A Modified Surgical/Prosthetic Approach For An Optimal Single Implant-Supported Crown
Part II - The Cervical Contouring Concept

Nitzan Bichacho, DMD • Cobi J. Landsberg, DMD

Achieving an aesthetic implant-supported restoration is a constant challenge for the restorative dentist. Part I of this article, published in the March, 1994, issue of PP&A, presented a modified regenerative technique - the "socket seal surgery" (SSS). Part II presents a modified prosthetic technique - the "cervical contouring concept" (CCC). The clinical and laboratory prosthetic procedures are covered in four steps, reshaping of the gingival profile is discussed, and a case report is used to illustrate the procedures. The learning objective of this article is to supplement reader knowledge of methods and techniques in prosthodontic procedures.

Following an anterior tooth extraction, the preservation of the alveolar ridge can be achieved predictably using the socket seal surgery (SSS), as was described in Part I.[1] This modified regenerative technique enables future optimal implant placement and sufficient soft tissue volume over the regenerated bone, resulting in satisfactory conditions for a properly placed and aligned porcelain crown. The prosthetic stages presented in Part II of this article lead to crown fabrication that will not only function satisfactorily but will also blend with the adjacent natural teeth to form an aesthetic integrated dental arch.

Dr. Bichacho is Coordinator of Esthetic Dentistry in the Postgraduate Program, Department of Oral Rehabilitation, The Maurice and Gabriela Goldschleger School of Dental Medicine, Tel-Aviv University, Israel, and a member of the European Academy of Esthetic Dentistry. He also maintains a private practice limited to Prosthodontics and Aesthetic dentistry in Tel-Aviv, Israel.

Dr. Landsberg is a member of the Department of Periodontology, The Maurice and Gabriela Goldschleger School of Dental Medicine, Tel-Aviv University, and Diplomate of the American Board of Periodontology. He also maintains a private practice limited to Periodontics and Implantology in Tel-Aviv, Israel.

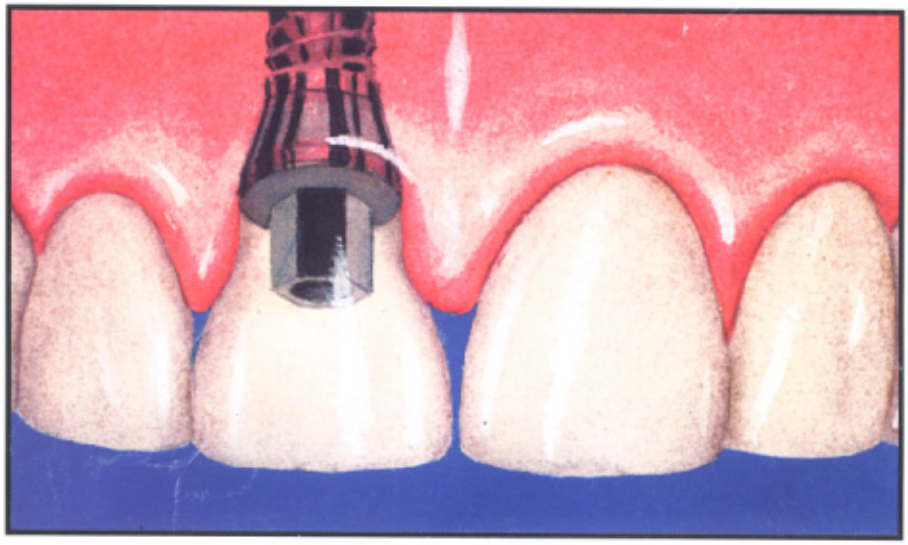

Figure 19. Straight emergence profile results in sharp slope in the cervical third of crown. Note bulky papillae and artificial appearance.

Following second-stage implant surgery, during which a healing abutment is placed on the implant, the free gingiva matures around it in a smaller diameter of soft tissue than that of the natural extracted tooth, and wider interdental papillae are recreated. There are two restorative options for this problematic situation:

1. Crown formation with a straight emergence profile, according to the abutment diameter and the present gingival contour. This results in an unattractive crown, which is narrow in its cervical third, diverging sharply coronally to compensate for the differences between the crown diameter and that of the abutment (Figure 19).
2. Crown formation with a very wide angled emergence profile, composed of sufficient volume at the abutment region and emerging from the gingival margin with the diameter of the contralateral tooth. The supragingival crown contour will look natural, but mucosa modification is necessary to create the space for the subgingival crown form.

To reshape a gingival profile which provides suitable volume for the crown, four major techniques have been suggested:

1. Wide temporary healing abutments (Temporary Healing Abutment, 3i, West Palm Beach, FL, USA),[2] which allows gingival maturation around a wider cap.

Since the diameters of these abutments are predetermined and in limited sizes, it is not possible to get an optimal gingival contour in every clinical situation.

2. Electrosurgery to cut the desired gingival contour.[3] The results are not always predictable since shrinkage of the free gingiva and gingival recession may result.[4-6]
3. Gingivoplasty, using high-speed diamond burs, at the delivery appointment of the final crown.[7] This rotatory curettage might cause unfavorable recession, especially when thin facial tissue is recontoured.[8]

To reshape a gingival profile which provides suitable volume for the crown, four major techniques were suggested.

4. Constructing a two-part PFM provisional crown, in which a ceramo-metal intracrevicular substructure seats directly on the implant.[9] Its profile guides maturation of the periabutment gingiva during the healing period. The porcelain of this part is baked onto a UCLA abutment, which is screwed to the implant and its coronal part holds a provisional cemented PFM crown. However, to obtain precise fit, a prefabricated abutment is then used and additional porcelain crown is used for the final restoration. This at least doubles the actual prosthetic cost of the treatment.

The present article describes a technique, the Cervical Contouring Concept (CCC), in which no additional gingivoplastic surgery or use of unconventional abutments are necessary to achieve a favorable soft tissue contour.

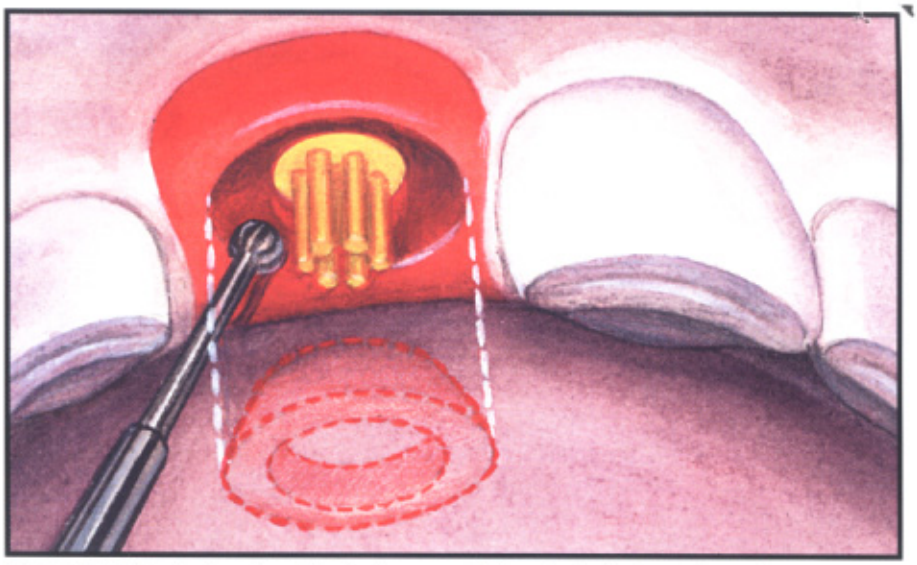

Figure 20. Peri-abutment acrylic gingiva remodeling. Conical sleeve trimmed out to create favorable gingival contour.

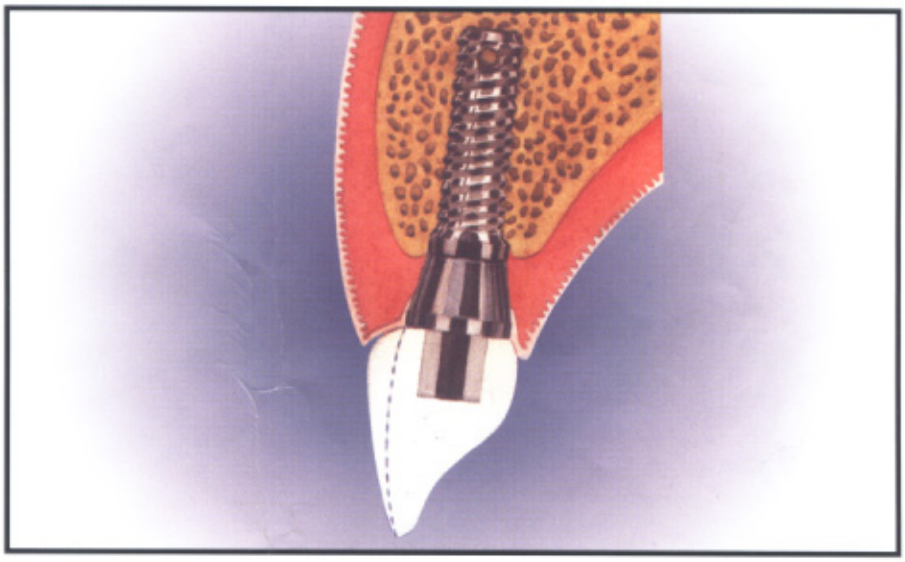

Figure 21. Wide buccal emergence profile angle and subgingivally located cervical height of contour retract free gingiva to desired form.

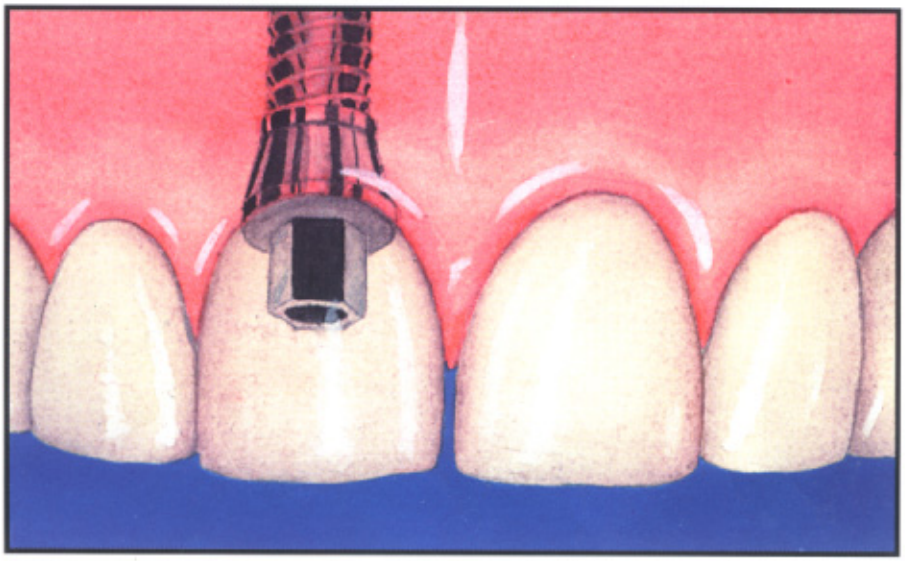

Figure 22. Final aesthetic proportions of implant/abutment/crown, according to the Cervical Contouring Concept. (Compare to Figure 1.)

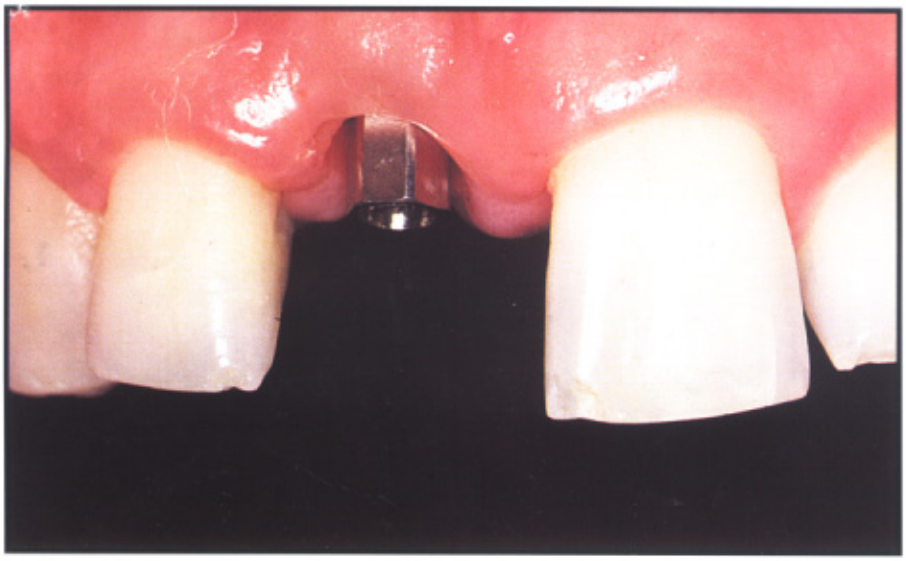

Figure 23. Abutment in place. Note the wide interdental papillae and the narrow curve of the buccal gingival margin.

Figure 24. Polycarbonate provisional crown in place. Crown's narrow neck follows gingival contour; wide bulky central papilla appear.

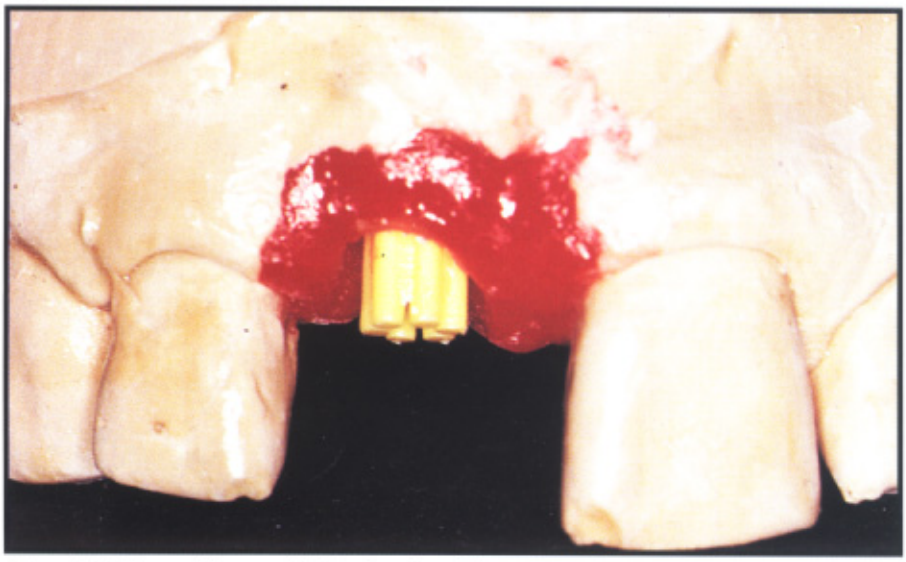

Figure 25. The working model. Duplication of the narrow contour of gums and the width of interdental papillae.

CLINICAL AND LABORATORY PROCEDURES

After the second-stage surgery and placement of a healing abutment, a period of 2 to 4 weeks is imperative for the mucosa to heal. The healing period is followed by these steps:

- Connect a transmucosal abutment to the implant in such manner that its shoulder is located 2 to 3 mm apical to the free gingival margin.
- Fabricate a provisional acrylic crown; the inner shape corresponds to the abutment dimensions, the outer shape follows the soft tissue contour.
- Take an impression, using an impression coping that is seated on the abutment and a vinylpolysiloxane impression material in the double-mix, one-phase impression technique.
- Remove the impression tray and cement the temporary crown with a noneugenol temporary cement.

Because of...the smaller diameter of the implant, as compared to natural root, an inevitable problem occurs...

The Cervical Contouring Concept is carried out as follows:

Step 1. Preparation of the Working Model

- Place an abutment analog in the impression coping, mix an acrylic resin (Dura-lay, Reliance Dental Mfg. Co., Worth, IL, USA), and pour it into the gingivae impression surrounding the analog.
- Allow to set for initial curing, then pour a cast stone.

Step 2. The Peri-Abutment Replica Remodeling

- Measure and mark on the model the mesio-distal width of the contralateral tooth, between the two transitional line angles.

- Copy and mark the same width on the acrylic gingiva replica.
- Place the impression coping on the abutment to protect it during the remodeling process.
- Use a small round carbide bur to carve the artificial gingiva to the width previously marked, making sure not to touch the abutment analog.
- Create a space labially to form a thin labial gingival "cuff," so that an imaginary conical acrylic sleeve is removed (Figure 20). This concave bed surrounding the abutment will face the outer cervical surface of the porcelain crown.
- Apply an isolation liquid to the acrylic surface.

Cervical Contouring Concept predetermines crown contour emerging from the soft tissue due to improved control of gingival shape.

Step 3. Fabrication of the Porcelain Crown

- Complete the cervical outer crown usually in the third firing session.
- Condense the porcelain powder well and press towards the acrylic bed to duplicate its form.
- Since the implant is positioned palatally to the original root and to the other teeth in most situations, add porcelain powder also labially to reach the plane of the adjacent teeth in the cervical height of contour region, resulting in a very wide-angled emergence profile (Figure 21).
- The buccal emergence profile angle becomes wider as the palato-labial distance between the implant plane and that of the adjacent teeth increases and the inciso-cervical distance from the free gingival margins to the abutment shoulder decreases, as shown in the equation:

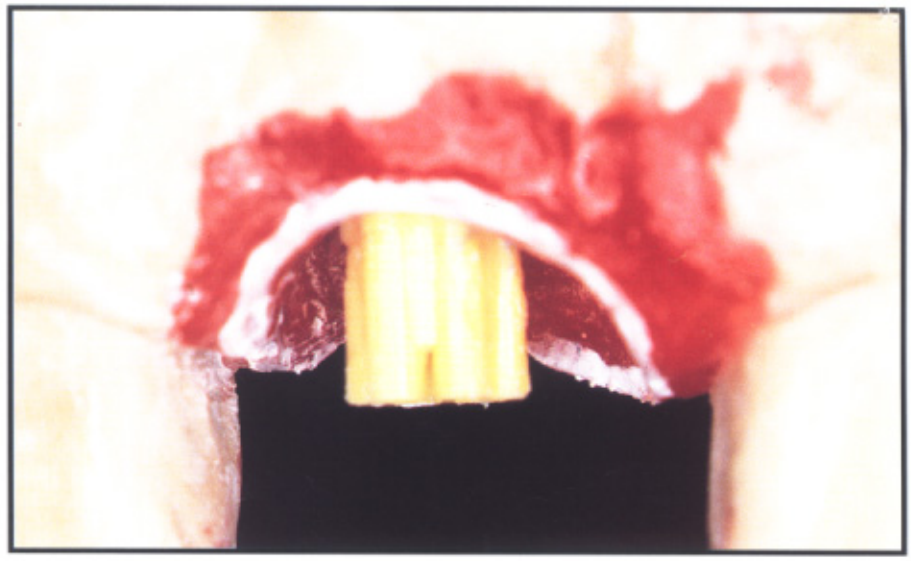

Figure 26. An adequate periabutment shape after the remodeling.

Figure 27. A cervical view of the porcelain crown with the white prefabricated ceramic core in its center.

Figure 28. Lateral view of the ceramic crown. Note the wide buccal emergence profile angle.

Figure 29. Porcelain crown in place. Emergence of the crown is natural and aesthetically acceptable. (Ceramics by Rafi Lahav, CDT, Tel-Aviv.)

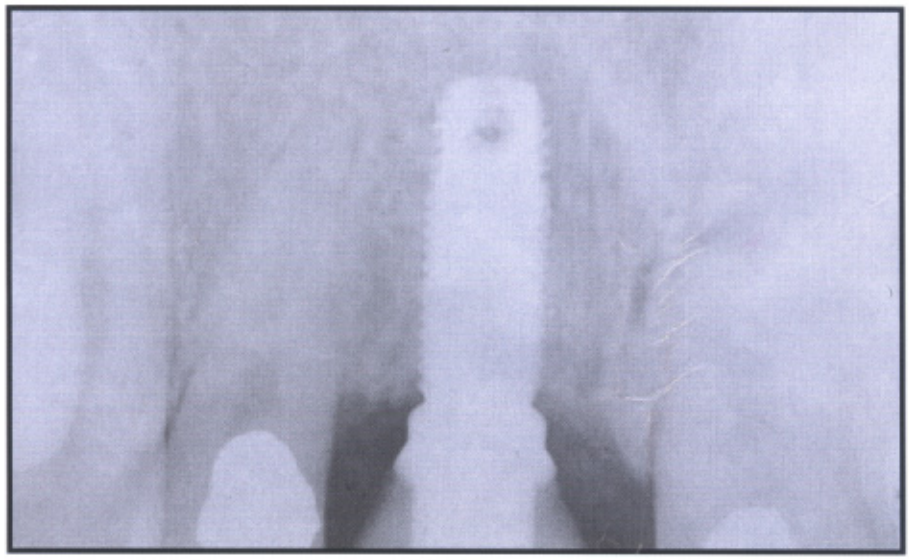

Figure 30. Radiograph of the implant/abutment/crown system exhibits the precise fit of all elements.

Figure 31. Function and phonetic testing.

Emergence Profile Angle

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Distance between implant plane to teeth.
Distance between gingival margins to abutment shoulder.

Step 4. Cementation of the Porcelain Crown

- Remove the acrylic crown and apply paraffin oil to the outer porcelain crown surface.
- Paint a noneugenol temporary cement on the inside.
- Place the crown on the titanium abutment and forcefully compress against gingiva until final seat. As a result, gingiva is blanched and retracted laterally and labially, as the crown contour dictates, to form a new favorable shape of the soft tissue (Figure 22). A symmetrical crown and gingival contour blend with the shapes and proportions of the adjacent teeth.

The provisional acrylic crown acts as a diagnostic tool which aids in the proper carving of the artificial gingiva...

CASE REPORT

- Following extraction of a right central maxillary incisor, Socket Seal Surgery was performed, as described.[1]
- After a 6-month healing period, a Branemark implant was placed.
- The healing abutment was removed.
- An abutment was selected (Cera-One, Nobelpharma, Goteborg, Sweden), placing its shoulder 2 mm apical to the free gingival margin (Figure 23).
- The abutment was screwed in place with torque controller (Nobelpharma, Goteborg, Sweden).
- An impression coping was placed on the abutment, and a tray was loaded with vinylpolysiloxane putty (Express, 3M Dental Products Division, St. Paul, MN, USA).
- Simultaneously, light body impression material was injected in

the mouth, the tray was inserted, held until final set of the silicones, and removed.

- A temporary cap abutment (DCA 161, Nobelpharma, Goteborg, Sweden) was shortened, and a polycarbonate crown (Ion, 3M Dental Products, St. Paul, MN, USA) was trimmed to adapt to the abutment.
- A cold-cured acrylic resin was loaded to the polycarbonate shell, placed over the abutment, and polymerized.
- The temporary crown was removed, adjusted cervically according to the gingival scalloping, and temporarily cemented (Figure 24).
- An abutment replica (DCA 129, Nobelpharma, Goteborg, Sweden) was inserted into the impression coping, a liquid resin was poured around it, and a cast stone was added (Figure 25).
- Peri-abutment replica remodeling was carried out as described to form a favorable gingival contour (Figure 26).
- Using the long ceramic cap (DCA 128, Nobelpharma, Goteborg, Sweden), a porcelain crown was created following the principles described (Figures 27 and 28).
- The crown was tried in for contacts and occlusion, then cemented in place, compressing the gingiva to form the desirable contour (Figure 29). The interdental papillae became thinned and sharpened, and the emergence of the crown appeared natural and aesthetically acceptable. The minute enamel fractures of the adjacent teeth were bonded.
- A radiograph was taken to verify proper seating (Figure 30), and the crown was examined for function (Figure 31).

DISCUSSION

An aesthetic implant-supported restoration is a constant challenge to the restorative dentist. Because of the shape of the implant and its smaller diameter, as compared to the natural root, inevitably a problem occurs: How to construct an artificial crown which will imitate a natural tooth crown form when emerging from the gingiva, while having narrow margins, to fit the abutment to which it is connected.

In natural teeth, the emergence profile angle is relatively straight,[10-12] but any attempt to reproduce this situation in an implant-supported crown will cause a grotesque, unnatural artificial restoration. In order to compensate for the discrepancies between the abutment and natural root diameters, techniques were suggested to remodel the free gingival contour: Application of surgery or wide healing abutment caps may solve some clinical situations, but the results are not always predictable.

Already in the laboratory phase, the Cervical Contouring Concept predetermines the crown contour emerging from the soft tissue due to improved control of the gingival shape. Carving the peri-abutment gingiva as described dictates a completely different form of this crucial crown region, different from the straight cervical contour advised for crowns on natural abutment teeth. Adapting this concept to the fabrication of implant-supported crowns would create a continuous straight emergence profile from the abutment which diverges sharply towards the free gingival margin.[3,13,14] However, the consequent cervical profile causes oral hygiene problems in cervical cleaning of such restorations, and it may also compromise aesthetics.

Providing that sufficient free gingiva matures around the abutment, a wide emergence profile angle of the crown is created according to the Cervical Contouring Concept. Although it compresses the surrounding soft tissue, it is easily maintained plaque-free by flossing the convex cervical crown region. It is accepted that gingiva compressed by a pressure-induced prosthetic system, as it is in pontic areas, should remain healthy without any inflammation symptoms when routine oral hygiene measures are performed.[15]

The peri-abutment gingival tissue is duplicated in the Cervical Contouring Concept by a rigid acrylic and not by a flexible silicone, as has been suggested.[2,3,7,9,14,16-20] This allows improved control of the remodeling process and enables the clinician to add material if overcarving has occurred during the peri-abutment remodeling process.

The human eye recognizes a healthy tissue as pleasant and aesthetic, and it perceives a swollen, red, edematous tissue as unattractive. Unusual major changes in color, texture, and contour are not aesthetically pleasing to the eye, especially when a single anterior maxillary tooth is involved.[21,22]

The cervical contouring concept focuses on shaping the cervical crown region. It facilitates proper construction of an implant-supported crown in spite of the difficulties created by the implant placement and its shape. In cases where the desired gingival profile is doubtful, it is advisable to first produce a transitional acrylic crown according to the remodeled resin gingiva. The result can then be checked in the mouth prior to creating the porcelain crown. The provisional acrylic crown acts as a diagnostic tool which aids in the proper carving of the artificial gingiva until an optimal contour is created. The result will then be duplicated in the final porcelain crown.

Because of the obstacles in creating an aesthetic single implant-supported crown restoration, understanding the objective limitations and intercepting each obstacle are essential for comprehensive treatment planning. Such attention will result in predictably functional restorations and an aesthetically appealing smile.

CONCLUSION

The era of implant dentistry has dawned. The use of single-unit implants has become a legitimate option in fulfilling specific rehabilitation needs, especially in the anterior region of the mouth. The aesthetic demands of this treatment modality, limited by the characteristics of the implant systems available, dictate certain modifications of the current treatment phases, both surgically and prosthetically. The socket-seal surgery, combined with the cervical contouring concept presented herewith, are valuable additional tools in our armamentarium when facing the ever-increasing patient demands for a simple and better thought-out treatment, yet ensuing in highly aesthetic results.

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PRACTICAL PERIODONTICS & AESTHETIC DENTISTRY

The 10 multiple choice questions for this exercise are based on the article "A modified surgical/prosthetic approach for optimal single implant-supported crown. Part II - The cervical contouring concept" by Nitzan Bichacho, DMD, and Cobi J. Landsberg, DMD. This article is on Pages 35-40. Answers for this exercise will be published in the June/July, 1994, issue of *PP&A*.

Self-Instruction Exercise No. 57

LEARNING OBJECTIVES:

Part II of this article presents a modified prosthetic technique - the "cervical contouring concept" (CCC). The clinical and laboratory prosthetic procedures are presented, and re-shaping of the gingival profile is discussed. Upon completing the exercise, the reader should have a broader knowledge of:

- The principles of CCC.
- Clinical and laboratory implementation of these principles.

1. A straight emergence profile is:
   a. Recommended for anterior implant-supported crown.
   b. Recommended for posterior implant-supported crown.
   c. Not recommended for crowns.
   d. Recommended for crowns on natural teeth abutments.

2. The gingival profile around the implant is reshaped:
   a. For functional reasons.
   b. For aesthetic reasons.
   c. During Stage 1 surgery.
   d. During Stage 2 surgery.

3. The transmucosal abutment shoulder should be placed:
   a. At the free gingival margin level.
   b. Supragingival 1 to 2 mm.
   c. Subgingival 1 to 2 mm.
   d. Subgingival 2 to 3 mm.

4. The gingival replica in the model is composed of:
   a. Cast stone.
   b. Vinylpolysiloxane.
   c. Acrylic resin.
   d. Polyether.

5. The peri-abutment volume removed is:
   a. Conical.
   b. Cylindrical.
   c. Ball-shaped.
   d. Ring-shaped.

6. The cervical part of the crown:
   a. Is completed in the first firing session.
   b. Duplicates the acrylic remodeled bed.
   c. Is composed of shoulder porcelain.
   d. Is composed of highly polished gold.

7. The emergence profile angle:
   a. Decreases as distance between implant plane to teeth decreases.
   b. Decreases as distance between implant plane to teeth increases.
   c. Increases as distance between gingival margins to abutment shoulder increases.
   d. Should always be straight.

8. The porcelain crown is cemented with:
   a. Composite luting cement.
   b. Non-eugenol temporary cement.
   c. Glass-ionomer cement.
   d. Zinc-oxy-phosphate cement.

9. The soft tissue surrounding the crown:
   a. Remains blanched.
   b. Undergoes desquamation.
   c. Reforms to a new favorable shape.
   d. Might be slightly inflamed.

10. The cemented crown margins:
    a. Should sit precisely on the abutment shoulder.
    b. Should stay 0.3 mm coronal to abutment shoulder.
    c. Should stay 1 mm coronal to abutment shoulder.
    d. Cannot be verified for exact location.

THE LOOPHOLES IN MANDATORY CONTINUING EDUCATION

By Norman L. Feigenbaum, DDS

Sometimes it seems like a joke! Several years ago I was the "hired" clinician on a seminar cruise. I have no problem with professionals mixing their pleasure with their business. A lecture cruise is a very pleasant way to learn and have a good time. What bothered me was that on this particular cruise there were two dentists who were reportedly "on board" but hadn't shown up at any of the presentations. The short-lived mystery was cleared up when one of the attendees ran into the pair in the casino one night. The two dentists were a "just-married" couple who were taking the cruise as a honeymoon. Well...congratulations to them on the recent marriage, but these dentists were still AWOL.

THE COCKTAIL PARTY

On the last night of the cruise prior to the captain's party, the seminar company had a cocktail party for the attendees. We handed out "diplomas" for attendance and proof of course completion. Our honeymooners were there. The seminar company's director had a problem. The dentist couple wanted their certificates as proof of continuing education, which, I believe, is a requirement in their native state of New York. The director asked me to sign their certificates. At first I said no...they had not attended a minute of the seminar. He then said that they would request that their money be returned if I didn't sign it. He reminded me that since it was the first seminar of his new business and not too highly attended, he really needed their tuition money to make ends meet.

MORALITY AND MONEY

It was another moment when morality and money were in direct conflict. I admit my guilt. I signed their certificates with an aching heart. Once again, I didn't have the strength of my convictions. The only saving grace of this episode is that they received very little for what they paid. Perhaps they will pay the price in lack of knowledge one day. This anecdote is only a minute part of a very large conspiracy by professionals to meet requirements without actually having to learn something.

PHYSICIANS DO IT TOO

Two years ago, there was a segment on "60 Minutes" presenting the sham of continuing education courses for physicians. The emphasis was on the fact that the combined pleasure/business trips were actually an attempt to make vacations a tax deduction. The companies that ran these "seminar-vacations" were making money without offering any real education. The physicians were being offered video tapes to watch at their vacation hotel.


Norman L. Feigenbaum, DDS

HE THAT [WHO] WAS ONLY TAUGHT BY HIMSELF HAD A FOOL TO [FOR] HIS MASTER.
BEN JOHNSON

ACCREDITATION BY CODED NUMBERS

At state meetings and the national Academy of General Dentistry's yearly conventions, there are code numbers distributed for the courses at or near the end of the course being given. This is done because dentists abuse normal means of accreditation. I don't mean to indict all of us. However, if the average percentage of low-ethics dentists is only 25%, that's appalling.

QUALITY CARE TAKES A DIVE

If the trend of postgraduate noneducation continues, it undermines the quality of care. It needs to be policed and stopped. The problem is: How to do it? Will we be forced to take yearly examinations? Why is it necessary to make continuing education a requirement? Do we possess enough ethical standards to be self governing? In an ideal world, we all would seek to be up-to-date with the latest materials, equipment, and techniques.

ADVERTISING OUR DIFFERENCES

Part of the problem is that our state rules do not allow us to exploit some of our achievements, albeit in an effort to be "fair." In my state of Florida, the state board would be down on you in one second if you showed any "superiority" in a public way. If a dentist has truly taken many advanced courses, why shouldn't that dentist be allowed to disclose it in writing?

LOOKING FOR ANSWERS

Let's not be afraid to change a system that needs change. We could construct a system that would allow us to list our complete postgraduate education in a way that would be meaningful to the public. The state society could publish a list of acceptable and nonacceptable courses and techniques that would be made freely available to the public. We should be able to list the courses and dates that the courses were taken. We should sign in at the beginning of a course, at the breaks, lunch, and at the end. The courses should be accredited by an appointed board. Business-pleasure trips should have a ratio of hours-of-learning versus 9-5 free time. The dentists who are regular course takers will shout "aye" to this proposal. The non-course takers will say "nay." What will you say?