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TIPS AND TECHNIQUES

ACCURATE ALGINATE IMPRESSIONS

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Written for dentists, hygienists and dental assistants
Designated for one CE Contact Hour

OVERVIEW

Dental alginate is the most widely used impression material. Its wide use is a result of its low cost, ease of manipulation, need for minimal equipment, and acceptable accuracy for many dental procedures. Impression technique can be improved by following specific guidelines for use in the dental office.

EDUCATIONAL OBJECTIVES

The overall objective of this article is to provide the participant with an evidence-based guide to the proper procedures for using alginate impressions in the dental office.

UPON COMPLETING THIS COURSE, THE PARTICIPANT WILL BE ABLE TO:

1. List and review the variables associated with poor impression outcomes.
2. Review the sequence of step-by-step procedures to ensure a high-quality alginate impression.
3. Identify five common impression problems and their causes.
4. List laboratory requirements to improve impression outcomes.



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Dr. Veis began practicing in 1984 as a solo general dentist and has been a part of both solo and group practices since then. A graduate of USC Dental School, he taught for 12 years at the University of Southern California as a Clinical Professor in Restorative Dentistry; is an internationally renowned lecturer (at locations including UNLV, Columbia University, Loma Linda University and NYU) on the topics of Dental Sleep Medicine, Orthodontics for the General Practice and Appliance Therapy; and has served on the faculty of the Las Vegas Institute of Advanced Dental Studies. He is the co-author of The Principles of Appliance Therapy for Adults and Children – considered one of the definitive texts on the subject – and has lectured extensively for the Academy of General Dentistry-sponsored mastership program. In 2014, he will embark on a world-spanning lecture tour encompassing Canada, Australia, Taiwan and the US.

AUTHOR DISCLOSURE:

Dr. Veis discloses that he is the President and CEO of SML™ - Space Maintainers Laboratories.

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ACCURATE ALGINATE IMPRESSIONS



INDICATIONS:

When a chef is first learning to bake something new, he will usually follow the recipe very closely. However, once he has made the dish a few times, he will often begin to tinker with the ingredients. Maybe he will add an extra pinch of salt or a little less flour. Modifying the recipe like this may work well when cooking, but it can be a nightmare in dentistry.

Taking an alginate impression is one of the most common procedures done in the dental office. In fact, if you follow directions, it should be as easy as baking a cake. But like baking, if the dentist changes the dental impression recipe without thinking about how it is going to affect the result, it can lead to failure. For example, simply adding a little extra water to alginate can adversely change the water/powder ratio, thinning the mix and increasing the setting time.

Unfortunately, because taking an alginate impression appears to be so easy, it has become one of the most abused techniques in dentistry. Not taking the time to perform this procedure correctly is one of the most expensive mistakes you can make in your dental practice.

DESCRIPTION:

Dental alginate is the most widely used impression material. Its wide use is a result of its low cost, ease of manipulation, need for minimal equipment, and acceptable accuracy for many dental procedures. Some of the more common procedures which can be accomplished using alginate are:

- Impressions for partial dentures
- Primary impressions in edentulous mouths
- Impressions for diagnostic casts
- Impressions for removable and fixed orthodontic appliances
- Master-cast impressions for dental sleep apnea appliances
- Impressions for splints and night guards
- Impressions for opposing casts for crown & bridge work[1,2]

Dental alginate is an impression powder that, when mixed with water, will undergo a series of chemical reactions that will take it from a viscous solution to an elastic gel.[1,2,3] A typical formula for an alginate impression powder is:

- Potassium or Sodium alginate. Comes from sea kelp and forms a solution in water.
- Calcium sulfate reacts with potassium or sodium alginate to produce a gel.
- Trisodium phosphate retards the reaction to provide more working time.
- Diatomaceous earth controls the consistency of the mix and the strength and flexibility of the impression.
- Potassium zinc fluoride is used to counteract an inhibiting effect that alginate has on the setting of the gypsum.
- Organic glycol is used to coat the powder particles to minimize the dust during dispensing.
- Quaternary ammonium compounds are sometimes added as a self disinfection agent.[1]

These ingredients allow alginate to:

1. Mix easily in water to form a viscous gel.
2. Have enough body to be contained in an impression tray.
3. Have enough working time to be carried to the mouth.



Metal rim-lock trays are best for alginate impressions

4. Change into an elastic gel once it is placed in the mouth.

5. Be removed from the mouth without distortion and to have enough strength and stiffness to insure a firm surface.[2]

Alginate is available in both individual packages and bulk containers. Although bulk alginate is used more often because of its lower initial cost, packages containing only enough alginate for an individual impression are preferred. These packages minimize moisture contact with the powder and extend the storage life of the alginate.[1]
Regardless of how it is dispensed, alginate should always be stored in a dry place where the temperature is maintained between 50° and 80° Fahrenheit. It is best to discard material that has been stored over one year.[2]

TREATMENT PROCEDURES

The following is a list of the precise, step-by-step procedures that must be followed exactly in order to obtain an impression and a cast that will meet the high standards of treatment desired for your patients.

1. Pick an appropriate impression tray.

   a. Selection of the proper size and shape of the tray is essential. A properly sized tray must include all areas wanted in the impression – and still allow for adequate clearance between the tray and the tissues. If this is not done, the impression will distort or tear upon removal from the mouth.

   b. Many different tray types can be used ranging from disposable plastic to metal perforated trays. We recommend the use of a metal rim lock tray for two reasons. First, because alginate is a compressive material a solid tray will force the material around the teeth better than a perforated tray. Second, the rim-lock design will hold the impression material in place without the need of an adhesive.

2. Prepare to take an impression by placing your alginate, rubber mixing bowl, spatula, and alginate measuring instruments on the counter.

3. Accurately measure out the amount of powder and water you will need to take an impression.

   a. Should you choose to use alginate from bulk containers, always make sure to shake the can to insure an accurate measurement of the material. Alginate tends to settle when left on the shelf.[1,2,3]

   b. One scoop of powder should be used for every mark on the water cup. When dispensing the powder, over fill the cup, tap it lightly, then remove the excess from the top. [1,2]

   c. Distilled water is recommended for use with all alginate mixes because it will eliminate contamination of the mix with calcium, fluoride and other materials often found in tap water.

   d. The temperature of the water should be 21°C (70°F).[1,2,3] (See Contraindications and Concerns)

4. Just before taking the impression, have the patient rinse to cut the mucin and lower surface tension. Prior to insertion of the impression material and the tray, lightly dry the teeth with compressed air. Do not over-dry the teeth. The material may tend to stick to teeth when the impression is removed.

5. Slowly add the powder to the water, making sure to incorporate all the powder into the mixture. Mix the alginate vigorously (pressing it between the mixing bowl and the spatula) until a smooth, creamy consistency - free of graininess - is achieved. Mixing time: 1 minute for regular set alginate, 45 seconds for fast-set alginate. If the material is under mixed, the chemical reaction will not proceed uniformly throughout the mass – which can decrease the strength of the gel by 50%. On the other hand, over-mixing also decreases the gel's strength, because too much spatulation will break up the gel as it forms.[2]

6. After the impression material is mixed, place the alginate in the tray in small amounts, and make certain that you force the material into the rim-locks of the tray. Then, dip your finger in cold water and smooth the surface of the alginate.[1]

7. Take some of the excess impression material and forcefully press it into the vestibule and on the occlusal, buccal, and lingual surfaces of the teeth. If a high palatal vault exists, place some there as well.

8. Insert the filled tray immediately, gently jiggling it into place until completely seated. Maintain only



Using an impression tray tree will allow your cast to set distortion-free.

enough pressure to hold the tray in place – making sure to **avoid moving the tray until after gelation is complete**. If the tray is moved during gelation, strains will be incorporated in the alginate and released upon removal of the impression. This causes distortion of the impression and makes the cast inaccurate.

9. Always keep a small test sample of the alginate in your mixing bowl. When this sample loses its tackiness, gelation has begun. Then, wait another two minutes before attempting to remove the impression. Waiting several minutes after initial gelation increases both the tear strength and compressive strength of the material.

10. Remove the impression with a firm, quick snap. **Do not** rock or twist the impression before removing it. An alginate impression is easily deformed if it is removed slowly, but it is not permanently distorted if it is removed quickly.

11. As soon as the impression is removed from the mouth, inspect it carefully for defects.

12. With a water/air syringe, rinse the impression free of any blood or saliva. Shake out as much of the excess water as you can, then lightly blow the rest away with the air syringe, being careful not to dry-out the impression.

13. Disinfect the impression. All impressions should be rinsed and disinfected before they are poured up and sent to the lab. Sodium hypochlorite, iodophor, glutaraldehyde and phenylphenol solutions are all being used. Some manufacturers have even added disinfectants to the alginate powder.[1,2,3,4,5,6,7] (See Contraindications and Concerns)

14. All impressions should be poured immediately with vacuum-mixed stone and with the use of a vibrator.

15. Accurately measure out an appropriate amount of stone and water. Stone requires a water/powder ratio of .30 or 30g of water for every 100g of stone.[1]

16. Slowly add the stone to the water to insure that all the powder is completely incorporated. Then vacuum mix the mixture.[1] The consistency of the stone should be that of a pseudoplastic viscous liquid which has a glossy surface to it.[1]

17. Holding the impression on a vibrator, start adding stone in the molar region on one side. Slowly allow the stone to work its way around the impression. Continue adding stone to the same side until the impression is completely poured.

18. Once the impression has been poured, hang it on an impression tree, wrap it in a moist paper towel and let it set up. Models that harden in 100% humidity have a superior stone surface.

19. Give a minimum of thirty minutes but not longer than one hour for the stone to set up. Then separate the alginate impression from the stone model. All alginate materials contain alginic acid which, if left in contact with stone too long, will “eat into it” and give the stone a moth-eaten appearance. To avoid this problem, remove the cast immediately after an adequate set.

20. Evaluate the stone model carefully. Check to make sure that you have recorded all the areas necessary to achieve a successful result and that the model is distortion free.

SUPPLY LIST

- ❑ Vinyl mixing bowl
- ❑ Wide blade spatula
- ❑ Alginate
- ❑ Distilled water
- ❑ Impression trays *(We recommend a solid rim-lock design)*
- ❑ Adhesive *(This is necessary with a plastic tray)*
- ❑ Laboratory vibrator
- ❑ Yellow stone *(Do not use plaster)* Vacuum mixer
- ❑ Impression Tray Tree
- ❑ Disinfectant

CONTRAINDICATIONS AND CONCERNS

Alginate does not reproduce fine detail as reliably as do the other elastomeric impression materials. This may be due to the somewhat more porous surface of the impression material or to a reaction between the stone and the irreversible hydrocolloid. Therefore alginate is not accurate enough for crown and bridge impressions.



Never place an impression on the bench. Always use a tray tree!

All impressions should be rinsed and disinfected before they are poured up and sent to the lab. The goal in choosing a method to disinfect alginate impressions is to select a material that will work without affecting the accuracy of the impression. Sodium hypochlorite, iodophor, glutaraldehyde and phenylphenol solutions are all being used. It is always best to follow the manufacturer's instructions since some companies have already added disinfectants to their alginate powder. There are occasions when you will need to vary the setting time of the alginate. For example: if your patient gags, you may want the alginate to set faster. This can be controlled by varying the temperature of the water. Warmer water allows the mix to set faster than cold water. Never control the setting time by varying the consistency of the mix. Changing this ratio will also effect the impressions permanent deformation, flexibility and strength. [1,2,3]

Alginate impressions lose their accuracy rather quickly. If the impression is stored in air, water evaporates and the impression shrinks. If it is stored in water, it will absorb the water and expand. Therefore, it is always best to pour up an alginate impression immediately. But, when you cannot, keep it in a humidor. Storing it in 100% relative humidity will give you about an hour before serious dimensional changes occur.[1,2,3]

Always allow your poured impression to set up in the tray with the teeth down. As stone sets in an alginate impression excess water in the stone mix rises to the highest point. If the tray is turned upside down onto a base of stone, that water will go to the cusp tips. This could result in faulty shaped cusp tips that are very soft.[4]

Never let an alginate impression sit on a bench top. If you place the impression with the alginate side down, the weight of the tray can deform the impression. If you place the impression with the tray side against the bench, any untrimmed excess alginate can deform the impression. Therefore, it is always best to use a tray tree to hold your impressions.

TROUBLESHOOTING

Common mistakes:

1. **Improper mixing.** Add the powder to the water to make sure that all of it is incorporated into the mix. Then mix vigorously for one minute to get a creamy consistency.
2. **Incorrect water/powder ratio**. Too much powder in the mix – usually because the alginate was not fluffed up in the can before measuring it out.
3. **Incorrect water temperature**. If your water temperature is too warm, it will decrease your mixing time and prevent you from achieving a smooth mix.

If my impressions are not coming out accurately, how can I find out where I'm making a mistake?
The following is a list of the most common impression problems and their causes.

1. Impression tears upon removal from the mouth.
   a. **Inadequate thickness of the material**. If the material is too thin it will usually tear. This is directly related to having too much water in the mix.
   b. **Premature removal from the mouth**. The impression must be left in the mouth for full 2 minutes after your test sample has begun to set in the mixing bowl. Alginate doubles its tear strength in this time period.
   c. **Incorrect removal technique**. Remember, alginates are less likely to tear during removal from the mouth when they are removed swiftly. Therefore, remove the impression with a snap.

2. There is a loss of detail or voids on the surface of the impression.
   a. **Premature removal from the mouth**. If the material is still in a plastic state, detail will be lost.
   b. **Moisture or debris in the mouth**. Remember to always have the patient rinse thoroughly before taking their impression.

3. The surface of the stone model is rough or chalky.
   a. **Inadequate cleaning and drying of impression**. Always rinse the alginate impression thoroughly with water to clean out any blood or saliva. Then shake out as much of the excess water as you can and lightly blow the rest of it away with an air syringe. Do not over-dry the impression.
   b. **Incorrect handling of the gypsum / excess water in the mixture.** This is especially true if you turn the impression over onto a base of stone as all the excess water will move towards the teeth.
   c. **Failure to separate the cast after one hour**. The alginic acid in the alginate will eat away at the stone if it is left in contact too long.

4. The finished model is distorted and inaccurate.
   a. **Delayed pouring of an impression**. Whenever possible, pour-up your impression immediately. If you keep the impression in a humidor at 100% relative humidity, you still have only 1 hour before your impression will be too distorted to use.
   b. **Inadequate retention of impression material in the tray**. If the impression material pulls away from the tray, redo the impression. Even if it fits back into the tray perfectly, do not use it. It is distorted!



Inverting the tray will cause the stone to flow away and excess water to move towards the teeth

c. **Incorrect technique used to remove the impression**. Alginate must be removed quickly with a snap. Slow removal will permanently distort the impression.

d. **Premature removal from the mouth.** Remember to wait a full two minutes after your sample alginate has set up in the mixing bowl.

e. **Movement of tray during gelation.** If the tray is moved during this period, strains will be incorporated in the alginate. On removal of the impression from the mouth, these strains will be released, causing distortion of the impression.

LAB REQUIREMENTS

At Space Maintainers, we evaluate hundreds of models every day. Our people are trained to recognize a distorted model, but even the best trained eye can miss a subtle distortion. Therefore, the key to having the lab produce a quality product is to give us a quality model which is distortion-free. To do this you must start at the beginning by taking an excellent impression. There is an old saying that I learned in dental school: "The impression you take is the impressions you make."

Nothing is more frustrating than sitting down to deliver an appliance only to find it doesn't fit. To make matters worse, we usually try to make the appliance fit so we won't be faced with the annoyance and the embarrassment of having to take another impression. Most of the time, this situation could have been avoided by following the guidelines recommended in this course.

In many offices, the chair-side assistant is responsible for taking alginate impressions and pouring them up in stone. Therefore, to get consistently successful results, we recommend the following:

1. Make copies of this course and share it with your staff.

2. Make sure your staff has all the tools they will need to be successful (see Supply List).

3. Take the time to check your impressions before they are poured up in stone.

4. If you are unsure whether your impression is good, take another one now!

5. Always carefully check your models for accuracy before you send them to the lab.

In a busy practice, it may not be easy to find the time to check an alginate impression for accuracy or stop what you are doing to check your models before they go to the lab ... but believe me, doing so will save you time, money, and a lot of heartache.

BENEFITS

Every time you have to repeat a procedure, it's like flushing money down the cuspidor. With the high cost of running a dental office, you could lose $500 or more for every hour of lost appointment time.

Equally important but more difficult to measure are the costs of unhappy patients; lab work that doesn't fit; poor relations with your lab; and an over-stressed, unhappy staff.

In today's economic environment, any steps you can take to make your office run more efficiently are of the utmost importance. If you follow the instructions in this course, taking an accurate alginate impression can really be as easy as baking a cake.

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