Dental Photography. Part II
Protocol for shade taking and communication with the lab

By Dr. Eduardo Mahn, Chile

Abstract

Part I of this article discussed the basic equipment that is necessary for dental photography. In addition, a few examples of pictures taken that were better than others for the same situation were also shown. In part II, a protocol of taking digital photographs will be presented which has been of great help to the author, specifically in achieving the right shade and value.

It is based on standardized pictures that should be taken in order to show certain individual characteristics of the tooth to be treated and standardized comparisons of the shade tabs and the natural tooth structures in order to give the technician more information than the usual A2 or A3 written on a piece of paper.

Shade taking

The evolution in digital photography and the possibility of taking pictures and evaluating them immediately as well as almost instantaneous access of the information by someone located off-site in the same city or even another country, we have a great resource available that can help us achieve the right shade of our indirect restorations. Standardized high quality photographs are also an advantage when the shade is taken for a direct restoration - for example a direct veneer or a class IV.

In this case a picture can really help the clinician identify the opalescent areas and the halo-effect of the adjacent tooth, before re-doing the restoration (Figure 1).

Dental shade taking at the dental lab or in the dental practice can be frustrating as most dentists do not really know how to use the shade guide when they finish their undergraduate studies. In particular, if work has to be redone, because the clinician does not know what was done incorrectly or how to obtain the right shade. Dental shade guides are used by dentists, dental assistants and dental laboratory technicians to communicate the right shade. Dental shade guides are used by dentists, dental assistants and dental laboratory technicians to communicate the proper tooth color, translucency, and brightness.

However, many variables come into play no matter what system you decide to use. Before even starting to think about shade taking, you need to answer an extremely simple and obvious question: are you using ex- actly the same shade system at the laboratory? There are many shade taking systems available, with variations in the shades between different manufacturer, even though the concept may be the same.

They are also manufactured from different materials with different optical properties. For example, some labs are familiar with the ChromaScope system, most of the dentists with the A-D shade guide, while the younger generation of dentists learned with the 3D master shade guide. The role of a shade guide is to help standardize the perception and so facilitate the communication in order to match the shade of the natural tooth with the required restoration.

Shade guides are not a perfect representation of what is actually seen but are close enough to identify a range of tooth colors. The best tool for identifying and communicating the correct dental shade. Tooth color can be referred to as an A3 or A2, between a B2 and a B1, describing the respective tooth color closest to the one being restored. It is always best to get the patient to the dental lab and have a custom shade taken, if possible, particularly for the more difficult cases.

However, in most of the cases this is not possible, due to unwillingness of the patient to spend time going to the lab, or the location of the lab not being in close proximity.

The use of shade guides should be used in conjunction with digital photography if no direct light is projected to the mouth and the shade tabs, the main light source will be the flash of the camera, which has always the same temperature (between 5500° and 6000°K) and can be used by the dentist in the clinic and the technician in the lab. When pictures are taken under different light conditions, the variations between the same shades can be considerable. A good photo for both the dentist and the lab technician can be obtained by two photos look at the tooth color under the same conditions. The technician compares the color of the restoration with the shade guide, he can take a picture that will create an image to be used as a comparison under the same light conditions as the natural tooth in the investment by the clinician (Figures 3 - 5).

Due to the flash of the camera, the technician can then compare, under the same light conditions as the clinician, whether the restorations look similar to the original shade tab sent by the clinician. (Figure 6). Veneers by CDT (Jürgen Seger, Liechtenstein)

Tooth Color Basics

Color has two basic characteristics. Hue and Chroma. Natural tooth color also displays these same characteristics. Hue can be defined as the actual color such, as yellow or gray. Chroma is the intensity of that color and is sometimes called saturation. Hue and Chroma are typically represented by a shade guide in terms of which color comes closest to the actual tooth being measured. For example, shade guides will have a range of A1 to A4 or B1 to B4, plus C and D shades (Fig. 2).

Value is the brightness of a tooth. It is therefore given a separate classification than color when communicating shade. Teeth also exhibit translucency and can be measured by how much light can pass through different sections of a tooth. Shade taking problems arise because most natural teeth are not an exact match to a shade guide, so shade guides definitely express tooth translucency.
and value. In many cases, when it
decided that a tooth has a certain
shade, the VUE and the Chroma are
communicated to the lab, but never
the value and this is where the
problems arise.

Very few crowns are accepted if the
value is incorrect, while moderate
inaccuracies in chroma and hue
gain go unnoticed. For this reason
the shade taking protocol needs to
be based on this information be-
ing communicated to the lab in the
most accurate way possible.

Before the shade is taken conven-
tionally or a picture is taken for the
same purpose, several factors need
to be controlled:

1. If patient is wearing bright colored
clothing, drape him or her with a
neutral colored cover.

2. Have patient remove lipstick and
other make-up, as well as eyewear.

3. If patient is wearing bright colored

clothing, drape him or her with a
neutral colored cover.

4. The shade taking should be done
at the beginning of the appoint-
ment, so that teeth are moist (the pa-
tient must lick their teeth constantly
before starting the treatment
itself. The same applies for pictures
extraorally, because of the large in-
fluence of the reds in shade taking.

5. The operatory light should be
turned off or pointed in another
direction. It must not focus on the
patient.

6. The room light conditions should
have a temperature of 5000-6500°
K. (When parameters are taken, these
parameters are no longer relevant,
because the light of the flash will
prevail).

7. Obtain value levels by squinting.
8. Women are far less likely to be
color blind than men, so it is a good
idea to have your assistant assist in
shade taking decisions (assuming
that the assistant is a woman and not
color blind).

In Part 1 of this article, the neces-
sary equipment and accessories for
adequate intraoral pictures was dis-
cussed. Please refer to it for the neces-
sary information if you are planning
to purchase adequate equipment.

Once the patient is ready, place the
shade tabs in front of the anterior
teeth, before starting the treatment
itself. The same applies for pictures
with lips. It is important to repeat
the same protocol intraorally, as well as
extraorally, because of the large in-
fuence of the reds in shade taking.

In addition to the points presented
before, the following should be con-
sidered initially when photographs
are taken (Figures 7-15):

1. Avoid the large reflection areas of
the metal parts of the shade guide as
they reduce the detail of the pictures.

2. Take pictures using two different
shade tabs.

3. The surface of the shade tab must
be at exactly the same level of the
buccal surface of the teeth, as even
minor discrepancies can make a
tooth look darker or brighter due to
the power of the flash.

4. The incisal edge of the tabs should
be at roughly equal distance from the
natural teeth, or as close as possible,
without touching each other.

5. Take pictures with and without
contrast. This is especially rele-
vant in young teeth with opalescent
areas and clear halo effects.

6. In cases where all-ceramic res-
toration is planned, the shade of the
stump should also be given to the
lab, using a special shade guide, such
as the natural die material shade
guide of the IPS e.max system (Info-
clar Vivadent, Liechtenstein).

7. Consider taking some pictures in
black and white. A black and white
photograph will help show the value of
the shade tab in relation to the pa-
tient’s tooth (Figure 14).

Clinical case
A 27-year-old female patient came
to our office unsatisfied with the
appearance of her 2 anterior pfm
crowns (Figure 13). The value of both
crowns clearly did not match the
other teeth and her smile line unfor-
nitably also showed the discolored
cervical part of tooth 11 (Figure 16).

An overview picture of the stump
shade was taken with a reference
(Figure 26). This reference should
ideally be the natural die material
A-D shade guide (Figure 27). Both
shade guides, the natural die mate-
rnal guide and the A-D shade guide
have some similarities, for exam-
ple, as a rule of thumb an ND2 looks
quite similar to an A2 (Figure 17a).

Obviously, the natural die mate-
rnal shade guide has shades that are
dark, since its purpose is to correlate
to artificially discolored stomas and
not to recreate natural shades as the
A-D shade guide (Figures 27 and 18).

Internal bleaching of the stump was
then performed with 3% hydrogen
peroxide (Figure 28) in 2 sessions of
20 minutes each. Figure 29 shows the
final result after the composite
build-up with Excite DSC and Multi-
core flow (Vivadent, Liechten-
stein). An impression was taken and
sent to the lab.

The cast was scanned and an IPS
e.max CAD LT block was milled
(Figure 20). The appearance of the
crowns is always checked with the
natural die material stumps in order
to get the correct value and chroma
(Figures 11 and 12). Finally, contacts
and final integration of the crowns
were checked in the solid cast (Fig-
ure 23; laboratory work done by
CDT Volker Brisch, Germany). A
retraction cord was placed prior
to bonding the crowns (Figure 24).
The stumps are etched with phosphoric
acid (Figure 25) and Excite DSC was
applied (Figure 26). Variolink N (base
catalyst, translucent shade) were
mixed and applied to the crowns
(Figures 27 and 28) and the internal
bleaching of the stump was

Figures 9 and 10: Overview pictures with different shade tabs.

Figures 11 and 12: Close-up pictures with different shade tabs.

Figures 13 and 14: Colored and black and white picture.

Figures 17a-17d: The stump shade is shown compared with a shade tab. Ideally the natural die material shade
guide should be used. As an example A2 looks similar to ND2.

Figure 21: Layering steps. The shade is
mixed and applied to the crowns
and catalyst, translucent shade) were
acid (Figure 25) and Excite DSC was
applied in the solid cast (Fig-
ure 23). The stump shade is shown
compared with a shade tab. Ideally
the natural die material shade
guide should be used. As an example
A2 looks similar to ND2.

Figures 15 and 16: Happy patient with
satisfactory
crowns.

Figures 18 and 19: Situation after internal bleaching and
crown fabrication.

Figure 20: IPS e.max CAD crowns after
milling with the MC XI (Sirona) unit. The
capings need to be crystallized in order
to get the final shade.

Figure 22: Final appearance of the crowns
planted on the natural die material
dumps, which has the same shade than the
dentin-composite stumps in the
toof’s neckath.

Figure 23: Proximal contact and integra-
tion control in the model.

Figure 24: A retraction cord was placed
prior to etching.

Acknowledgements
The author would like to thank CDT
Juergen Seger and Volker Brisch for
their valuable technical work pre-
ented in this article.

Dr. Eduardo Mahn, DDS, received his
dentistry degree from the University
of Chile in 2004. He received the German
DDS one year later. The New York Uni-
versity College of Den-
tistry certified him as Implantologist
in 2010. His thesis in 2008 titled “Osseointegration of
dental implants, an in vivo study” and
got his doctorate degree in 2010 from the
University of Duisburg, Germany.