MiCD: Do no harm cosmetic dentistry

By Dr Sushil Koirala, Nepal

The demand for cosmetic dentistry is a growing trend globally. Increased media coverage, the availability of free online information and the improved economic status of the general public has led to a dramatic increase in patients' aesthetic expectations, desires and demands. Today, a growing, healthy and vibrant smile is no longer the exclusive domain of the rich and famous; hence, many general practitioners are now being forced to incorporate various aesthetic and cosmetic dental treatment modalities into their daily practices to meet the growing demand of patients.

Cosmetic dentistry is a science-based art guided by the desire of the patient. Many young clinicians who plan to incorporate it into their practice are confused about what they and their patients actually wish to achieve. It is to be noted that the treatment modalities of any health care service should be aimed at the establishment of health and the conservation of the human body with its natural function and aesthetics. However, it is worrying to note that the treatment philosophy and technique adopted by many cosmetic dentists around the world tend towards macro-invasive protocols, and millions of healthy teeth are aggressively prepared each year for the sake of creating beautiful smiles.

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The practice philosophy adopted by the clinic and the professional team members generally guides the overall output of the practice. Minimalistic invasive cosmetic dentistry (MiCD), a do no harm practice philosophy, has four fundamental components: level of care, quality of operator (dentist), protocol adopted and technology selected, which must all be respected in daily clinical practice. Adopting this holistic medical science practice philosophy is not an easy task, as it requires a change in the mindset of professionals.

In Parts I and II, I explain MiCD, do no harm cosmetic dentistry, based on my Vedic Smile concept, which I have been practising successfully in Nepal for the last 20 years, and advocating globally since 2009 as the MiCD global mission. It is to be noted that both parts are based on fundamental science (truth and available evidence), clinical experience and the common sense required in holistic dentistry.

Cosmetic dentistry, a global trend

The prevalence and severity of dental decay have been declining over the last decades in many developed countries and this trend is shifting towards developing countries as well. With increased media coverage, the availability of free online information, public awareness has fuelled the demand for cosmetic dentistry globally. Now, a glowing, healthy and vibrant smile is no longer the exclusive domain of the rich and famous! The population of beauty- and oral health-conscious people is increasing every year and data from various sources shows that the coming generations of children, especially from the middle- to higher-income population, will have fewer decayed teeth and will need less complex restorative dental care as they age. These changing patterns of dental care needs will bring about a major shift in the nature of dental services from traditional restorative care to cosmetic and preventive services.

The increased market demand for smile aesthetics among patients is forcing general practitioners of today to incorporate the art and science of cosmetic dentistry into their practice. Cosmetic dentistry is not yet recognised as a separate clinical specialty like orthodontics, periodontics or paediatric dentistry. Cosmetic dentistry is synonymous with multidisciplinary dentistry, as its success and failure are related to the patient's psychology, health, function and aesthetics. Ethical, high-standard cosmetic dentistry skill training of clinicians is essential for the increased global market of cosmetic dentistry and its promotion. It is widely seen that the treatment modalities of contemporary cosmetic dentistry are tending towards more-invasive procedures with an over-utilisation of full crowns, bridges, dentine veneers, and invasive periodontal and oral aesthetic surgery, while neglecting long-term oral health, actual aesthetic needs and the characteristics of the patient. These aggressive treatment modalities are indirectly degrading social trust in dentistry, owing to the trend of fulfilling the cosmetic demands of patients without ethical consideration and sufficient scientific background and promoting the “the more you replace, the more you earn” or “more is more” mindset in dentistry.

Changing the professional mindset of the practising clinician is not an easy task. It is just like quitting smoking for a heavy smoker. In order to practise healthy dentistry, one must be groomed, starting from dental school education, with moral values, a high ethical standard, a positive attitude and a patient-centred practice philosophy. A student reflects the mindset of his or her teachers, and a teacher or mentor with comprehensive knowledge, clinical skills, honesty and humanity is difficult to find in today’s business-oriented dental education. I believe that knowledge should be free and skill training must be useful and easily affordable to our young practising clinicians around the world. Compromised university dental education and expensive private skill training with biased mentoring have been promoting health-compromising treatment protocols and costly diagnostic, preventive and treatment technologies. This highly business-oriented trend will promote a change in the mindset of practising clinicians to adopt more-aggressive and invasive dental treatment modalities, leading to the practice of unhealthy dentistry in the long term.

Aesthetic versus cosmetic dentistry

The words “aesthetics” and “cosmetic” are viewed as synonyms by many cosmetic dentists. However, it is necessary to understand the core difference in meaning. The Oxford dictionary defines “aesthetics” as “the branch of philosophy which deals...
with questions of beauty and artistic taste and “cosmetic” as “improving only the appearances of something.”

In dentistry, “aesthetics” explains the fundamental taste of a person concerning beauty, whereas “cosmetic” deals with the superficial or external enhancement of beauty. Therefore, aesthetic dentistry falls under need-based dental service, and it is generally guided by the sex, race and age (SRA factors) of the patient. However, cosmetic dentistry, which is influenced by perception, personality and desires (PFD factors), can be categorised as want or demand-based dental service. For example, a patient’s request to replace old amalgam restorations with tooth-coloured restorative materials can be considered an aesthetic requirement or demand. The request of an old woman for pearly white teeth and the ideal smile design is for more than an aesthetic requirement, and must be considered a cosmetic demand or requirement.

In my clinical practice, I divide aesthetic and cosmetic clinical cases into three different categories:

1. Preventive, or support based: treatment prevents or intercepts the diseases, defects, habits and other factors that may adversely affect the existing or the future smile aesthetics of the patient.

2. Nature-mimetic, or need based: treatment is carried out to restore or mimic the natural aesthetics, bearing the SRA factors of the patient in mind, and the treatment generally enhances the health and function of the oral tissue.

3. Cosmetic, or desire based: treatment is performed to enhance or supplement the aesthetic components of the smile; hence, the treatment outcome of cosmetic treatment may not be in harmony with the patient’s SRA factors as in nature-mimetic dentistry, and cosmetic treatment may not necessarily be beneficial to the health and function of the oral tissue.

**Practice philosophy in dentistry: The mindset**

The majority of dental schools around the world focus on teaching knowledge and skills in dental medicine that are based on contemporary dental science and art. Dental education does not give due consideration to healthy dental practice philosophy, owing to various factors, such as the need to choose one’s practice philosophy and the domination of business rather than service-oriented dental practice in the global market. However, quality and healthy clinical practice is always a dream of a good clinician, and establishing such practice requires an unbiased vision, learning and serving attitudes, and dedication from the dentist. What we understand that science and art in dentistry have no meaning if practised by an unethical professional, who does not respect the overall health of the patient. Any scientific advancement in technology has positive and negative sides; hence, if not applied properly, it may adversely affect the profession and may become a threat.

1. I believe that a clinic or treatment centre must establish its practice philosophy according to its objectives. What a clinician wants and the kind of services he or she wants to deliver to his or her patients guides the clinic. Practically, the practice philosophy in dentistry can be classified into two different categories, depending on the mindset of the operator:

    - Patient centred
    - Clinicians with this kind of mindset generally have a do no harm dental practice (Fig 1). Professional honesty and humanity are the fundamental principles of such a practice. Operators with this mindset enjoy sharing their clinical knowledge and skills with their professional friends and junior colleagues to promote patient-centred clinical practice in society. This group of clinicians firmly believes in the word-of-mouth approach to practice marketing and always thinks of the patient’s long-term health, function and aesthetics. Clinicians practising no harm dentistry are generally cheerful, happy and healthy in their professional life.

    - Financially focused
    - Clinicians with this kind of mindset practice financially focused dentistry and adopt various kinds of direct marketing approaches to sell their dentistry like commodity in the market rather than a health care service. Practitioners in this group generally achieve a secure financial position quickly, however, it is frequently seen that they develop chronic stress, burnout syndrome, depression, frustration and professional guilt, leading to compromised health and happiness in their professional life.

**Cosmetic treatment**

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**Cosmetic News**

Cosmetic dentistry and cosmetic treatment protocol that I apply in my practice. Since late 2009, I have been promoting my practice philosophy and clinical protocol in South Asia, and started the MiCD Global Academy in 2012 with the help of like-minded friends, who also practise a similar kind of holistic dentistry around the world. The MiCD Global Academy has a mission to share clinical knowledge and fundamental clinical skills free of charge with all clinicians who desire to practise no harm cosmetic dentistry for better patient care and to enhance their happiness in their professional life.

**Three-way test: Questions for your conscience**

Cosmetic dentists can make errors in practice in two ways, first owing to a lack of the required professional knowledge and skills, and second owing to a lack of professional honesty and humanity. The first one can be eliminated with good education and proper training, but the second one demands a moral shift in mindset, with a high level of consciousness in professional ethics, attitudes and respect towards the patient’s long-term health, function and natural beauty.

I apply a simple yet very powerful test to keep myself stress- and guilt-free and within the boundaries of professional ethics, honesty and humanity when planning a dental treatment plan to my patient. Clinicians can apply the three-way test
day, we have been applying the concept of "extension in dentistry" in the name of prevention, retention, func- tion, aesthetic need and cosmetic desire, and caries removal. It is not possible to focus on one treatment that is effective for all cases. Instead, it is important to tailor the treatment to the specific needs of the patient. In the "extension in dentistry" approach, the treatment is designed to address the specific needs of the patient, rather than treating the symptoms of the disease. This approach is based on the idea that prevention is better than treatment, and that it is important to address the underlying causes of the disease, rather than just treating the symptoms.

The three-way test consists of three basic questions:

1. Would I use this treatment for a member of my own family in this situation?
2. Will the patient be happy with the treatment plan?
3. Is the patient competent enough to take up the case?

If the answers to all three questions are positive, then the treatment is considered appropriate in relation to the patient's specific needs.

The introduction of procedures selected in cosmetic dentistry depends on the level of smile defect, type of smile design, proposed treatment plan, and various treatment complexity. MICS uses the most conservative smile enhancement procedure possible. The level of invasiveness in cosmetic dentistry can be classified into four types, namely non-invasive, minimally invasive, invasive, and extensive invasive. The treatment options and their clinical and biological factors must be considered.

Invasive dentistry is always minimal, safe, and healthy. However, non-invasive and minimally invasive procedures are more commonly used in cosmetic dentistry. Minimally invasive dentistry was developed in the 1980s by restorative experts and founded on sound evidence-based principles. In dentistry, it has focused mainly on prevention, remineralisation, and minimal dental intervention in caries management and non-invasive surgical attention to other oral health problems. For this reason, I developed the MiCD concept and its treatment protocol in 2000. MiCD integrates the evidence-based minimally invasive philosophy into aesthetic dentistry in the hope that it will help practitioners achieve optimum outcomes in terms of health, function, and aesthetics with minimum treatment intervention and optimum patient satisfaction. The MiCD concept and its treatment protocol are summarised in Table III. The MiCD treatment protocol and clinical technique are summarised in Table III. The MiCD treatment protocol and clinical technique are summarised in Table IV.

MiCD treatment protocol and clinical technique

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Introduction: Smile analysis and aesthetic design

Dental facial aesthetics can be defined in three ways.

Traditionally, dental and facial aesthetics have been defined in terms of macro- and micro-elements. Macro-aesthetics encompasses the interrelationships between the face, lips, gingiva, and teeth and the perception that the colour and form are pleasing. Micro-aesthetics involves the aesthetics of an individual tooth and the perception that the colour and form are pleasing.

Historically, accepted smile design concepts and smile parameters have helped to design aesthetic treatments. These specific measurements of form, colour, and tooth/aesthetic element aid in transferring smile design information between the dentist, ceramist, and patient. Aesthetics in dentistry can encompass a broad area—known as the aesthetic zone.

Rufenacht delineated smile analysis into facial aesthetics, dentofacial aesthetics, and dental aesthetics, encompassing the macro- and micro-elements described in the first definition above. Further classification identifies five levels of aesthetics: facial, orofacial, oral, dentogingival, and dental (Tab I).1

Initiating smile analysis: Evaluating facial and orofacial aesthetics

The smile analysis/design process begins at the macro level, examining the patient's face first, progressing to an evaluation of the individual teeth, and finally moving to material selection considerations. Multiple photographic views (e.g., facial, sagittal) facilitate this analysis.

At the macro level, facial elements are evaluated for form and balance, with an emphasis on how they may be affected by dental treatment.1 4 During the macro-analysis, the balance of the facial thirds is examined (Fig. 1). If something appears unbalanced in any one of those zones, the face and/or smile will appear unesthetic.

Such evaluations help determine the extent and type of treatment necessary to affect the aesthetic changes desired. Depending on the complexity and uniqueness of a given case, orthodontics could be considered when restorative treatment alone would not produce the desired results (Fig. 3), such as when facial height is an issue and the lower third is affected. In other cases—but not all—restorative treatment could alter the vertical dimension of occlusion to open the bite and enhance aesthetics when a patient presents with relatively even facial thirds (Fig. 5).

Components of smile analysis and aesthetic design

Table 1: Components of smile analysis and aesthetic design.

<table>
<thead>
<tr>
<th>Facial aesthetics</th>
<th>Total facial form and balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orofacial aesthetics</td>
<td>Maxillomandibular relationship to the face and the dental midline relationship to the face pertaining to the teeth, mouth and gingiva</td>
</tr>
<tr>
<td>Oral aesthetics</td>
<td>Labial, dental, gingival, the relationships of the lips to the arches, gingiva, and teeth</td>
</tr>
<tr>
<td>Dentogingival aesthetics</td>
<td>Relationship of the gingiva to the teeth collectively and individually</td>
</tr>
<tr>
<td>Dental aesthetics</td>
<td>Macro- and micro-aesthetics, both inter- and intra-tooth</td>
</tr>
</tbody>
</table>

Photoshop provides an effective and inexpensive way to design a digital smile with proper patient input. To start creating custom tooth grids, open an image of an attractive smile in Photoshop and create a separate transparent layer. Then use a two-pixel stroked line (with colour set to black) to trace your selection. Make sure the transparent layer is the active working layer.
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Evaluating oral aesthetics

The dentolabial gingival relation, which is considered oral aesthetics, has traditionally been the starting point for treatment planning. This process begins by determining the ideal maxillary incisal edge position (Fig. 4). This is accomplished by understanding the incisal edge position relative to several different landmarks. The following questions can be used to determine the ideal incisal edge position:

- Where is the face in the maxillary incisal edges placed?
- What is the proper tooth display, both statically and dynamically?
- What is the proper intra- and inter-tooth relationship (e.g., length and size of teeth, arch form)?
- Can the ideal position be achieved with restorative dentistry alone, or is orthodontics needed?

In order to facilitate smile evaluation based on these landmarks, the rule of 4.2.1—which refers to the amount of maxillary central display when the lips are at rest, the amount of gingival tissue revealed, and the amount of maxillary central display—is orthodontics needed. The followings

Dentogingival aesthetics

Gingival margin placement and the scalloped shape, in particular, are well discussed in the literature. As gingival heights are measured from the base of the gingival margin to the cementoenamel junction, in order to establish an aesthetic intra- and inter-tooth relationship, with the two central incisors being most important:

- The midline only should be moved to establish an aesthetic intra- and inter-tooth relationship, with the two central incisors being most important.
- The midline only should be moved restoratively up to the root of the adjacent tooth if the midline is within 2 mm of the center of the face, it will be aesthetically pleasing.
- The midline should be vertical when the incisal edge is in the posture.

Evaluating dental aesthetics

Part of evaluating dental aesthetics for smile design is choosing tooth shapes for patients based on their facial characteristics (e.g., long and dolichocephalic, or brachycephalic). When patients present with a square face, a tooth with an 80% width-to-length ratio would be more appropriate. The width-to-length ratio most often discussed in the literature is between 75% and 80%, but aesthetic smiles could demonstrate ratios between 70% and 75% or between 80% and 85%.

Several rules can be applied when considering modifying the midline to create an aesthetic smile design:

- The midline only should be moved to establish an aesthetic intra- and inter-tooth relationship, with the two central incisors being most important.
- The midline only should be moved restoratively up to the root of the adjacent tooth if the midline is within 2 mm of the center of the face, it will be aesthetically pleasing.
- The midline should be vertical when the incisal edge is in the posture.

The length of teeth has a affect on aesthetics. Maxillary central incisors average between 10 mm and 11 mm in length. According to Magne, the average age length of an unworn maxillary central to the cementoenamel junction is slightly over 11 mm. The aesthetic zone for a central incisor length, according to the authors, is between 10.5 mm and 12 mm, with 11 mm being a good starting point. Lateral incisors are between 11 mm and a maximum of 2 mm shorter than the central incisors, with the canines slightly shorter than the central incisors by between 0.5 mm and 1 mm (Fig. 14).

The inter-tooth relationship, or arch form, involves the golden proportion and position of tooth width. Although it is a good beginning, it does not reflect natural tooth proportions. Natural proportions demonstrate a lateral incisor between 60% and 70% of the width of the central incisor, and this is larger than the golden proportion. However, a rule guiding proportions is that the canine and all teeth distal should be perceived to occupy less visual space (Fig. 12). Another rule to help maintain proportions throughout the arch is to use 2:3:4:5; the lateral incisor is two-thirds of the central incisor and the canine is four-fifths of the lateral incisor, with some latitude within those spaces (Fig. 13). Finally, contact areas can be moved restoratively up to the root of the adjacent tooth. Beyond that, orthodontics is required (Fig. 14).

Creating a digitalsmile designed in Photoshop

Although there are digital smile design services available to dentists for a fee, it is possible to use Photoshop CS6 software (Adobe Systems) to create and demonstrate for patients the proposed smile design. It starts by creating tooth grids—predesigned tooth templates in different width-to-length ratios (e.g., 75%, 75% central, 80% central) that can be incorporated into a custom smile design based on patient characteristics. You can create as many different tooth grids as you like with different tooth proportions in the aesthetic zone. Once completed, you will not have to do this step again, since you will save the created tooth grids and use them to create a new desired outline form for the desired teeth.

Follow these recommended steps:

1. To begin creating a tooth grid, use a cheek retracted image of an attractive smile as a basis (e.g., one with a 75% width-to-length ratio). Open the image in Photoshop and create a new clear transparent layer on top of the teeth (Fig. 15). This transparent layer will enable the image to be outlined without the work being embedded into the image.

2. Name the layer appropriately and, when prompted to identify your choice of fill, choose “no fill,” since the layer will be transparent, except for the tracing of the tooth grid.

3. To begin tracing the tooth grid, activate a selection tool, move to the tool palette, and select either the polygonal lasso tool or the magnetic lasso tool. In the authors’ opinion, the polygonal works best.
Once activated, zoom in (Fig. 16) and trace the teeth with the lasso tool.

To create a pencil outline of the tooth, with the transparent layer activated, click on the edit menu in the menu bar; in the edit drop-down menu, select “stroke”; choose black for colour, and select a two- pixel stroke pencile (Fig. 17), which will create a perfect tracing of your selection. Click “OK” to stroke the selection. (Trace with the lasso selection tool) one tooth at a time and then stroke (Fig. 18) Select and stroke (trace) the teeth in the second premolar (the first molar is acceptable, (Fig. 19).

The image should be sized now for easy future use as a smile design.

In the author’s experience, it is best to first select the size of the image to a height of 720 pixels (Fig. 19) by opening up the image size menu and selecting 720 pixels for the height. The width will adjust proportionately.

At this time, the tooth grid tracing can be saved, without the image of the teeth, by double-clicking on the layer of the tooth image: Adialog box reading “new layer” will appear, click “OK” This process unlocks the layer of the teeth so it can be removed. Drag the layer of the teeth to the trash, leaving only the layer with the tracing of the teeth (Fig. 20). In the file menu, click “save as” and choose “.png” or “.psd” (Photoshop) as the file type. This “save as” and choose “.png” or “.psd” (Photoshop) as the file type. This .psd file will keep your original file intact and can be opened in the future, and it will save the transparency. You do not want to save it as a JPEG, since this would create a white background around the tracing. Name the file appropriately (e.g., “75 S.W. L. central”)

- By tracing several patients’ teeth that have tooth size and proportion in the aesthetic zone and saving them, you can create a library of tooth grids to custom design new teeth for your patients who require smile designs.

The Photoshop smile design technique

The Photoshop Smile Design (PSD) technique can be done on any image, and images can be combined to show the full face of the lower third with lips on or lips off. This article demonstrates how to perform the technique on the cheek-retracted view.

The first step in the PSD technique is to create a digital conversion of the actual tooth length and width, and the polishing factor, to determine the proposed new length and proportion of the teeth.

Determining digital tooth size

To determine digital tooth size, follow these steps:

- Create a conversion factor by dividing the proposed length developed from the smile analysis by the existing length of the tooth. (Fig. 21)
- The patient’s tooth can be measured in the mouth or on the cast (Fig. 22) if the length measures 8.5 mm but needs to be at 11 mm for an aesthetic smile, divide it by 8.5. The conversion factor equals 1.29, a 29% digital increase length-wise.

To enlarge or shrink the tooth grid, select all the teeth to be smile designed (cheek-retracted view) by clicking on each tooth to select all of them, using the custom tooth grid. (Fig. 28)

- Select and drag the ruler tool from the top to the bottom of the tooth to generate a vertical number, in this case 170 pixels (Fig. 24). Multiply the number of pixels by the conversion factor. In this case, 170 x 1.29 = 220 pixels; 220 pixels is digitally equivalent to 1 mm (Fig. 25). Determine the digital tooth width using the same formula.

- Create a new layer; leave it transparent, and mark the measurement with the pencil tool (Fig. 26).

Applying a new proposed tooth form

Next, follow these steps:

- After performing the smile analysis and digital measurements, choose a custom tooth grid appropriate for the patient. Select a tooth grid based on the width-to-length ratio of the planned teeth (e.g., 85/70 to 90/80 or 80/65/70). Open the image of the chosen tooth grid in Photoshop and drag the grid into the image of the teeth to be smile designed (Fig. 27). (Fig. 26)

- If the shape or length is deemed inappropriate, press the command button (control button for PC) and “z” to delete and select a suitable choice.

- Depending on the original image size, the tooth grid may be proportionally too big or too small. To enlarge or shrink the tooth grid created (with the layer activated), press command (or control) and “z” to bring up the free transform function. While holding the shift key (holding the shift key allows you to transform the object proportionally), click and drag a corner left or right to expand or contract the custom tooth grid.

- Adjust the size of the grid so that the outlines of the central incisors have the new proposed length. Move the grid as necessary using the move tool so that the incisal edge of the tooth grid lines up with the proposed new length (Fig. 28).

- Areas of the grid can be individually altered using the liquify tool (Fig. 29).

Digitally creating new aesthetic teeth

Next, follow these suggested steps:

- With the new tooth grid layer and the magic wand tool both activated, click on each tooth to select all of the teeth in the grid (Fig. 30). Expand the selection by two pixels by clicking on the layer menu, click “select” > expand (Fig. 31).

- Select the brightness/contrast adjustment in the brightness/contrast menu; click “image > adjustements > brightness/contrast.”

- Performing the changes on only one side of the mouth allows the patient to compare the new smile design to his/her original teeth before agreeing to treatment.

Create a copy

To save the information you have created for presentation to the patient, follow these tips:

- Go to “file” and select “save as.”
- When the menu appears, click on the “’copy’ box.”
- Name the file at that step.
- Save it as a JPEG file type.
- Select a size where you want it saved.
- Click “save.”

A file of the current state of the image will be created in the designated area. You can now continue working on the image and save again at any point you want.

Conclusion

Knowledge of smile design, coupled with new and innovative dental technologies, allows dentists to diagnose, plan, create, and deliver aesthetically pleasing new smiles. Simultaneously, digital dentistry is enabling dentists to provide what patients demand: quick, comfortable, and predictable dental restorations that satisfy their aesthetic needs.

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