prosthesis type is always a crown and is so stated.

The simplified SRCP classification system for single-unit implant restorations can be stated in the following syntagm:

{Retention}(Connection Subtype)
{Connection Type}
(Design) (Composition) Crown,

where all previously stated rules apply. A compilation of the simplified SRCP system can be found in Table 4. The resultant nomenclature for implant single-unit restorations is simple and unambiguous (Figure 3).

CONCLUSION

The profession of dentistry has created a fledgling subscience in implantology. Along with this creation, clinicians and implant manufacturers have been faced with the task of applying new classification and nomenclature to innovations in implant prostheses engineering and design. As the implant modality of patient treatment continues to spread across multiple continents and native languages to include hundreds of thousands of clinicians and support personnel,[39-41] the need for universal nomenclature and classification systems is irrefutable. To that end, the advantage of using a semiotic approach is that it is easily understood and can also be translated without difficulty. The shortform, SRCP, and simplified SRCP are examples of semiotic method applied to implant prostheses classification and nomenclature.

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