One of the most basic tasks in a dental office is taking alginate impressions. However, “basic” should not translate to “unimportant” or “over-simplified”. It can be easy to overlook mediocre impressions and their resulting models when they are being used for diagnostic purposes, opposing models for crown and bridge, or even bleaching trays. On the other hand, if they are going to be used to fabricate orthodontic appliances, removable partial dentures, sports mouthguards, or bite splints, the impressions and models need to be high quality with a focus on accuracy as well as capturing all the needed information in that impression. In other words, your assistants need be the métières of impression taking and model pouring to ensure well fitting appliances.

For as many assistants as any dental office may have, there are probably an equal number of alginate impression techniques being used in that office, usually with pervasive inadequacies. There are basically six keys to success in obtaining an impression that will produce an accurate model:

1. Tray selection
2. Choosing the right alginate
3. Mixing the material
4. Tray insertion and position in the mouth
5. Handling the impression prior to pouring the model
6. Selection and mixing of the gypsum product

Tray Selection

The most common full arch impression trays are plastic and stainless steel rim lock trays (Fig. 1). Disposable Styrofoam™ trays are useful for orthodontic and archival quality models (Fig. 2). The Styrofoam™ is rigid and will push tissue away, allowing for easier capture of the vestibule. Some of the disadvantages of Styrofoam™ trays are: 1) alginate adhesive should be applied prior to use; 2) they can be expensive; 3) because they are more size specific, storage may also be an inconvenience; 4) when using a heavy-bodied alginate, they may crack.

Stainless steel rim lock trays are still the gold standard in dentistry. The extensive number of perforations in the tray combined with the rim lock design offers great anchorage for a heavy-bodied alginate with no adhesive required. Plastic trays come in two basic designs. Those with small round holes are designed for silicone impression materials and are very useful in crown and bridge procedures. They prove un-trustworthy when using heavy-bodied alginate because the holes are too small for the material to extrude properly (Fig. 3).

When the impression is removed from the mouth, there can be a pull-away of the alginate from the tray which will create distortion if it goes unnoticed. Plastic trays that have slots are ideal for heavy bodied alginate. The slots allow for extrusion of the viscous material which offers excellent retention (Fig. 4).

Besides the material the impression tray is made of, size matters. The proper size tray will provide approximately 5mm of alginate material lateral to all teeth and ridges. The trays should be long enough to capture the hamular notches and the retromolar pads without impinging on the ramus of the mandible or the pharyngeal folds (Fig. 5). 1

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Impression Material Selection

Silicone impression material has a reputation for capturing detail, resistance to tearing and deformation, elastic recovery, multiple pours, as well as long term stability, which is why the dental profession has relied on it for high quality impressions.\(^2\) Unfortunately, there are some disadvantages to using silicone impression material for full arch impressions. The lengthy setting time of silicone can be prohibitive for general use. The expense associated with the amount of material needed for full arch impressions can dramatically increase office overhead. Considering these full arch impressions are being taken on unprepped teeth, the set silicone can be a challenge to remove from the mouth, which can be uncomfortable for the patient. Equally challenging is removing the set model from the silicone without breaking the stone model.

Alginate impression materials (imprESSIX\textsuperscript{®} Alginate, Dentsply Raintree Essix, Sarasota, FL) give the benefits of silicone without the associated disadvantages (Fig. 6). The advantages of using a silicone-like alginate compared to silicone are:

1. It is inexpensive.
2. It has similar physical properties that allow the operator to double-pour the impressions with no drop in accuracy.
3. It has a dramatically decreased setting time.
4. The impressions are easier and more comfortable to remove from the mouth.
5. The stone models are easily removed from the impression.

This alginate material is heavy-bodied and will move the peripheral tissues out of the way and capture all of the anatomy of the dental arch in question without slumping. It is accurate in its detail reproduction. ImprESSIX\textsuperscript{®} Alginate has a high tear-resistance when pulling away from extreme undercuts.

Physical properties of imprESSIX\textsuperscript{®} Extra Fast Set Alginate:
- Elastic distortion: 14–16%
- Detail reproduction: 25–50µ
- Setting time: 45 sec.
- Dustless formula
- Red berry fragrance
- Two pours per impression
- Two days distortion free impression when placed in a sealed bag

Physical properties of imprESSIX\textsuperscript{®} Color Change Alginate:
- The above characteristics plus,
- Changes color from pink to white
- Setting time: 60 sec.
- Five days distortion free impression when placed in a sealed bag

The Proper Mixing of Alginate

The US Navy developed alginate as a replacement for agar during World War II when agar became unavailable.\(^3\) Hand mixing has been the accepted technique since its introduction. Recent research, however, has shown a positive improvement in the quality of the mix when mechanical means are used.\(^4,5\) Another study found almost no porosities in the alginate that was mixed with an automatic alginate mixer and the researchers concluded that the standardization of the mix was preferred over traditional hand mixing (Fig. 7).\(^4,6\)

It was reported that the TurboMAX\textsuperscript{®} Alginate Auto Mixer (Dentsply Raintree Essix, Sarasota, FL, Fig. 8) provided a consistent mix with fewer porosities and was more convenient and easier to use than the Alginator II (Cadco, Oxnard, CA).\(^4\) Elastic recovery and compressive strength improved when mechanical mixing was used, which in turn improved the accuracy of the impression material.\(^4,6\)

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The Proper Mixing of Alginate (Cont.)

From a clinical standpoint, when these authors introduced mechanical mixing (using the TurboMAX® Alginate Auto Mixer) into their office about six years ago, the improvement in the impressions was immediately noticed. The resulting models provided better overall fit in the appliances made from them, and decreased the number of remakes of appliances tremendously. Although there has been research to support the use of a vacuum type mixer, this is not a practical option in most offices as these require installation and connection to a vacuum line, are not portable, and can be expensive. The TurboMAX® Alginate Auto Mixer can be put on a mobile cart with containers for the impression material, distilled water, and impression trays, and conveniently rolled into any treatment room (Fig. 9, 10).

There are additional advantages in using the TurboMAX® Alginate Auto Mixer besides the improvement of the mix. It could be considered “the great equalizer” when it comes to full time or experienced staff members in comparison to part time or inexperienced staff members. The Turbomax allows any staff member (even the dentists) to make a perfect mix every time. The mechanical mixer shortens both the mixing times and setting times of the material which can be appreciated by both the staff and patients. A noticeable side benefit is the ease of the clean-up after taking impressions because of the non-stick mixing cups. No more dirty bowls to waste the staff members’ precious time.

The mixing protocol for the TurboMAX® Alginate Auto Mixer easily allows the assistant to measure the powder and water precisely, again enhancing the quality and standardization of the mix. The protocol for using the TurboMAX® Alginate Auto Mixer is relatively simple.

Powder is measured using the provided scoop and is placed in the non-stick mixing cup (Fig. 11). Room temperature distilled water is measured and poured in the mixing cup and the lid is secured (Fig. 12-14). Distilled water has fewer impurities than tap water that would hasten the set.

The cup is positioned in the TurboMAX® Alginate Auto Mixer and the cover is closed (Fig. 15). When the start button is pushed, the lid of the machine automatically locks and the mixing cup is placed under extreme centrifugal force to maximally incorporate the powder and liquid. When the cycle is complete the lid unlocks and the cup is removed (Fig. 16). The assistant loads the impression tray that was pre–selected for the best fit and inserts it into the patient’s mouth. When imprESSIX® Extra Fast Set Alginate is used, there is approximately 30 seconds of actual patient involvement in the taking of the impression.

Even though this material is very stable, these authors have their staff members pour each impression immediately after it has been taken. A second pour is routinely performed when fabricating models for Essix® aligners. The model from the second pour is useful to track the orthodontic movement from the clear aligners throughout treatment, as well as providing a back up model in the event the patient loses an aligner.

Positioning is Everything

Proper positioning assures a greater chance of success. The causes of error that may appear at this stage in the protocol include: 1) improper tray size, 2) improper tray positioning, and/or 3) poor capture of the vestibular area. Examining the resulting impression to ensure there is no show-through of the tray in the impression is critical to the success of the model and the appliance. In this picture, there is both show-through from an improperly seated impression as well as an air void where the anterior vestibule should be (Fig. 17). There should be, on the average, approximately five millimeters of material thickness between all teeth and the sides of the tray (Fig. 18).
Positioning is Everything (Cont.)

On tray insertion, it is more predictable when the assistant stands behind the patient on upper impressions, and in front of the patient on lower impressions. This allows an easier approach of the free hand, allowing the assistant to pull the lip away from the teeth during tray insertion. By doing so, the alginate material will not be blocked out of this important area.

Another very clever method is to first insert cheek retractors (Fig. 19). This gives the assistant the best view of all vestibules. When the tray is inserted, it becomes very easy to position the tray properly; the tray flanges push up or down on the retractors and provide all of the space needed for a perfect impression (Fig. 20, 21).

Mixing Stone

There are a variety of gypsum products available for fabricating models. If appliances such as RPD’s, orthodontic retainers or clear aligners are being fabricated, die stone is preferable because it provides excellent detail and hardness. Die stone can be purchased in unidose packets which offer convenience, but these can also be expensive. Stone purchased in bulk is more economical, but has a reputation for clinicians to be inattentive in measuring (e.g. paper cup and a trickle of water from the faucet until it seems to be the correct viscosity). The success of the appliance depends on following a rigid although easy protocol which includes following the manufacturer’s powder/liquid ratio instructions. A convenient and inexpensive way to ensure the correct amount of powder is being used, is to pre-measure the powder and place in plastic containers that are always ready to use when an impression is being poured up (Fig. 22, 23). Having two different sized containers depending on whether one or two impressions are being poured can be very helpful. A larger container can hold 150g of powder which will pour two impressions, while a smaller container can hold 100g of powder which will pour one impression. The proper protocol for impression pouring requires the assistant to rinse the impression under a powerful water stream. The excess water is shaken from the impression and debubblizer is sprayed into the impression prior to the pour. The impression is set aside while the assistant measures the water into the flexible bowl that contains the premeasured die stone (Fig. 24, 25). The die stone and water are then spatulated to a creamy mixture. Using a vibrator, the stone is then poured into the impression and left to set. The resulting models can generally be separated in about thirty minutes.

Following proper protocol in any dental procedure increases the potential for a successful outcome. Certainly when fabricating appliances, every step counts. Misstep even once during the process and the chance of having an appliance that does not fit is a real possibility. The last thing you want to experience is a non-fitting appliance at the delivery appointment. This costs you time and money and erodes patient confidence. Incorporate these clinical tips into your practice and enjoy consistent successful results.