A NEW CLASSIFICATION OF ATTACHMENTS

BY

Isamu Nakazawa and Hiroshi Amemori*1

ABSTRACT

Owing to the formidable number of attachments, we cannot assess the relative merit of all these units and choose the most effective attachment when indicated. Therefore, it has been thought advisable to devise a classification. In this paper the authors propose a new classification of attachments.

This classification is based on three characteristics of the attachments. The first step is to classify attachments into coronal and radicular attachments. The next step is to divide the former into intracoronal and extracoronal attachments, and the latter into intraradicular and extraradicular attachments. Finally, they are each classified into precision type and stress-breaking type. Consequently, attachments are classified into the following eight groups: (1) The precision type of intracoronal attachment. (2) The stress-breaking type of intracoronal attachment. (3) The precision type of extracoronal attachment. (4) The stress-breaking type of extracoronal attachment. (5) The precision type of intraradicular attachment. (6) The stress-breaking type of intraradicular attachment. (7) The precision type of extraradicular attachment. (8) The stress-breaking type of extraradicular attachment.

INTRODUCTION

Attachments usually consist of two closely fitting metal components, male and female parts. One of them is joined to one section of the prosthesis and the other part is set in a restoration of an abutment tooth forming part of another section of the prosthesis. While they may be applicable to connecting two sections of a fixed or a removable prosthesis, their most common application is in joining a removable prosthesis to a fixed restoration.

The invention of attachments is an attempt towards concealing the retentive element of a removable prosthesis within the body of the abutments or of the prosthesis, and to replace the clasp with its various unsatisfactory properties respective to hygiene, tooth mobility, carries susceptibility, and aesthetics. Their design should be adapted to the cir-

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cumstances under which they may be used, for example, the space in which to conceal them, height and width of the abutment crown, depth of preparation, the desirable continuity of a removable splint over several abutments, and also considerations of statics and dynamics of a removable denture. The variability of circumstances makes many specialized attachments exhibiting diverse shapes and function.

Owing to the formidable number of attachments, we cannot assess the relative merits of all these units and choose the most effective attachment when indicated. Therefore, it has been thought advisable to devise a classification. Several classifications have been devised, but there is none which entirely satisfactory and none which has been accepted for international use. In this paper, the authors propose a new classification of attachments.

**Design of Classification**

Any classification, to be useful, must be based on sufficiently broad principles, so that all the definite characteristics of attachments may be included in it. The shape of attachments forms the basis for classification, but this characteristic alone is not adequate and must be supplemented by the function served by attachments. The present classification was based on the following three characteristics of their shape and function:

1. **Coronal attachments and radicular attachments**: Attachments are classified according to whether they are used in connection with the crown of a tooth or with the root of a pulpless tooth. The former is the coronal attachment and the latter is the radicular attachment.

2. **External attachments and internal attachments**: They also fall into two categories of external and internal attachments. External attachments have parts or all their mechanism outside the abutment tooth, whereas internal attachments take place within the contour of a tooth.

3. **Precision attachments and stress-breaking attachments**: All attachments possess some form of a joint which when articulated restricts or limits movement, and may therefore be classed as precision or stress-breaking. Precision attachments are designed to prevent movement when fully articulated, so that they provide a rigid connection between two sections of the prosthesis. In contrast, stress-breaking attachments are made to permit specific movement when fully articulated, so that they allow a certain amount of movement between two sections of the prosthesis.

In any kind of classification, at any one time, a single principle should be used as the basis of division. When, for any reason, the principle is changed, that fact should be indicated. The present classification consists of three steps. The first step is to classify attachments into coronal and
radicular attachments. The next step is to divide the former into intracoronal and extracoronal attachments, and the latter into intraradicular and extraradicular attachments. Finally, they are classified into precision types and stress-breaking types (Table 1).

![Diagram of classifications]

**Table 1. Classification of attachments**

<table>
<thead>
<tr>
<th>Attachments</th>
<th>Intracoronal attachment</th>
<th>Extragradinal attachment</th>
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<tbody>
<tr>
<td></td>
<td>Precision type</td>
<td>Stress-breaking type</td>
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<td>Stress-breaking type</td>
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**Exposition of Attachments by the New Classification**

The authors believe that the present classification will be found more understandable if the widely used attachments are classified into these eight groups, and their chief specimens are described and discussed according to it. They are listed in Table 2 by reference to reliable textbook,[1,3–13] but it is inevitable that error of omission will occur, because many practitioners in different countries have invented number of attachments. However, our survey indicates that some of them seem to be rather duplications, and therefore we suppose, with few exceptions, the essential devices will be mentioned (Table 2).

1. **Precision type of intracoronal attachments**

   The precision type of intracoronal attachments is applied to those units that are placed within the contour of a tooth crown, and making a rigid connection between two sections of the prosthesis. Majority of intracoronal attachments belong to the precision type. The retention provided by this type of attachments primarily depends on frictional surface area of contact between the two parts. It is particularly true in inlay clasp attachments, telescopic crowns, channel shoulder pin attachments, Beyeler attachments, etc., whose retention entirely relies on friction between the parallel walls of their two parts.

   However, retentive features are modified in several kinds of them. Constant insertion and removal of the prosthesis will cause the attach-
Table 2. The present classification classifying attachments into eight groups

<table>
<thead>
<tr>
<th>Precision type of intracoronal attachments</th>
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<tbody>
<tr>
<td>Inlay clasp attachment. Telescopic crown. Channel shoulder pin attachment.</td>
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<tr>
<td>Beyeler attachment. Stern deep-seat-rest.</td>
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<td>Ipsoclip 783 attachment. Pressomatic unit.</td>
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<tr>
<th>Stress-breaking type of intracoronal attachments</th>
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<tbody>
<tr>
<td>Precision dowel rest attachment. Sphere joint. Cummer pin-in-the-inlay attachment.</td>
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</table>

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<tr>
<th>Precision type of extracoronal attachments</th>
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<tbody>
<tr>
<td>Bolt</td>
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<table>
<thead>
<tr>
<th>Stress-breaking type of extracoronal attachments</th>
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</thead>
<tbody>
<tr>
<td>Télescopé (Système Egert) Mono-Reducteur nach Zuccoli.</td>
</tr>
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<table>
<thead>
<tr>
<th>Precision type of intraradicular attachments</th>
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Stress-breaking type of intraradicular attachments


Precision type of extraradicular attachments

Steiger and Beitel bar. Dolder bar unit.

Stress-breaking type of extraradicular attachments

Dolder bar joint. Gilmore attachment. Ackermann bar joint.

ments to wear, so that some form of adjustment is utilized in Ney Chayes attachments, Stern type 7, McCollum attachments, Split dowel, lingual half crowns, Brown-Soereensen attachments, Gollobin attachments, and so on (Fig. 1). On the other hand, auxiliary retentive devices are incorporated in some attachments to provide more retention for a given frictional area. Many of the devices consist basically of a mechanical lock, for example, a spring-loaded piston on the male part engaging a socket within the female element. This type of arrangement is found in Sheter spring-lock attachments, Stern G/L, Crismani attachments, Schatzmann attachments, etc. (Fig. 2).

![Fig. 1.](image)

![Fig. 2.](image)

Besides these, plunger attachments, such as Ipsoclip 783 attachments and Pressomatic units, are employed mainly to increase the retention between the outer removable crown and the inner core. The Ipsoclip attachment is a spring-loaded plunger, and the Pressomatic unit is kept under tension with a rubber cartridge.
(2) Stress-breaking type of intracoronal attachments

These attachments also have the two parts joined in the contour of a tooth crown, but they differ from the precision type of intracoronal attachments in that they allow some movement between two sections of the prosthesis. A small number of intracoronal attachments fall into this type.

The precision dowel rest attachment has a box-like occlusal rest seat in the abutment casting for support of the partial denture, and a dimple on the lingual surface of the abutment casting for the purpose of retention (Fig. 3). Its stress-breaking effect is due to the flexibility of the lingual arm engaging the dimple on the abutment casting. The pin-in-the-inlay attachment, devised by Cummer, consists of a ring in inlay and a stud attached to the flexible bar of the denture, and permits saddle movement without strain upon the abutment tooth.

![Precision dowel rest attachment diagram]

Fig. 3.

(3) Precision type of extracoronal attachments

The precision type of extracoronal attachments is defined as the attachments having part or all of their mechanism outside a tooth crown, and providing a rigid connection between two sections of the prosthesis. It includes three groups.

The first group comprises those forming a projection from the crown of a tooth, to which the prosthesis is attached, such as Condit attachments, Morgan attachments, and Snap-rox attachments (Fig. 4). The second group are bolt units. They are used to connect two parts of a sectional denture in the mouth. Each part of the denture is inserted separately and the patient locks them together with the bolt. The last group are several kinds of bar units, such as Bennet blades, Fossume bars, and Andrews bars. They consist essentially of a bar and one or more sleeves. The bar spans an edentulous area to join together mainly the crowns of abutment teeth, and the sleeves connect the denture to the bar.
(4) Stress-breaking type of extracoronal attachments

These attachments are designed to be placed outside a tooth crown, and to permit specific movement between two sections of the prosthesis when fully articulated. A wide variety of attachments are included in this group.

The first category comprises Stern stress-breaking attachments, Hruska-Gelenke, Strini hinges, Crismani combined units, Conod hinges, Gelenke nach I. Reichborn-Kjennerud, Rotation joints, and so on (Fig. 5). These are basically the inseparable joints allowing hinge movement. The second category, the group of separable joints allowing hinge movement, is represented by Inoue attachments, Gerber hinge blocks, P. R. Geschiebe-Scharnier, and Hofer screws (Fig. 6).

![Fig. 4.](image)

![Fig. 5.](image)

![Fig. 6.](image)

Stern stress-breaker attachment
- f. : female
- m. : male with extension bar
- s. : screw
- b. : box with tube

Inoue attachment
- m. : male
- f. : female

The third category is the joint which allows vertical movement, and is resilient or self-returning by a coil spring. The representatives are Téléscope (Système Egert) and Mono-Reductoren nach Zucconi. The fourth category, the non-resilient joint allowing vertical movement, is represented by Boos tube attachments, Suplee attachments No. 3 and No. 5, Berry attachments, Griswold attachments, Shell locks, Ear locks, and Schröder-Stab-geschiebe (Fig. 7).

The fifth category, the separable joint allowing movement in more
than two directions, comprises Roach ball attachments, Roach flat attachments, Cammer ring-and-pin attachments, Dalbo 667 attachments, and ASC 52 (Fig. 8). Finally, the sixth category, the inseparable joint allowing movement in more than two directions, is represented by Kayle attachments, Dresch attachments, BMB-Schlösser nach Beat Müller, Biaggi-Resilienzgelenke, BMB-Glenke, and Axial rotation joints.

Fig. 8.

(5) Precision type of intraradicular attachments

The precision type of intraradicular attachments is defined as the units that are used with the root of devitalized tooth, taking place within the contour of a tooth, and providing a rigid connection between two sections of the prosthesis. This group consists of various attachments exhibiting diverse form.

First, several kinds of stud attachments, such as Gerber 686 attachments, Bona 604 A, and Gmur attachments, belong to this type (Fig. 9). Their male part consists of a stud-shaped projection to be soldered to the diaphragm of a post crown, and their female part is embedded within the acrylic resin or soldered to a metal framework of the prosthesis, and fits over the male part. Second, screw block systems are good examples of this type. They join the prosthesis to pulpless roots by screwing, and typified by Corcoran attachments, Heddy attachments, Schubiger attachments, and Hruska units (Fig. 10).

Third, Kelly attachments and Peeso split-pin and tube attachments are also included. The Kelly attachment consists of two small thimbles,
each closed at one end, and in which one telescopes within the other with tight contact. The inner thimble is soldered to the diaphragm of a post crown, and the outer one is joined to a prosthesis. The Peeso split-pin and tube attachment has a split cylinder and a tube in the root of a pulpless root. Fourth, the plunger attachments, for example, the Ipsoclip 784 attachment, fall frequently within this group, for they can be incorporated in the inner section joined to a devitalized abutment tooth (Fig. 11).

(6) Stress-breaking type of intraradicular attachments

These attachments are also used with devitalized roots, and take place within the contour of a tooth, but they differ from the precision type of intraradicular attachments in that they permit specific movement between two sections of the prosthesis. Most of stud attachments, such as Gerber 696 attachments, Bona 604 and 604 P, Rothermann units, Anderes and Schönenburger stud attachments, B & C anchors, and Verankerungen nach Sandri-Narboni, belong to this type (Fig. 12).

(7) Precision type of extraradicular attachments

The precision type of extraradicular attachments is described as being used with the roots of devitalized teeth, having a part or all of its mechanism outside the contour of a tooth, and preventing movement between two sections of the prosthesis. It is represented by the bar units, such as Steiger and Boitel bars, and Dolder bar units (Fig. 13). Their bar
spans edentulous area frequently between the roots of pulpless teeth, although they are also used with the crowns of teeth, and their U-shaped sleeve fits over the bar to provide a rigid connection.

(8) Stress-breaking type of extraradicular attachments

These attachments are also used with the devitalized roots, and have a part or all of their mechanisms outside the contour of a tooth, but they allow a certain amount of movement between two sections of the prosthesis.

Bar joints belong to this type (Fig. 14). They act as splints, spanning the edentulous regions to join two or more pulpless roots. Dolder bar joints permit vertical and rotational movements, but Gilmore attachments and Ackermann bar attachments, if they are bent to an antero-posterior curve, might allow only a slightly rocking motion.

**Conclusive Remarks**

One of the requisites for a good classification is that it must be carried out to a point beyond which further classification is impossible. In the above-mentioned classification, each group can be further divided into appropriate subgroups on the basis of some principle different from each
other, but it cannot be done on the basis of a common principle.

In several kinds of attachments, it is difficult to determine in which group they should be placed, for it may depend on the manner in which they are used. The Steiger and Bottel bar, and the Dolder bar unit are included in extraradicular attachments when they are used with the root of pulpless tooth, but used with the tooth crown, they belong to extra-coronal attachments. Another example is found in the intracoronal attachments, such as the Ney Chayes attachment and the McCollum attachment, which can be used extracoronally in split-pontic technique. They are carried in an artificial tooth cantilevered from the splinted abutments. In these attachments, each case should be determined separately.

It is thought that this classification satisfies practical requirements of an acceptable method of classification, but it should stand the test of years of successful application.

REFERENCES