Critical Evaluation of Classification Systems of Partially Edentulous Arches
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Abstract
Various classification systems of partially edentulous arches have been proposed from time to time to the profession. However a universally acceptable classification system which helps in visualization, communication and plan treatment for such situation is an ideal goal. Different systems proposed till date has certain advantages and disadvantages and limitations. This paper gives a review on the same.

Key words: Partially edentulous arches, Classifications

Introduction
The intent of this article is to evaluate the classification systems of partially edentulous dental arches proposed to the profession by various authors so that a correct and precise idea of a particular system is brought to fore.

In last 6 decades many clinicians, oral educator have proposed various types of classification to facilitate the discussion and communication and to plan treatment modality.

Need and requirement of classification:
A classification should be universally acceptable, visualize the dental arch and guide the denture design. It should contribute materially to the systematization of art of partial denture design facilitate discussion and helps in teaching.

Cummer in 1920 (1, 2) was the first to propose a system of classification which received recognition. His classification is based on position and number of direct retainer and position of indirect retainer.

Class-I: A partially edentulous arch in which two (Diagonal) diagonally opposite teeth are chosen as abutment teeth for the attachment of direct retainers with an indirect retainer as an auxiliary attachment.

Class-II: A partially edentulous arch in which two (Diametric) diametrically opposite teeth are chosen as abutment teeth for the attachment of the direct retainer with an indirect retainer as an auxiliary attachment.

Class-III: A partially edentulous arch in which one or more (Unilateral) teeth on the same side are chosen as abutment teeth for the attachment of the direct retainers with or without an indirect retainer. This class includes most fixed and removable partial denture design.

Class-IV: A partially edentulous arch in which three or more (Multilateral) teeth are chosen as abutment teeth for the attachment of the direct retainer.

Cummer believed that a good classification should immensely simplify the development of sound and universally applicable design principles. His classification provided an inspirational well spring for many of the numerous classification systems.

The main advantage of Cummer classification system is it helps in design and support but does not consider edentulous area.

Kennedy’s classification: In 1923 Dr. Edward Kennedy (3) proposed a method of classification...
based on the relationship of edentulous spaces to the abutment teeth. Kennedy classified all partially edentulous arches into 4 categories in order of descending frequency of occurrence at the time of proposal.

Class-I: Bilateral edentulous areas located posterior to the remaining natural teeth has the highest incidence in mandible (72%).

Class-II: A unilateral edentulous area located posterior to the remaining natural teeth (72%).

Class-III: A unilateral edentulous area bounded anteriorly and posteriorly by remaining teeth (14%).

Class-IV: In class-IV, edentulous area located anterior to the remaining natural teeth. A single but bilateral (crossing the midline) edentulous area located anterior to remaining natural teeth (8.5%).

Probably because of its simplicity and ease in application to almost all situations it is well received by the profession and presently it is most widely used system of classification. On the basis of this classification at least two more system have been advocated i.e., Applegate Kennedy system and Swenson system.

The sequence of Kennedy’s classification has been questioned, it is being felt by some that class-I and class-II could have been reversed in order to present the more logical order. However the sequence suggested by Kennedy coincides with incidence in which the partially edentulous situation has been encountered clinically, seems to be logical answer.

The principal advantages of Kennedy’s classification are, it permits immediate visualization of partially edentulous arches, permits logical approach to design, differentiate between saddle bounded and free end. But enough consideration is not given to the condition of teeth and remaining supporting structures, no factor could be more fundamental than that of achieving support for a prosthetic appliance. And also no distinction between modification spaces which occurs in the anterior to those of posterior segment, the relative location of modification space is not only significant at the time of design and construction of the prosthesis but later whenever there is need for maintenance service.

Bailyn's Classification: In 1928 Dr. Charlin M. Bailyn (4) introduced a system of classification based whether the prosthesis is tooth borne, tissue or a combination of the two.

A : Saddle areas anterior to the first bicuspid.

P : Saddle areas posterior to the canine.

Class-I: The abutment teeth present at arch extremity of a saddle area representing a span of not more than three teeth. Bounded saddle (Not more than three teeth).

Class-II: Free end saddle.

Class-III: Bounded saddle where more than 3 teeth missing.

Class-A I: An edentulous area anterior to the first bicuspid between the two available abutments less than three teeth distant from each other.

Class-A III: An edentulous area anterior to the first to the bicuspid between the two teeth which might be available on abutments, more than 3 teeth distant from each other.

Class-P I: An edentulous area posterior to the cuspid with one available abutment not more than 3 teeth distant from each other.

Class-P II: A bilateral edentulous area posterior to the cuspid with one available abutment tooth for each denture borne area.

Class-P III: An edentulous spaces with 3 posterior to the cuspid dental abutment.
Bailyn’s classification was first to emphasize the importance of support to partial denture by the remaining tissue but does not give immediate visualization of partially edentulous arch.

**Neurohr’s Classification – 1939:** In 1939, Dr. Ferdinand Neurohr (4) introduced a system of classification based on the type of support. He described the difficulties in communications which he frequently experienced as Lecturer and clinician when a partial denture situation was discussed, the system he proposed is one of the most complex of all those reviewed.

- **Class-I:** A partial denture situation falls under this classification, when there are teeth posterior to all spans and when there are no more than four teeth missing in any space.
- **Variation-I:** Posterior teeth are missing and anteriors are in place.
  - a) Posterior teeth are missing and some anterior are missing.

- **Variation-II:** Missing anterior predominates:
  - a) Anterior missing, posterior in place.
  - b) Anterior missing and some posteriors missing.

- **Class-II:** A partial denture situation falls under this classification when these are no teeth posterior to one or more spans or when there are more than four teeth including a cusp in one or more spans.

- **Variation-II:** Missing anterior predominates:
  - a) Anterior missing, posterior in place.
  - b) Anterior missing and some posteriors missing.

**Mauk’s Classification – 1941:** In 1941, Dr. Edwin H. Mauk (5) proposed a classification of partially edentulous ridges after a study of 100 casts. His system of classification is based on

1. The number, position and length of the spaces.
2. The number of position of the remaining teeth.

- **Class-I:** Bilateral posterior space and teeth remaining in a segment in the anterior region.

- **Class-II:** Bilateral posterior space and one or more teeth at the posterior end of one space.

- **Class-III:** Bilateral posterior spaces and one or more teeth at the posterior end of both spaces.

- **Class-IV:** Unilateral posterior space with or without teeth at the posterior end of the space.

- **Class-V:** Anterior space; the posterior part of the arch is unbroken on the either side.

- **Class-VI:** This has irregular spaces around the arch. The remaining teeth are single or in small groups.

One of the drawbacks of this classification is many of his design does not match his principles of classification.

**Wild’s Classification:** In 1949, Wild (4) proposed a simple and self-explanatory classification.

- **Class-I:** Interruption of the dental arch (bounded)
- **Class-II:** Shortening of dental arch.
- **Class-III:** Combination of 1 and 2.

**Godfrey’s Classification:** In 1951, Dr. R.J. Godfrey (6) described a classification system which was taught and used at the University of Toronto. His system of classification is based on the location and the extent of the edentulous space where teeth are to be replaced. In his classification, there are no subdivisions or modifications to the main class.

- **Class-A:** Has tooth borne denture bases in the anterior part of the mouth.
- **Class-B:** Has mucosa borne denture bases in the anterior part of the mouth.
- **Class-C:** Has tooth borne denture bases in the posterior part of the mouth.
- **Class-D:** Has mucosa borne denture bases in the posterior part of the mouth.

He doesn’t consider the edentulous area. His classification does not have any subdivision or modification.

**Friedman’s system of classification:** Dr. Joel Friedman (7) introduced a system in 1953 based on essential functional segment areas.

- **Class-A:** An anterior tooth bounded space.
Class-B: A bounded posterior space.

Class-C: A cantilever situation or a posterior free and space.

During masticatory function the posterior segment area which receives masticatory stress is of significant variance in the action of partial denture when a posterior terminal abutment is present, compared to a cantilever or free and space.

Its advantage is its simplicity. This system finds itself as a reference in many articles pertaining to the subject of system of classification.

Beckett's system of classification: Dr. Leonard S. Beckett (4) of the University of Sydney proposed a system in 1953 which is based on the load distribution of the individual component on saddles of the partial denture.

His classification was based on the whether the denture base is tooth borne, tissue borne or a combination of the two, his classification was based on the idea of Bailyn’s classification.

Beckett claims that any individual saddle of a denture should be either entirely tooth supported or entirely mucosa supported, any attempt to share the load between the two is considered unsound since it is impossible to transmit varying occlusal stresses in determined proportions to tissue whose supporting value can only be estimate approximately instead of measured in accuracy.

In his classification the individual saddle of any partial dentures are divided into three groups.

Class-I: Saddle which is entirely tooth supported abutment teeth qualified to support the denture.

Class-II: Saddles which are entirely mucosa supported. Two types of saddle are found in this.

1. All free en saddles.

2. Those bounded saddle where the length of the saddle and the condition of the abutment teeth contraindicate a tooth borne saddle.

Class-III: Saddle are bounded and inadequate abutment to support denture and inadequate mucosa support.

Craddock’s classification: Craddock(4) in 1954 proposed a classification based on support. The classification of partial denture as follows.

Class-I: Saddle supported at both ends by substantial abutment teeth.

Class-II: Vertical biting forces applied to denture insisted entirely by soft tissue.

Class-III: Tooth supported at only one end of the saddle.

Austin-Lidge Classification: Austin-Lidge (4) offered a system of classification in 1957 based on missing teeth or edentulous spaces; based on the position of missing teeth. In this system the letter

‘A’ designates an anterior space.

‘P’ designates a posterior space.

‘Bi’ designates a bilateral condition.

Class-A: Missing anteriors:

A1: Missing anteriors one side (unilateral construction)

A2: Missing anteriors both sides.

AB1: Missing anteriors with bilateral posterior construction.

Class P: Missing posteriors:

P1: Missing posterior on one side.

P2: Missing posterior both side.

PB1: Missing posterior one side with bilateral construction.

Class AP: Missing anteriors and posteriors:

AP1: Missing and posteriors one side (unilateral construction)
AP2: Missing anteriors & posteriors both sides.

It will not give immediate visualization on the edentulous space.

**Watt’s system of classification:** Watt et al (8) in 1958 stated that there are three possible methods of supporting partial denture.

1. Entirely tooth borne.
2. Entirely tissue borne.
3. Partially tooth borne and partially tissue borne.

**Skinner’s System of Classification:** In 1957 Dr. C.N. Skinner(8) offered a system of classification based on the relationship of the abutment teeth to the supporting residual ridge. The classification is based upon the relationship of the anatomic and physiologic factors of the maxillary and mandibular dental arches.

The value of removable partial denture is directly related to the quality and degree of support which it receives from the abutment teeth and the residual ridge, therefore a classification system should be based on these factors. The classification should be based upon the relationship of the abutment teeth to the supporting residual alveolar ridge.

**Class-I:** An edentulous area with natural teeth remaining both anterior and posterior to it. These groups of partial denture, are found in both the maxillary and the mandibular arches and they may occur unilaterally or bilateral.

**Class-II:** Is that group of removable partial denture in which all of the teeth are posterior to the denture base which functions as a partial denture unit. These groups of partial denture, are found in both the maxillary and the mandibular arches and they may occur unilaterally or bilateral.

**Class-III:** In that group of removable partial denture in which all of the abutment teeth are related anterior to the denture base which functions as partial denture base.

**Class-IV:** Is that group of removable partial dentures in which the denture bases are both anterior and posterior to the remaining teeth. The abutment teeth are in the center or between the functional denture bases.

**Applegate-Kennedy system of classification:**

Dr. Oliver C. Applegate(9) offered a system of classification in 1960 is a modification of Kennedy’s system. He explains the need for a classification because of recent, marked and increased emphasis in the specialty of Prosthodontics upon physiologic principle. He believed that a system is based on the number and location of the remaining teeth and edentulous spaces are less meaningful than one which taken into consideration of the capabilities of the teeth which bound the spaces to serve as abutments for the contemplated prosthesis.

Two more groups have been added to the previous Kennedy’s classification.

According to him classification of semi edentulous dental arch is meaningless until capability of the supporting structure is taken into consideration. Based on the complete evaluation of both dental arches, abutment teeth a decision is made on the type of partial denture. The number and location of the teeth which are to remain have been determined and the capability of the remaining teeth and the supporting structure to bear the work load.

**Class-V:** Is that group of partial dentures in which all of the abutment teeth are unilateral to the denture base.
Class-V: An edentulous situation in which teeth bound the edentulous area anteriorly and posteriorly but where the anterior bounding tooth is not suitable for abutment service (as the lateral incisor). It occurs more commonly on maxillary arch, because of the more vulnerable position of upper cuspid tooth when accident takes place. Usually edentulous area terminates at the maxillary lateral incisor: which usually has a short conical root. It is the anterior bounding teeth of class-V group which fails to provide adequate support due to the length of the edentulous area is too great, the amount of load is excessive, the form or length of the abutment root is inadequate and the supporting bone is depleted.

Class-VI: An edentulous situation in which the boundary teeth are capable of total support of the required prosthesis as the span is short, limited work load and length and morphology or roots of abutment teeth.

Swenson’s system of classification: In 1963, Swenson (4) described a system of classification based on Kennedy’s system. The four primary classes represent only slight modification of the Kennedy system of classification is described in text book authored by Terkla and laney. They recommended this system because of its simplicity and fact that it is based on logical reasoning rather than memory. He named the Kennedy Class-II as Swenson’s Class-I: Unilateral free end denture base, unilateral edentulous areas posterior to the remaining natural teeth.

Class-II: Bilateral free end denture base. Bilateral edentulous area posterior to the remaining natural teeth.

Class-III: Edentulous space posterior on one side or both sides of the mouth; but teeth present anteriorly and posterior to each space.

Class-IV: Edentulous space located anterior to the remaining natural teeth (five or more teeth missing).

Subdivision: A method of subdividing the four main classes without denoting the exact tooth which is missing is used.

Avant’s System: In 1960 Dr. W.E. Avant (10) proposed a classification based on the requirements that a system should satisfy in order to meet with universal acceptance.

According to Avant such a system should be enable one to visualize the type of partially edentulous arch represented, differentiate between potential tooth borne and extension base partial denture, get a general idea of the type of partial denture design to be used and to know the general location of the teeth being replaced.

In the Avant system the dental arch is divided into 3 segment or groups of teeth, two posterior and one anterior. With this as a basis all partially edentulous dental arches can be classified into one of five groups.

Class-I: Replace one or more posterior teeth on one side of the arch mesial to the most distal abutment tooth.

Class-I F: Replaces one or more posterior teeth on both sides of the arch terminating a free end.

Class-II: Replaces one or more posterior teeth on both sides of the arch mesial to the most distal abutment tooth on the both sides.

Class-II F: Replaces one or more posterior teeth on both sides of the arch terminating in free ends on both sides.

Class-III: Replaces one or more anterior teeth.

Rules of Classification: To classify a removable partial denture situation assign it to the class that covers best the most important segment being restored. If there are any remaining spaces being
restored use minor notations to indicate them by adding the small letter ‘A’ for a spaces in the anterior segment; and ‘P’ for spaces in the posterior segment. *Minor notations:* These minor notations ‘a’ and ‘p’ are used to indicate spaces that remain after a basic class has designated the most important areas being restored.

Three minor notations are possible with class-I F situation.

1. Class I F ‘a’ – Indicate the anterior segment.
2. Class I F ‘p’ – The opposite posterior segment.
3. Class I F ‘ap’ – Both of these segments.

Class III can have one or both posterior segments indicated.

*Costa’s system of classification:* Dr. Costa(11) in 1974 proposed yet another descriptive classification of partially edentulous arches based on anterior lateral and terminal spaces.

Partially edentulous arches exist in a great variety of forms. Many systems have been developed to classify partially edentulous dental arches. The origination of these systems tried to solve the problems by grouping the huge number of possible combinations into classes and subclasses based on various principles.

The various classes and sub classes do not meet a visual image. Instead they require a memory for the component of the system itself and reasoning effort for the configuration of the partially edentulous arch corresponding to a given class of the respective system. Such system is complex and tiresome and often requires consulting a text book dealing with various classification of partially edentulous arches.

This system was developed at the Romanian school of stomatology. This system based on describing rather than classifying.

Instead of grouping the various forms of partially edentulous arches in class and sub class this system consists of simplified descriptive terminology which may used to easily identify any form of dental arch. Terminology used in this are


*Anterior:* An edentulous space that located in the anterior part of dental arch.

*Lateral:* An edentulous space which is bounded both mesially and distally by remaining teeth.

*Terminal:* An edentulous space which is not bounded distally by remaining teeth.

*Fiest system of classification:* Jacques Fiest(12) in 1973 proposed a system of classification in his system. He describes a classification of partially edentulous situations, including terminal cases and presents a complete grouping of all possible problems.

Fiest has used the Applegate Kennedy classification for more than 10 years. For each class basic principles are outlined on a chart for easiest teaching, he added 4 more classification.

*Class-VII:* An edentulous situation in which all remaining teeth are located on one side if the arch (or of the median line).

An edentulous situation in which only one or two remaining teeth are located on the either anterior corners of the arch. The fulcrum line is incompatible with the action of physiologic forces.

*Class-IX:* An edentulous situation in which functional and cosmetic requirements and the magnitude of the interocclusal distance require the use of telescoped prosthesis partial or complete. Remaining teeth are capable of total or partial support.
Class-X: An edentulous situation in which remaining teeth are incapable of any support. If the teeth are kept the prosthesis is totally tissue borne.

**Osborne system of classification:** In 1979 Osborne Lammine(13) proposed a system of classification which is based on a support of a denture as a whole.

- Class-I: Mucosa borne.
- Class-II: Tooth borne.
- Class-III: Combination of mucosa borne and tooth borne.

**Conclusion**

Two principal benefits might occur from the universal adaption of such a system for prosthodontics. One it would open channels of communication between speaker and listener, otherwise obscured by ambiguity. Secondly it would contribute materially to the systematization of the art of partial denture design proposed by different clinician; the dental literature abounds with proposed system for classifying the partially edentulous arches. As a result as on today a classification that describes the various positions of teeth and saddle and looks closely at the support and gives a idea of design, and helps in ease of understanding, communication is still a matter of debate.

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