Esthetics in anterior fixed bridge prosthodontics

George M. Moulton, D.D.S., Atlanta, Ga.

Objectives of crown and bridge prosthesis are restoration of function and the restoration of esthetics. This paper reviews and emphasizes some of the more important points in the achievement of an esthetic replacement in anterior fixed bridge prosthodontics.

PREPARATION OF ABUTMENT

The success of a restoration starts with the preparation of the abutment; this is obvious when failures and successes are analyzed from an esthetic point of view. A few points regarding the selection of the retainer and its preparation will be considered. The three-quarter crown is perhaps the most widely used retainer for upper anterior abutments. Although it has its limitations, it satisfies to a great extent the requirements of a retainer. It is in its preparation, however, that the practitioner may go amiss (Fig. 1, left) particularly in the mesial and distal slices which usually are the first steps of this preparation.

Insofar as possible, the characteristic contour of the tooth from the labial aspect must be maintained; that is, from a labial aspect the tooth should still retain its square, ovoid or tapering contours. Stated another way, the mesial and distal slices should reduce only the height of contour and there should be no attempt with the mesial and distal slices to establish the labial margins of the preparation. The extent to which the labial margin is produced with these slices depends only on the original contour of the tooth and will be a result of that contour rather than of the initial attempt to establish this labial margin. It must be kept in mind that flat, rigid disks are being utilized to produce these cuts. If, for example, an attempt is made to establish the margin toward the gingiva in a self-cleansing area, this flat rigid disk will overextend the margin at the incisal third. This explains why many times an unnecessary amount of gold is displayed at the incisal third from the labial aspect.

After the procedure has been completed to the point of preparing the mesial and distal resistance grooves, the practitioner returns to the labial margin. Whether or not an incisal resistance groove has been used, the starting point of the mesial and distal grooves is approximately the same. These grooves are prepared parallel with the labial incisal two-thirds. This will provide the longest possible grooves and will, generally, avoid the mesial and distal concavities. These grooves will, however, be "tucked in" behind the labial line angles. Insofar as possible the dentist is actually establishing the labial margin of the preparation with the labial wall of these grooves, so that not only the direction of the groove but the eventual esthetics resulting from this preparation may be controlled.

Presented before the section on partial prosthodontics, ninety-fifth annual session, American Dental Association, Miami, Fla., November 9, 1954.

Chairman, crown and bridge prosthesis, School of Dentistry, Emory University.

One other point concerning esthetics should be emphasized: it is not necessary to show any gold on the incisal edge. The preparation of the incisal edge should be accomplished on a bevel toward the lingual surface and this bevel should start from the height of contour of the incisal edge. Again, this should result in almost total hiding of the gold from the direct labial view.

Whether an incisal resistance groove is to be used will depend on the labiolingual bulk on the incisal edge. If the tooth is too thin labiolingually, the placement of a resistance groove will, of course, result in discoloration about the margins of the crown from a labial aspect within a few months after cementation. This bulk is adequate in a majority of cases, and it is improper preparation of the lingual surface toward the incisal edge after the accomplishment of the incisal bevel which results in inadequate bulk for the resistance groove.

A good rule to follow in many preparations is to remove a uniform amount throughout; thereby, the original contours of the teeth can be retained in many instances. If, however, this bulk is inadequate, the use of a lingual step or of trusses must be considered in order to provide the required rigidity in castings.

If a fixed prosthesis is to be furnished the patient, the operator cannot limit himself to the use of the three-quarter crown and meet the requirements of a fixed prosthesis, either esthetically or in relation to retention of the prosthesis. Other types of retainers must be selected which better answer the individual needs. The modified three-quarter crown is one which has been found to be invaluable (Fig. 1, center). This is the preparation which utilizes one resistance groove, an incisal pin and a lingual pin for retention. There are many instances in which its use is preferable to that of the three-quarter crown. In some ovoid teeth the mesial surfaces often lend themselves to an adequate resistance groove, whereas the distal surfaces do not. In attempting to prepare both the mesial and distal surfaces, the esthetic objective of replacement may be defeated. Also, in instances where teeth are slightly tipped or rotated, two slices can be made, one on each of the abutments, and the line of insertion directed without the overreduction of one or more surfaces so that the prosthesis may be inserted; in other words, to make four parallel slices frequently leads to unesthetic results.

There are instances where the placing of even one slice for a preparation impairs rather than enhances a result; for example, in the short, bulky teeth which do not allow for adequate resistance grooves in either the mesial or distal surfaces. In such instances, it is possible that the retainer should be the three-pin hood (Fig. 1, right). When this retainer is supplemented with trusses on the lingual surface to provide for the necessary rigidity of the casting, it has many valuable uses in fixed prosthesis.

PROBLEMS OF SPACING

There are other details in the construction of anterior fixed bridgework which are worth emphasizing. It is necessary at times to place a facing where the space seems too small. If such a facing were placed within the space it would be unesthetic because the harmonious effect would be lost. The dentist must keep in mind that an esthetic effect means harmony in contour and color, and that there are many things which go to make up this effect. In the example shown in Figure 2, above, the space does not seem large enough for placement of a facing. However, it is possible to place this facing so that it overlaps slightly the adjacent abutments and carries out irregularities which are already apparent in the mouth; thus harmony is achieved. The incisal opaque staining should reproduce any or all white opaque, brown or other inperfections.

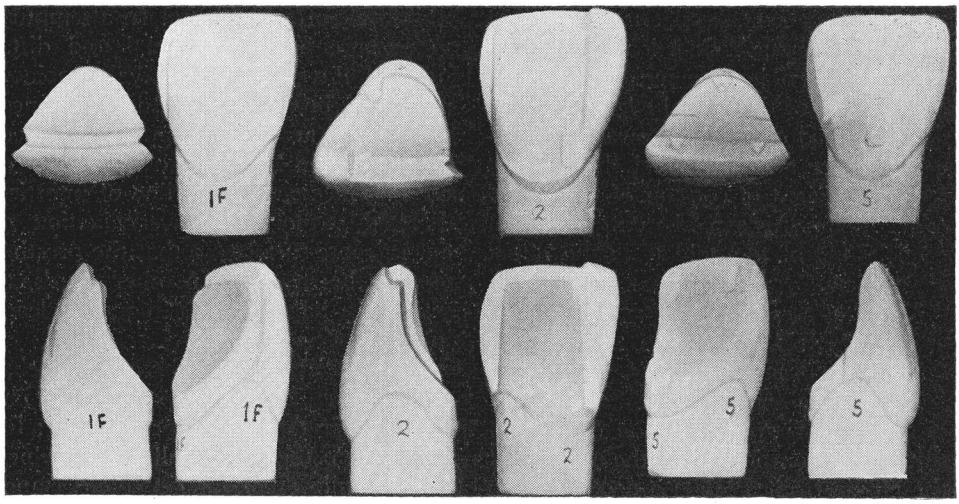

Fig. 1 • Left: Preparation for a three-quarter crown. Center: Preparation for a modified three-quarter crown. Right: The three-pin hood (Courtesy of J. Raymond Gill, School of Dentistry, University of California)

Another detail is the refining of the retainers just prior to taking the impressions for the working model. The excess bulk of gold on the mesial, distal and incisal surfaces after casting must be reduced. This should not be done on the working models as it is not possible to get the proper perspective on these models. The reduction will accomplish many things. It will provide for the maximum space into which the facing can be ground and will, to a great extent, obliterate the gold margin of the retainer and the soldered connector from the labial view. The importance of this reduction cannot be overemphasized. It should also be stressed that the facing selected should be slightly large, if anything, for the space. Such a facing will provide for the necessary bulk of porcelain for its preparation, and it can then be spot ground into position and shaped to harmonize with the abutments.

In many instances, one or more of the abutments have moved because of the loss of an adjacent tooth. Orthodontic treatment is indicated to reestablish normal alignment (Fig. 2, center). Retainers have been prepared and temporarily seated prior to obtaining this movement. In the example shown, after the central incisor had been brought into contact with the adjacent incisor, impressions for the working model were taken, and the bridge acted as an absolute retainer after the orthodontic movement. The importance of consultation with the orthodontist and use of orthodontic appliances when preparing a mouth for a better prosthesis cannot be overemphasized. If, however, spaces exist generally throughout the anterior region, it is not desirable to close any space. A type of connector must be used that will maintain the space or diastema. The bar type connector, shown in Figure 2, below, provides an esthetic result. Occasionally, it is possible to use a bar type of connector to connect the pontic with both retainers. This gives a normal appearance of space between teeth rather than filling in the space with an unsightly solder connector. These bars, however, must be rigid enough to stand the stress to which the prosthesis will be subjected; furthermore, they must be just off the supporting tissue so that floss

may be passed underneath the bar for proper cleansing.

In any discussion of esthetics, the consideration of the type of porcelain replacements utilized cannot be omitted. The author believes that the most esthetic facing is the long-pin porcelain facing. In the past, inadequacies in porcelain facings have been due, principally, to the lack of condensation of the porcelain. The new vacuum-fired pin facings now available are well condensed and have the desired strength. Proper preparation of this facing for its backing is, of course, a requirement. A long-pin facing allows for the protection of the incisal edge. If the same approach is used as in the preparation of the three-quarter crown, it is not necessary to show any amount of gold from the labial aspect. These facings can be arranged in any way indicated for the individual patient and they will produce the artistic result so much desired (Fig. 3, above).

Another anomaly is the instance in which there is more than the normal

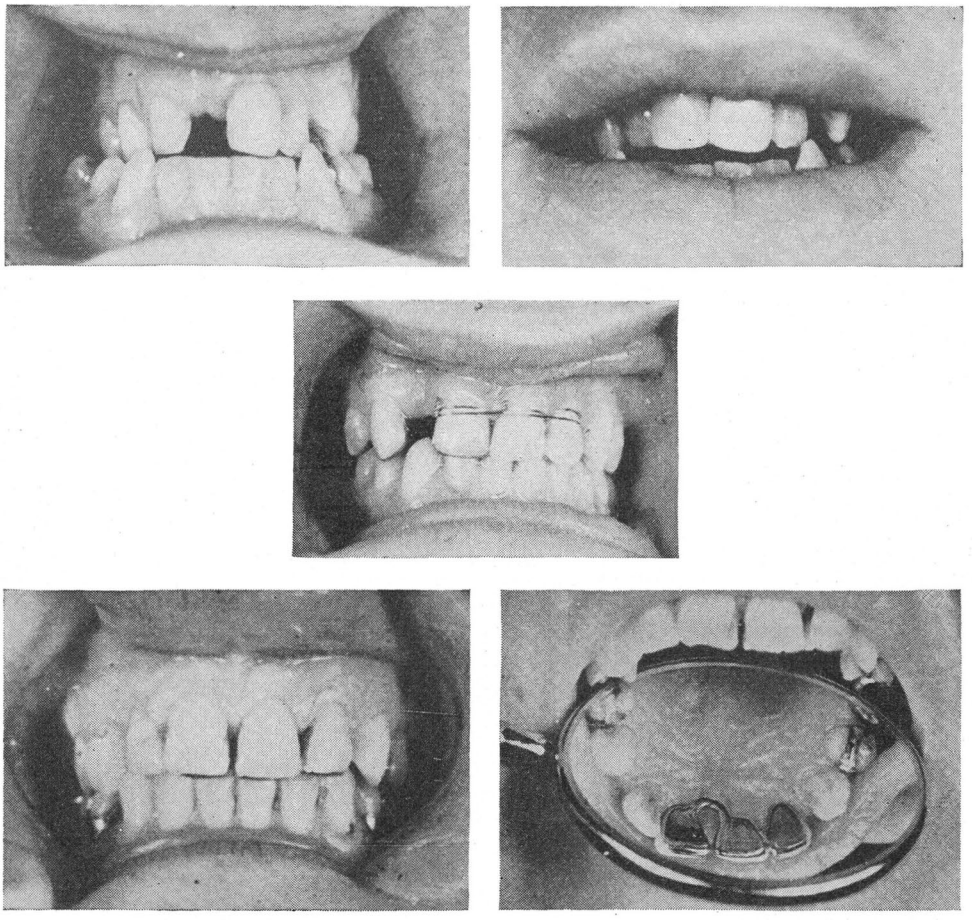

Fig. 2 • Above: The placement of upper right central incisor where space is inadequate and irregularities exist. Center: Simple orthodontic treatment used to close space between lateral incisors. Below: The bar type connector used to maintain normal space between central incisors

space for a single missing tooth, which provides space for two replacements instead of for only the one which is missing. Such an anomaly presents an excellent chance for the dentist to use ingenuity. Figure 3, center and below left, shows an example in which the abutments are the upper left central incisor and the upper right lateral incisor, the upper right central incisor having been lost. If an attempt were made to place the missing central incisor in this space, it would obviously produce an unesthetic result. If a central and a lateral incisor were placed in this space it would look from the labial aspect as if there were two lateral incisors on the right side, and this would create lack of symmetry. The lateral incisor that is the abutment in this instance obviously occupies the position of the upper right cuspid. Therefore, to produce the desired harmony, this upper right lateral incisor must be prepared on its incisal edge to simulate a cuspid. The right lateral incisor now harmonizes with the left cuspid and symmetry has been restored to the upper anterior segment.

One of the replacements most frequently needed in the anterior mouth is probably the lost lateral incisor (Fig. 3, below right). It is the author's opinion that this is the one instance in which the "wing bridge" can and should be utilized. Observation will show that this type of construction frequently renders the longest service of all fixed prostheses. The type referred to is strictly a single bridge replacement and does not have any attachment or arm on the adjacent central incisor. In such instances, judgment must be used in the treatment planning.

If the central incisor is involved with caries or restorations, it might be considered for use as an abutment. Probably more important, however, is the study of the occlusion. If there is a normal overbite-overjet relationship, this type of construction will serve very well; it will also where there is more than normal overjet with little or no overbite. It should be obvious, however, that if there is a deep overbite with little or no overjet, the problem of replacement becomes complex. The central incisor must certainly then be considered for use as an abutment.

ESTHETICS OF THE FULL-VENEER RETAINER

The problem of the anterior replacement cannot be left without discussing the need for a full-veneer retainer to obtain an esthetic result. This need is apparent for mouths in which extensive restorations involve a good deal of the labial surfaces, or for those which present anomalies of form or color which must be corrected to produce a pleasing result. Many patients are satisfied with the porcelain jacket crown which is and always has been the most esthetic restoration. Of late, however, many schools are omitting the construction of the porcelain restoration from the training and others are content with teaching the placement of one such restoration. This is woefully inadequate training for the young dentist who may wish to prescribe a porcelain restoration.

In addition, the widespread use of acrylic resins in dentistry has caused a severe setback in the use of porcelain. There must be a re-evaluation of teaching and ideas relative to the use of these two materials. Certainly, for the unit restoration, if the conditions are favorable, particularly the occlusion, the porcelain jacket is by far the best restoration. At the same time, the limitations of any material must be realized. Porcelain is brittle and will not stand undue stress. Therefore, in patients who have a deep overbite and little or no overjet in the anterior region of the mouth, the use of a full porcelain crown is contraindicated. In such instances, failure would result, with a fracture of the porcelain across the area of the cingulum. Under such circumstances a more durable type of

restoration is indicated; one which will, at the same time, accomplish the objectives of esthetics. A restoration in which acrylic resin is used is shown in Figure 4. The crown is of the open-face type; that is, with a shoulder on the labial, mesial and distal sides of the tooth. After the complete blue inlay waxup, the open-face portion is cut out prior to casting. Inadequately shown in the illustration are the undercuts on the mesial and distal sides for retention of the acrylic material. This type of restoration provides for full gold coverage of the preparation. This is important in several ways. First, in providing for full gold coverage, cement is

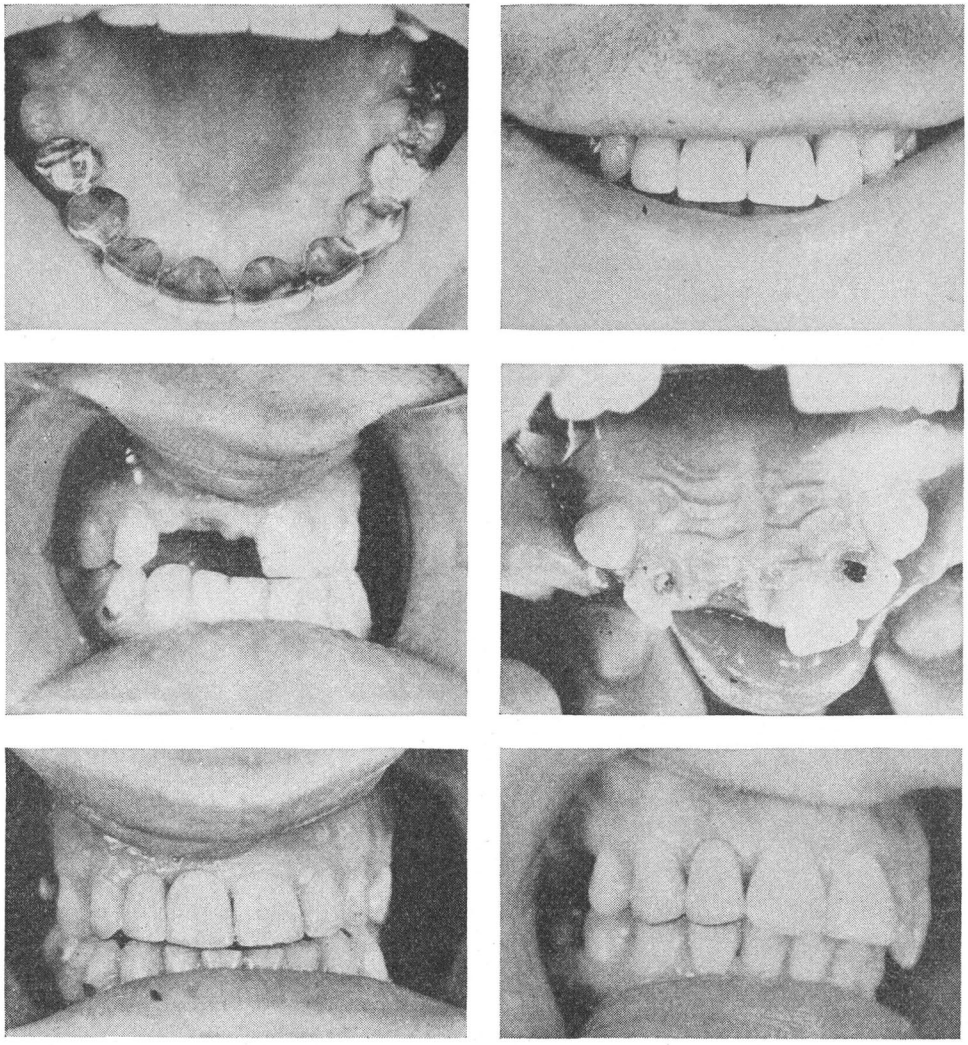

Fig. 3 • Above: Esthetic arrangement of upper four anterior long-pin facings. Center and below left: The incisal edge of the upper right lateral incisor has been prepared as a cuspid to produce symmetry. Below right: Wing bridge replacing upper right lateral incisor with no connector to upper right central incisor; modified three-quarter crown used as retainer on cuspid

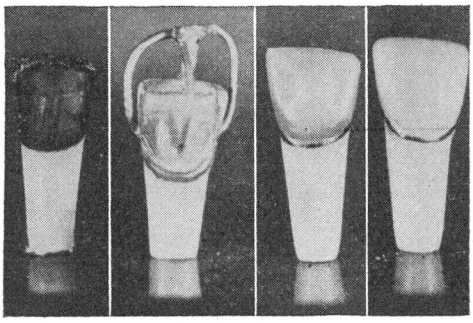

Fig. 4 • Models showing procedure from the blue inlay waxup stage with cutout, the casting, the white ivory waxup and the complete gold-acrylic combination open-face crown

not placed adjacent to the acrylic veneer. Secondly, there are no pressures applied to the acrylic resin on cementation that might tend to break the acrylic resin loose from its undercuts and cause leakage between the acrylic resin and its gold retainer. The net result is adequate retention for the acrylic resin and stability of color. After casting, all margins and shoulders should be polished, but not the open-face portion of the crown.

White ivory wax is then used to wax up the open-face portion. This must be done in the mouth. No model is adequate for this procedure. Many excellent articles have discussed color in anterior restorations. Before success can be achieved with this type of restoration, the operator must be aware that color involves many things. He must become extremely conscious of contour and all labial markings that produce contour. The highlights are what differentiate one type of contour from another; that is, the tapering ovoid and square. Therefore, the contour and all labial markings of the adjacent teeth must be reproduced to attain a harmonious effect in the restoration. Only if there is exactness in the reproduction will the restoration blend in with the adjacent teeth and achieve good matching color. This does not mean to imply that bulk is of no consequence, but the bulk depends on the proper preparation for this type of jacket or crown. The requirements for this, however, do not differ from the requirements for the full-porcelain veneer. The thinnest possible cast veneer covering the stump in the open-face portion of the restoration usually will provide adequate bulk for the acrylic material. The author has not found masking materials of any significance and does not use them. This type of restoration is useful when the occlusion is unfavorable to porcelain. Another type of open-face crown that achieves an esthetic result, is, of course, one made of porcelain instead of acrylic resin. The porcelain restoration, however, has been well covered in the dental literature.

OPEN-FACE ACRYLIC CROWN

The open-face acrylic crown can be used both as a unit restoration and as a retainer in fixed prosthesis. There should be no hesitation in using this type of retainer adjacent to a porcelain pin facing, as the same harmonious effect can be produced whether the adjacent teeth are natural or have porcelain facings. An example of this is shown in Figure 5, first row. The amount of the protection of the incisal edge should be determined, of course, in each individual instance. If there is an end-to-end occlusion, the gold should fully cover the incisal edge. To achieve an esthetic result in the unit restoration, the adjacent teeth again must be considered. If the adjacent teeth have interproximal foils or three-quarter crown restorations with gold showing from the labial aspect, the restoration should be constructed to harmonize. This means that it is necessary sometimes to provide for the imitation of gold foils or three-quarter crowns when cutting out for the acrylic veneer. Esthetic results are in direct proportion to attention to details.

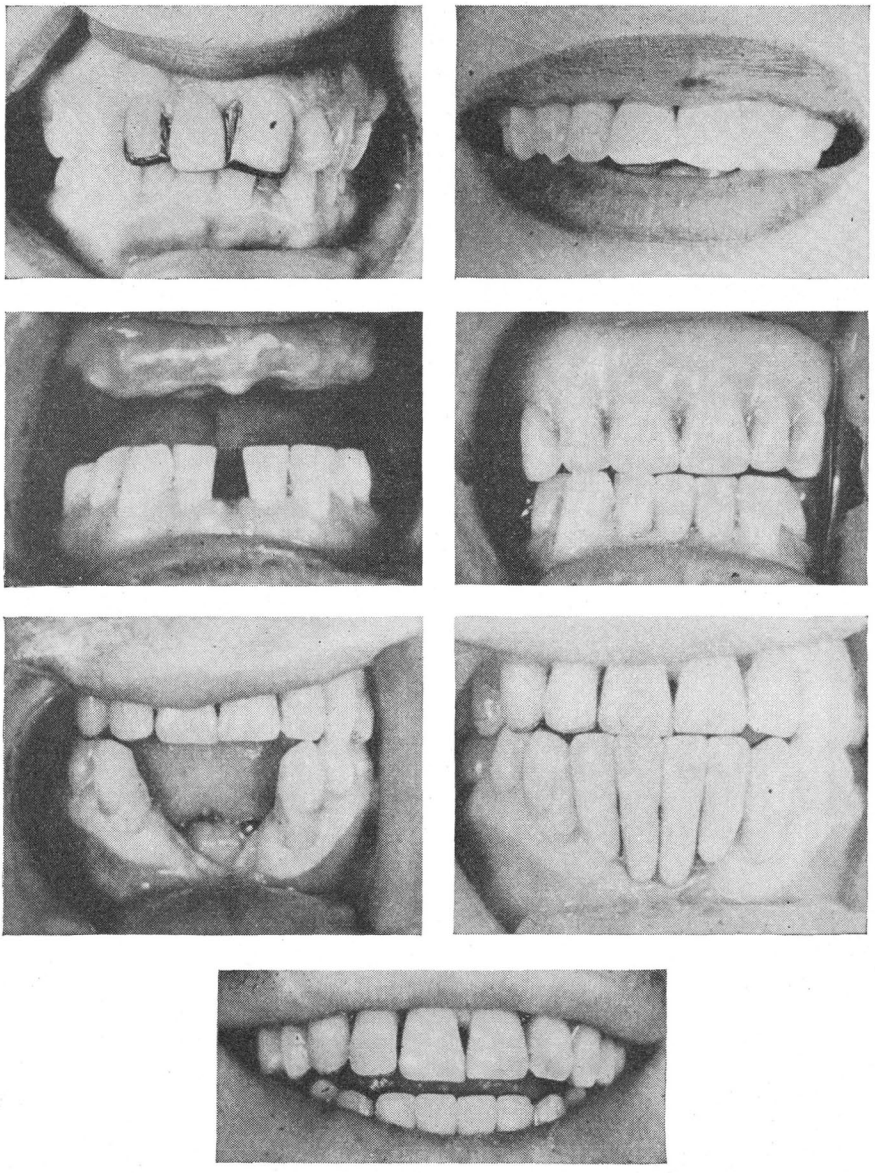

Fig. 5 • First row: Before and after treatment, utilizing acrylic open-face crown and long-pin porcelain facing. Second row: Utilization of three-pin hoods for replacing lower anterior tooth. Third and fourth rows: Before and after treatment used in case of traumatic injury

LOWER ANTERIOR REPLACEMENTS

The lower anterior replacement is one of the more difficult procedures. This is particularly true for the operator in the early years after graduation from dental school. The difficulties are partly responsible for the fact that many dentists avoid the fixed prosthesis and fall back on the removable replacement that requires no operation on the natural dentition.

In a discussion of the lower anterior replacement, it should be emphasized even more that the three-quarter crown is seldom the retainer of choice. Here again, the contours of the teeth and the alignment of one abutment to another lend themselves better to the preparation of other types of retainers. The three-pin hood can and should be used extensively for this replacement. The modified three-quarter crown is also valuable. And, of course, a type of full restoration, either the open-face type crown or the full jacket, is needed to obtain an esthetic result in those instances in which the teeth have been extensively restored. There are many modifications suitable for use in the lower anterior replacements, so let it be understood that when the three-quarter crown is termed inadequate, reference is made to the standard type. Figure 5, second row, shows a replacement that has been accomplished by the use of three-pin hood retainers. As shown here, these teeth lend themselves very well to the three-pin hood; also, there is adequate bulk for the pin type of retention.

Many times a dentist is called on to construct a fixed prosthesis because of a traumatic injury. Traumatic injuries will often present unusual problems. An example is given in Figure 5, third and fourth rows, which shows an instance where the lower four anterior teeth were lost as the result of a gunshot wound during the fighting in Korea. The mandible was fractured and, after healing, posed the problem of replacement. The removable types of appliances were contraindicated for several reasons, the main one being discomfort. The patient strenuously objected to even finger pressure on the ridge area.

The fixed replacement was the choice, but certain things had to be kept in mind; the construction of the pontics had to be such that it would discourage what could be a disastrous tongue habit. The pontics had to be lengthened so that the root tips rested on the ridge in normal anatomic relationship. This would prevent the tongue habit from loosening one or both of the retainers, or from creating excessive trauma on the abutment teeth. The length of the porcelain in such a case required adequate backing by gold castings on the lingual aspect to strengthen the porcelain facings. Thus a desirable restoration was produced and a good esthetic appearance created with the lip in normal position.

SUMMARY AND CONCLUSION

To meet the requirements of retention and esthetics in an anterior fixed prosthesis, one must start with the selection of the retainer and preparation of the abutment. The three-quarter crown is the retainer that answers perhaps the greatest need; because of variables in form, bulk and alignment, however, the dentist must be able to modify this preparation. He therefore must learn to use as basic preparations the modified three-quarter crown and the three-pin hood. It is in the preparation for these retainers that the dentist many times goes amiss, and the result is actual overreduction in one or more of the steps of the preparation which results in an unnecessary display of gold.

The selection of the porcelain replacement is of equal importance. It must fill the space adequately and harmonize in size, contour and color. Many times staining is necessary to produce this harmony of color. A type of full veneer crown must be used in those instances

where the esthetics of the individual tooth has been lost because of fracture or extensive caries or restorations.

The porcelain jacket is the restoration of choice when indicated. Occlusion will, at times, contraindicate the use of a brittle material such as porcelain. At such times it is the open-face type of crown of either acrylic resin or porcelain that should be utilized.

The success of the gold-acrylic resin combination type retainer depends on the attention given to many details having to do with color. In the main, these details concern the reproduction of contour and all minute labial markings which produce highlights. Highlights produced by the reflection of light take on certain characteristics of form and color.

Various types of connectors are essential to carry out the symmetry of the mouth. To achieve ideal esthetic results, the soldered connector must be obscured from the labial view, and proper refinement of the retainers prior to the taking of impressions for working models should accomplish this. Other than soldered connectors must be planned for reproduction of a diastema which is normal for an individual instance. It is apparent that no one point is more important than another in the construction of the fixed bridge.

323 Robinhood Place

The dentist's capabilities in the management of mass casualties

Russell W. Sumnicht, D.D.S., Washington, D.C.

More than nine years has elapsed since the first atomic bomb was dropped over the Japanese city of Hiroshima, yet the majority of experts still talk about what should be done to meet atomic disaster, but say very little about what has been done or what is being done at the present time. Those who are charged with the planning have done an outstanding job. With a few exceptions, however, not enough individuals have been reached and persuaded to put an effective plan into operation. Russell W. Bunting of Ann Arbor, Mich., dental consultant to the Federal Civil Defense Administration, members of the American Dental Association Subcommittee on Civil Defense headed by Carl Sebelius of Nashville, Tenn., and other individuals and groups of individuals in dentistry have more than met their responsibilities in this regard, but for the most part, the role of dentistry in atomic warfare must be discussed in the light of what should be done rather than what has been done.

Before the dentist's capabilities in the management of mass casualties can be evaluated, it is necessary to know just what the need for the dentist will be. A

Lieutenant colonel, Dental Corps, Army Medical Service Graduate School, Walter Reed Army Medical Center. Member, American Dental Association Subcommittee on Civil Defense of the Council on Federal Dental Services.