Dental composite curing system apparatus and method

By Dr. Mohammad Al-Balal, UAE

This invention will be a revolution in the field of dental composite restorations, as it will change the prevailing principles and the current rules within the procedure of composite application significantly. With the techniques used in this research, any composite material that has inferior properties concerning stress or shrinkage will behave as an ideal composite restorative material. I was able to achieve this outcome by decreasing the shrinkage and stress to a value of approximately up to 70% for the same materials currently used by dentists using the current techniques. This motivated me to publish my invitation.

Basically, the idea deals with the issue of reducing the side effects of shrinkage and stress of a composite.

Research and development departments in manufactories and universities tried to develop the best possible outcome concerning composites' minimal side effects of the throughout many ways, such as:

1. As resin is the main reason for undesired side effects in composites, companies tried to create a material (a composite) by improving the quality of resin and trying to reduce it in the composite mix.
2. Working on developing the curing light devise (light source) by increasing the light wave's power to reach 1,600 mw/cm², increase the range of the light wave length to 300-500 nm, using a soft start technique and change the light beams coming from the tube light source from a straight to an angle beam (conic shape).

5. In addition to above, other techniques were used but with a minimal impact in reducing the undesired side effects of the composite, e.g. using a perforated plate with different shapes. Unfortunately this technique was not successful and was left aside and not commercially produced.

Considering all of these above, I will explain the difference between my invention and others. I would like to clarify a few simple things to be able to reach solid results:

1. The light beams in all light cure devices has a conic form.
2. During the composites polymerization, unfavorable shrinkage and stress appears.
3. Stress is the power produced from the shrinkage of a restoration connected to the edges of a tooth's walls. The restoration cannot depart from the walls because the power of the adhesive is greater than the shrinkage power (undesired side effect). The stress power is concentrated inside the corners like a tri-angle and rectangle until the crater appears.
4. Using the perforated plate, it will divide the curing process within the restoration to cured and uncured areas. The uncured areas will slightly expand and compensate the shrinkage generated by the cured area.

We benefit from this division that the stress and shrinkage allocated to many areas in the restoration and is not concentrated in the edges of the restoration, because when the restoration gets cured without a perforated plate, shrinkage and stress will pull the restoration to the center and the tooth's walls will prevent this action (vide figure 1.1-1.2)

In the beginning of my researches, using a perforated plate was also not effective and I tried to find the reason what could be changed in order to succeed. The main problem using the perforated plate is that a large part of the restoration or the whole restoration is being cured (keeping in mind that the transformation from plastic-soft-form to a solid state takes 5 to 5 seconds), I made the following reasons responsible for this effect:

There seemed to be not enough space between the holes to prevent the light beam from reaching the restoration. Thus, there will not be enough uncured areas between the cured areas. Since the light beams spread in an angle shape from the source, this the cured area will be increased as well and might cure the entire restoration (vide Figure 2).

To solve this issue I came up with the idea of leaving 1 mm space between the holes. The diameter of the holes is 1 mm. In the following, I would like to point out the reason why I decided to use a diameter of exactly 1 mm and not measurements of more or less.

The main concept is trying to...
I studied several combinations of both perforation size and separating distance, and examined the following:

I. Perforations of 0.5 mm did not allow a sufficient amount of curing light to pass through the perforated plate and thus was not able to cause the desired curing effect within the composite.

II. Perforations of 1 mm allowed a sufficient amount of curing light to pass through the perforated plate (I recorded 400 mw/cm² out of a source of 1100 mw/cm²) and was able to cause the desired curing process in the composite.

III. Perforations of more than 1 mm were not desirable, mainly for two reasons:
   1. It will reduce the number of perforations possible which contradicts with the general concept.
   2. In dental practice there are restorations of 1.5-2 mm in size. which means that a perforation of 1.5 mm or 2 mm in diameter has the potential of covering the whole surface of the restoration and that may cause the curing of the entire restoration, which is what we are essentially trying to avoid.

IV. Perforations of 1 mm diameter and 0.5 mm separating distance: I found that the light beams passing through the perforated plate (the plate must not exceed 0.5 mm in thickness to reduce the diminishing of curing light power) have almost reunited on the restoration surface after passing through the plate (due to the conic pattern of the light beams passing through the plate) and caused the curing effect on almost the whole restoration's surface.

V. Perforations of 1 mm and 1 mm separating distance: this combination allowed enough light power to pass through suitable separations, and achieved the desired result of both cured and non-cured areas of the composite's restoration.

VI. Perforations of 1 mm and 1.5 - 2 mm separating distance were not suitable for reasons very similar to the reasons that lead to the rejection of 1.5-2 mm perforations above.

VII. In conclusion I found out that a plate of 1 mm perforations and 1 mm separating distance are the best combination that allows enough curing light power to pass through the perforated plate and achieve the desired focal curing process.

My suggested shape of circular holes of 1 millimeter in diameter and separated from each other by a distance of 1 millimeter is unique and completely different from the shapes suggested in the existent proposals.

Why using circles as a perforation shape?

My experiments indicate that this formation will result in minimal shrinkage effects in comparison to other suggested formations. Furthermore, my suggested formation does not contain any angles (in contrast to the other suggested shapes of parallel lines or grid). It is well known that stress points are usually formed in the tips of angles and thus will result in minimal stress points in the restoration after polymerization.

Based on the researches above and after my experiments, I considered that the shapes of the cured areas have a cylinder or conic shape, when using a perforated plate with holes in circle shape. Instead, I ended up a different result:

When I investigated the cured areas within the restoration, I found out that the areas are bigger than the hole-diameter from the perforated plate and that its shape is random (not conic or cylinder shaped). Furthermore, these cured areas are fused with the cured areas next to it. It seems as if there are no effects or benefits from using the perforated plate. The reason why we received cured areas of a random shape and
Surfaces that were bigger than expected (when using a hole- diameter of 1 mm), is the vibration of the tooth's hand during the curing process. Due to this vibration, a change of the light beam is caused and more areas are cured than we would like to cure. (Please vide Figure 5.1).

To solve the issue of the light beam not being stable and to mitigate the vibration of the doctor's hand, I figured out that the light source, the perforated plate and the tooth should be connected with each other in a single handle. Such a single handle has many advantages (please vide figure 4.1 and figure 4.2 below).

Above you see a simple illustration of the proposed handle.
1. Flexible metal ring
2. Fiberglass tube (end of the light cure device)
3. Metal holder (connecting the ring with the plate)
4. Perforated plate
5. Special part of the holder designed to stand on side of the tooth
6. Light beam passing the plate

In this new design, the plate was carried independently. Thus, it can be fixed on the tooth, while the light source is placed above it.

In this pattern, the plate can be fixed on the light cure device directly through the flexible metal ring (1), then the device and the plate can be connected to the tooth. This will simplify the treatment with the plate; result in good stability of all components. Therefore, the light beam does not suffer from hesitation/shaking of the doctor's hand during the curing.

The plate and the fiberglass tube are connected with each other through the handle. A flexible ring within the handle allows the head of the fiberglass tube an accurate incorporation (1). The ring has an open spot for the fiberglass. It allows a simple expansion within the dimensions. This makes the ring suitable to a large number of devices as shown in the in figure 4.2 above.

The ring allows moving the plate and the holder in different directions around the axis of the curing device's tube, where the special part of the holder (5) can apply on different walls of the tooth (lingual, bucal).

While using the special handle with the perforated plate, I received favorable results: the dimensions and the shapes of the cured restorations are close to the diameter of the circles within the perforated plate (around 1 mm) and the shape is close to the conic shape. Furthermore, the cured areas did not fuse with the cured areas next to them. Consequently, it can be examined that the special created handle has a significant impact and improves the results.

I also want to add some more things to the main idea. Details about the suggested design that have not been covered by others yet, such as:
1. The thickness of the perforated plate: according to my researches 0.5 mm is the plate's best thickness, since a thickness of more than 1 mm will reduce the light beams passing through the circle holes (keeping in mind that the diameter of the hole is 1 mm) and this will reduce the cured areas significantly. If the thickness of the plate is less than 0.25 mm, more light beams will pass through the hole and this consequently will increase the cured areas significantly.
2. The design of the handle allows the plate to move within a range of 360 degrees around the light cure device's tube, which will give the doctor the ability to use the plate for any tooth's surface - wherever located in the mouth (upper, lower, right, or left).
3. The design is created to allow a minimal distance between the light source, the plate and the tooth's surface, which will keep the light beam straight to the chosen spot on the certain restoration.
4. It is easy to develop the proposed design commercially with low costs and with the ability to be sterilized easily (since it is supposed to be made of stainless steel).
5. The shape of the handle's part is made to allow a loose fixation on the tooth surface, since it has a curved shape - thus, a high stability on the tooth's surface is granted.

All others ideas presented before focused on preventing a part of the light beam to reach the restoration by using a perforated plate. This perforated plate was never presented in a practical way, and did not mention any of following:
1. The shape and diameter of the holes and the plate's thickness.
2. The handle that connects the light source, plate and tooth's surface within one object.
3. The ability to produce a practical design which guarantees the ability to be used on any tooth's surface, being easy to sterilize and being developed with low costs.

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New world record: Third molar erupts in 92-year-old

By Dental Tribune International

SAABURG, Germany: Usually third molars erupt during early adulthood, typically between the ages of 17 and 25. In very rare instances, these teeth erupt at a later point in life. At the beginning of the year, a woman already in her 90s set a new record for an erupting wisdom tooth at an advanced age.

The incidence was confirmed on 25 February in Saarburg, Ingeborg Wolf-Wimmer, who was born in 1922, was 92 years and 258 days old when she was entered into the Guinness World Records.

As reported online by the Luxemburger Wort newspaper, Wolf-Wimmer, who is originally from Austria and now lives in a nursing home in Luxembourg, complained about her denture and her dentist identified an erupting third molar as the cause of the problem.

Wolf-Wimmer is now officially the oldest person in whom a wisdom tooth has erupted. The previous record was held by an 80-year-old person in South Africa. According to the Luxemburger Wort, radiographs showed that Wolf-Wimmer has three more unerupted third molars in the palate.

(© Coombesy/Pixabay)
Splyce ID: Designing Bespoke Modern Wonder Clinics - Part II

By Nijas Salim, UAE

“Design is not just about aesthetics” says Ranjit Prasad, the Creative Director of Splyce, who is in full flow, about the one subject that has become his passion in life.

“We were designing a training room for a medical company and the client were going to use a manikin to provide classroom instructions and training. The client wanted to ensure that all participants would have an unobstructed clear view of the manikin wanted while also utilizing most of the space for participants. We had the manikin drop from the ceiling at the press of a button. It certainly has a futuristic “Wow” effect to it. But that is just secondary to the experience of the users and its main purpose.”

I remember taking a walk through the Apa Aesthetic Dental & Cosmetic Centre, and looking at a few features that struck out. The button that opened the sliding door to the sterile room was placed at the optimum height and was big to facilitate gloved doctors using their elbow to open the doors. The design of the conference room and the computing power in the server room was to ensure that discussions and meetings with Dr. Apa on the days he was seated 11,000 kms away felt like he was next to you. The need to drown out the sound of the powerful motor connected to all the dental chairs was crucial because otherwise the little alcove with the fountain would not serve its purpose. We wanted the space to be lit up by natural light. But this natural light would hinder the personnel manning the reception desk. The height of the desk became important to the design, and tracking the suns path with respect to the space became crucial. This was what good design was all about. Leaving no stone unturned.

Splyce Interior Designs is a boutique agency driven to meet satisfaction of a clientele that know the value of good design and incorporated that into their own philosophy. Splyce believes its raison d’etre is creating stunning designs that exceeded client expectations.

United Kingdom, Italy, Belgium, France, South Korea, Canada, Lithuania, and from the Arab countries Kuwait, Oman, Egypt, Yemen, Bahrain, Sudan) in addition to an interesting panel of Lebanese talented lecturers.

The four day event began with pre-conference workshops, organized by Professor Carina Mehanna, LDA Director of Continuing Education Programs and included over 115 sessions, 9 workshops, poster presentations and a newly introduced panel discussion together with a series of 8 pre-congress courses which gathered 262 participants at the Beirut Arab University Campus. The event combined excellence and expertise in all fields of dentistry and served as a forum to explore new technologies, innovations and new materials helping the participants to take smart decisions on why, when and how to use them. The event received sponsorship from over 97 major international industry players and regional dealers taking part under the impressive 6000 square meter flat space especially designed to hold the event.

BIDM 2015 further enjoyed a high standard supported and documented with high tech audio visual equipment during the 4 days.

Dental Tribune Middle East & Africa / CAPPMEA was proud to be the official media partner at the event.
Tooth enamel first evolved in the skin

By Dental Tribune International

UPPSALA, Sweden: Tooth enamel is the hardest substance produced by the human body. Since enamel is one of the four major tissues that make up the teeth and gives them their distinctive shiny white appearance, it comes as a surprise that a study has found that enamel most likely originated from the skin—the mouth or the body as a whole. In fact, it is estimated that enamel originated at a much earlier point in evolutionary history, possibly as early as the Permian period, when the first bony fishes appeared. Researchers from Uppsala University in Sweden and the Institute of VertebratePaleontology and Palaeoanthropology in Beijing have now confirmed their hypothesis, using genomic data to show that enamel evolved independently from scales in ancestral fishes and was not a specialization of the teeth, as previously thought.

Their findings suggest that enamel in fact evolved in the skin, where it may have served as a form of protection against wear and tear. In the study, the researchers analyzed genomic data from various fish species, including the Psarolepis, which has scales like those of modern fish, but lacks enamel. They found that the Psarolepis genome contains genes for enamel, indicating that enamel originated in the skin, rather than in the teeth. The results of this study have important implications for our understanding of the evolution of teeth and the human body as a whole.
TRIOS® shade measurement tool more reliable than the human eye

By Dental Tribune International

The University of Copenha-
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ed a joint study comparing the reliability of three teeth shade color assessment methods used in dentistry. The study evaluated TRIOS® shade measurement tool versus the MHT SpectroShade™ spectrophotometric computer-based system and the human eye.

The university study found that the two objective methods, TRIOS® digital impression solution’s shade measurement tool and the MHT SpectroShade™ spectrophotometric computer-based system, to be more reliable than the conventional visual system – the human eye. This is in accordance with a number of other studies cited by the study’s authors. [7-9, 15, 16]

Published in the International Journal of Oral and Dental Health, the 2015 in vivo study compared the three teeth shade color assessment methods. Concluding that “The reliability of the objective, computer-based systems was higher compared with the subjective, visual method for color determination.”

Shade matching in the restorative workflow

The study noted that patients consider shade match to be the most important factor when judging the quality of a restoration, especially in the anterior region.** However, reliable visual shade selection by the human eye and in nature can be inconsistent due to the complexity of tooth color and outside factors like room lighting, patient clothing and even makeup.

To compensate for these variables, the study performed the color determination in natural daylight, but away of all windows with no direct light. Patients were sat in the same unit chair and with the dental lamp turned off. The angle of the view for MHT Spectroshade, 3Shape TRIOS® Color and subjective Vita 3D-master Vitapan was the same. Lipstick or other effects that may affect color assessment were removed and patients with strong colored clothing were covered with a white-grayish cloth.

The study found TRIOS® shade measurement to be more reliable than the human eye. An important result because less practical have the time or resources to meet the ideal conditions used in the study for evaluating patient’s teeth shades. When you factor in possible doctor or assistant eye fatigue as well, then the proven reliability of TRIOS® shade measurement becomes even more significant. To be able to rely confidently on TRIOS® to identify teeth shades saves a tremendous amount of time and steps in the workflow and adds consistency and accuracy to the procedure.

TRIOS® is the only intraoral scanner on the market with an automatic shade measurement tool included. The digital impression solution embeds the teeth shade information into the intraoral scan which is then used to design the restoration. This makes communication of the unique teeth shades much simpler and eliminates several steps in the workflow for both the lab and dentist.

The teeth shades are embedded in the scan. And in TRIOS® case, the digitally-shared scan can be augmented with HD intraoral images and video – as TRIOS® also includes an intraoral camera featuring high speed video and image capture integrated within the IO scanner.

Study methodology

The study pitted the three shade measurement methods against each other: the subjective (visual) method and the objective TRIOS® and MHT SpectroShade™. Eighty-seven teeth from twenty-nine patients were used in the testing.

Visual pairwise comparison was used in the study for benchmarking because the human eye and perception is believed to be the most important factor in color evaluation.

The study concluded by supporting the use of scanning and color measuring computer-based systems for dentistry.

Saying, “the TRIOS® Color Shade system as well as the MHT SpectroShade™ colorimetric system were able to measure all the various shades appearing all over the tooth surface, thus give a very detailed shade determination at the tested tooth.”

The study also determined that “the further development of such systems for clinical use would be warranted and could serve as a valuable tool for material selection and restoration design, particularly in the area of aesthetic, restorative dentistry.”

References

*Effectiveness of Shade Measurements Using a Scanning and Computer Software System: a Pilot Study


Study Highlights

• TRIOS® shade measurement is more reliable than the human eye.

• TRIOS® shade measurement is as accurate as the human eye.

• TRIOS® intraoral scanner was easy to handle and more convenient to the patient than the colorimetric camera system.

• Further development of such systems for clinical use was warranted and could serve as a valuable tool for material selection and restoration design in aesthetic and restorative dentistry.

• TRIOS® is the only intraoral scanner on the market with an automatic shade measurement tool included.

*effectiveness of shade measurements using a scanning and computer software system: a pilot study.