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Clinical Technique/Case Report

A Simplified Clinical Technique for a Routine Indirect Restoration Impression on a Challenging Patient Using a Dry Field Illuminator

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Clinical Relevance

Quality impressions require a dry oral environment. This can be difficult on medically compromised patients. During impression taking, simultaneous isolation along with check and tongue retraction, can be achieved using a dry field illuminator.

SUMMARY

Detailed and accurate impressions are made when the oral environment is dry during the impression process.[1] Maintaining a dry field on medically, physically, or emotionally compromised patients can be very challenging. If not achieved, it may compromise dental care and accurate outcomes. This article describes a technique that can be used to make a final impression for an indirect restoration in a protected, isolated, and dry environment, using a dry field illuminator.

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DOI: 10.2341/11-290-T

INTRODUCTION

From pediatrics to geriatrics, one can find patients whose medical, physical, mental, or emotional status renders dental treatment challenging. [2,3] Temporomandibular dysfunction, enlarged or overactive tongue, dental phobia or anxiety are just a few of the challenges that may compromise routine or complex dental care.[4,5] Children with special needs may exhibit uncontrollable or limited mandibular activity, and older adults with dementia may demonstrate behavioral problems that can limit the doctor's ability to deliver dental care in an efficient, comfortable, and skillful fashion.

Examples of limiting physical conditions include restricted maxillary/mandibular incisal opening, microstomia, masticatory myalgia resulting from prolonged or exaggerated opening, and temporomandibular joint tenderness, especially in patients with a history of temporomandibular dysfunction.[5] An

enlarged, overactive tongue or impingement of the coronoid process against the buccal surfaces of the maxillary posterior teeth can also limit access and visibility.

Patients who are taking certain antipsychotic medications may experience sialorrhea as a side effect.[6] Excessive salivation that is not well controlled, may compromise the success of direct composite restorations or render moisture control very difficult while taking an impression. A patient's medical history may limit the use of parasympatholytic medications, such as propantheline. These medications, which control excessive salivary flow, are contraindicated in patients with glaucoma.[7] The patients themselves may be averse to taking long-acting medications that produce excessive xerostomic effects, thereby precluding their use.

The aforementioned conditions can make, what would seemingly be a routine dental restoration, very difficult and can limit the doctor's ability to deliver dental care.

Techniques suggesting the use of bite-blocks and high-speed suction when providing direct or indirect restorative care fall short when dealing with these complicating factors as they do not allow for adequate moisture control, tongue and cheek protection, accessibility to or sufficient space around the operating field, uninhibited visibility, or adequate illumination. [8] Both patient and operator comfort can be challenged.

Studies have shown a high degree of patient acceptance of rubber-dam use while undergoing dental treatment.[9,10] Yet past emotional reactions to dental procedures can bring on feelings of anxiety. Rubber-dam placement can be a source of apprehension to some patients.[10] It could trigger the claustrophobic feeling that overcomes a patient with rubber-dam isolation techniques.[10] This distress could induce excessive salivation or the fear that they will not be able to maintain a sufficient airway.[10] Patients who exhibit anxiety-related habits, such as protective tongue movements toward the treatment area, pose a risk of injury during dental procedures. Patient perception that a procedure is lengthy can lead to the onset of muscular fatigue and inappropriate mandibular opening. Repeated interruption of the dental procedure to allow the patient to rest the muscles can be frustrating to the doctor and the patient by contributing to a lengthier appointment time. As practitioners, our hope is that, with time, patience, and education, the patient may learn to relax, discontinue the risky maneuvers, and continue to be treated safely. Unfortunately, treatment must still be rendered in the interim.

Traditional rubber-dam isolation is a technique that has been promoted by such organizations as the Centers for Disease Control and Prevention (CDC).[11] It serves as a barrier against blood-borne pathogens, helps minimizing aerosols, and helps attain optimal results in adhesive dentistry.[12] Gilbert et al have shown "greater shear bond strengths and reduced microleakage"[13] with the use of the rubber dam compared with use of cotton-roll isolation alone. Traditional rubber-dam isolation can also improve patient management while serving as a barrier for the tongue and other soft tissues. The rubber dam enhances treatment area visualization by isolating the operative field, keeping it dry, and decreasing the time needed to perform a dental procedure. Perceived drawbacks to the rubber dam include patients' dislike of its use, a potentially time-intensive and inconvenient placement, and ease of dislodgment of the rubber dam or the clamp in patients with active tongue movement.

Some variations to the traditional rubber dam have been developed. One such device is the Quick Dam (Auckland Co, Cary, NC, USA). This device does not require clamps but is supported by a flexible ring located at its border, which is then supported intraorally. One study compared it to the traditional rubber dam and found that "saliva control was not as positive for posterior teeth."[14]

Other time-saving techniques described in dental journals and developed by dental colleagues include a custom prosthesis to enhance moisture control. Fabrication of this device requires a preoperative alginate impression, denture base material, and additional laboratory time.[15]

Dry angles used as isolation devices are thin enough to insert into a patient's mouth and serve as a retraction device of the soft tissues, such as the tongue and buccal mucosa. It also prevents the high-volume evacuation (HVE) from suctioning the soft tissues. Its ability to absorb water for moisture control is short lived, and it needs to be changed frequently. One advantage, however, is that its thinness allows for a less encumbered access to the operative site, though it does not offer any oral-pharyngeal protection.

Some techniques use bite-blocks and HVE when dealing with complicating factors that affect restorative care. The advantage of HVE is that it can reduce microbe-containing aerosols that could potentially be

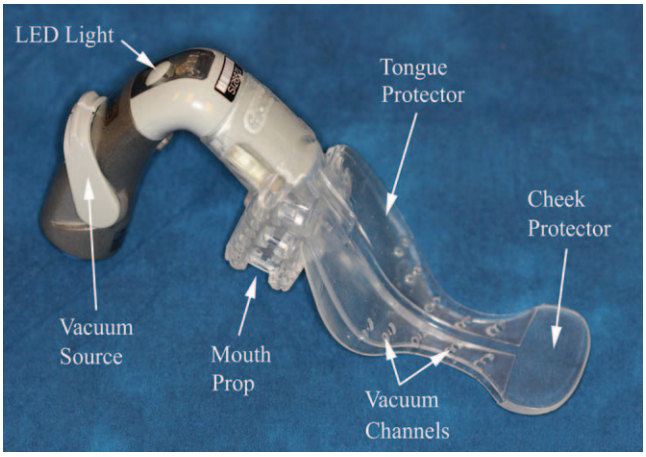

Figure 1 *The isolite appliance and its components*

Figure 2 *Small, medium and large mouth piece.*

hazardous to the doctor or assistant.[16] The technique falls short because it does not promote tongue and cheek protection while allowing for operator space, visibility, illumination, and patient comfort.[17]

Cotton-roll isolation is a method of moisture control in the placement of restorative materials and orthodontic brackets when used in conjunction with the rubber dam to retract it further from the operative sight.[18,19] Other studies show that there is an increase in the long-term survival rates of restorations if placed with the rubber dam versus cotton rolls alone.[20]

The newest devices for isolation and moisture control are dry field illuminators. One such device is the Isolite i2 Dry Field Illuminator (Isolite Systems, Santa Barbara, CA, USA) (Figure 1). This device combines several features, including a portion that retracts the cheek and tongue simultaneously, a bite block to help patients keep their mouth open comfortably, suction, and an intraoral light source for illumination, all in one instrument. An advantage of such devices over conventional rubber dams is the ease of insertion and removal as needed throughout a dental procedure. This allows a patient who may otherwise be apprehensive about the use of a rubber dam to know that at appropriate moments during a restorative procedure the device could be removed and reinserted easily.

This article proposes a technique using a dry field illuminator to address the challenges posed by the physical, medical, or emotional characteristics of the patient while performing a crown preparation, making a final impression, and fabricating a provisional restoration. This system allows the doctor to provide added comfort for the patient, help control excessive salivation around the operative site, maintain maximum operative space, increase illumination, and significantly reduce the risk of patient injury posed by a large tongue or excessive tongue movement during the restorative session.

DESCRIPTION OF MATERIALS AND TECHNIQUE

A 56-year-old male patient presented with a medical history that included systemic degenerative arthritis, resulting in a restricted maxillary/mandibular incisive opening. His dental history indicated difficulty in completing routine dental procedures because of masticatory muscle fatigue and limited incisive opening. This was further complicated by his large tongue. The patient also had an uncontrolled posturing habit directed toward the treatment zone.

The goal of the appointment was to complete the crown preparation, the impression, and the provisional crown on the mandibular left first molar in a perfectly dry, visible, and protected environment with a dry field illuminator appliance in place. This tooth had been previously endodontically treated, and a light-cured core buildup material had been placed.

Before seating the patient, the dry field illuminator appliance was assembled. The parts of the dry field illuminator appliance include a High Volume Evacuator (HVE) source with evacuation channels, a light-emitting diode (LED), and a mouth prop (Figure 1).

The vacuum hose is attached to the HVE port on the cart. Before attaching the mouthpiece to the evacuation/LED system, a proper-sized mouth prop must be selected. The single-use, disposable, nonlatex, Isolite i2 mouthpiece with vacuum channels and sublingual vestibular aspiration comes in pediatric, small, medium, medium-large, large, and

Figure 3 *Inserting the dry field illuminator.*

extra-large sizes (Figure 2). It is recommended to choose the largest size that allows for a comfortable but maximum opening and soft-tissue protection for the patient. Practicing inserting and removing the dry field illuminator makes the process routine.

First, fold the protective tongue flange against the bite-block portion and insert the bite block to the contralateral side of the proposed treatment area (Figure 3). While the patient rests against the bite block, the flange can be positioned so that the tongue is behind the flange and the vacuum channels rest against the lingual side of the teeth to be prepared. The terminal portion of the flange will rest behind the retromolar pad and come anteriorly into the buccal vestibule for cheek retraction and field accessibility during the restorative procedure (Figure 4).

Customized sculpting of the mouthpiece is possible to further improve compliance, especially in situations where impingement on maxillary or mandibular structures, such as tori, exists. This customizing can be easily accomplished with utility scissors.[2] A series of pretreatment exposures of the patient to the mouthpiece is most beneficial for those patients who present with emotional reactions to new dental procedures.

When core buildups are required, the light source in the dry field illuminator appliance can be changed

Figure 4 *Positioning appliance in the buccal corridor.*

to the "cure safe" mode so as not to disturb the setting time properties of the composite core materials.

In a study presented at the World Congress of Minimally Invasive Dentistry in San Francisco, California, on August 13, 2004, Dr. Michael J. Melkers showed that the dry field illuminator appliance compared very favorably with rubber-dam isolation in reducing the relative intraoral humidity.[4,21] Proper isolation when placing routine direct composite restorations is critical as saliva contamination can affect the properties of self-etching adhesives, can significantly lower bond strength when etched dentin is contaminated with saliva, and can deteriorate the bond strength of luting cements.[22,23]

After the successful administration of the appropriate anesthesia, the opposing arch impression, temporization template, and pretreatment shade were secured. Consider using a fast-setting alginate substitute for the opposing model on patients with limited incisal opening, increased salivation, or exaggerated swallowing reflex.

With the dry field device in place and the proper suction level attained, the crown preparation can begin. An entire preparation can be completed with the isolation device in place, but it can also be removed at any time to evaluate the need for further occlusal reduction and to ensure that the preparation meets all the appropriate preparation criteria necessary for the new crown to restore proper form, function, and esthetics. Gingival retraction can also be completed with the isolation device in place.

Use of a standard complete arch stock or custom impression tray may be difficult with patients who

Figure 5 *Adapted stock tray.*

have limited opening and may require their modification or use of a sectional tray.[24] With the dry field illumination technique, the clinician will need to adapt either a stock tray or a previously fabricated custom tray (Figure 5). In modifying the tray it is important to include as many teeth as possible in the impression. Including the contralateral cuspid is ideal to improve model stability during the laboratory mounting process.

Figure 6 *Final impression using modified stock tray and dry field illuminator.*

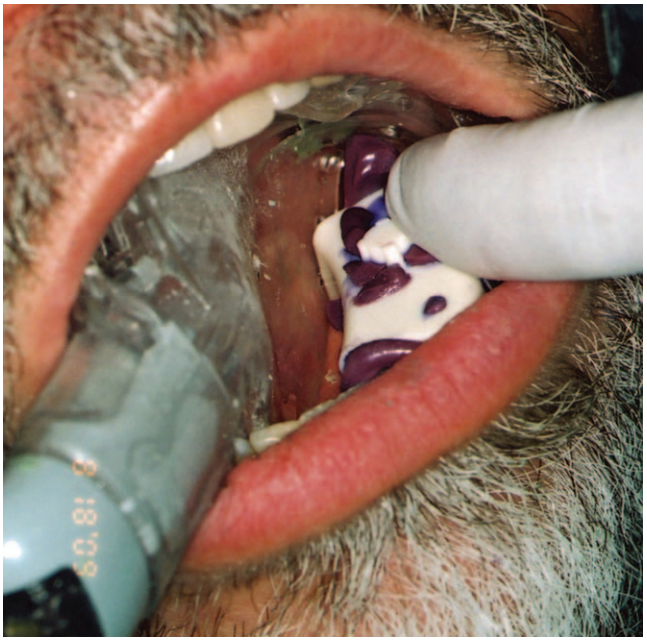

Figure 7 *Provisional restoration fabrication with dry field illuminator in place.*

Polyvinylsiloxane was used for the final impression, following product guidelines. To ensure that the final impression was made in a dry, protected field, it was made with the dry field illuminator appliance in place (Figure 6). The tongue and cheek isolation facilitated by the appliance encourages a superior final impression while helping to prevent displacement of the tray by the tongue while the material is setting. It also facilitates the fabrication of the provisional crown using the previously acquired template (Figure 7).

After the removal of the isolation device, the occlusal adjustment of the provisional and interarch bite registration was completed. The registration should include as many teeth on the prepared side as well as half of the buccal surfaces of that quadrant to help the laboratory technician mount the cast in proper relationship to the opposing model. This is analogous to their mounting a split cast. Cementation of the provisional was accomplished with the dry field illuminator appliance in place.

Except for the occlusal adjustment, at the crown cementation appointment, evaluation of contacts, internal fit, and margins as well as final cementation can be performed with the dry field illuminator in place. This ensures a dry field and unrestricted access during final cementation (Figure 8).[25]

Figure 8 *Final cementation completed.*

POTENTIAL PROBLEMS

This technique presents two potential challenges. First, a full-arch final impression is not possible. A good laboratory technician, however, can use the opposing cast and bite registration to mount the cast made from the modified impression tray onto a semi-adjustable articulator. This is similar to the spilt cast mounting for a removable appliance. The second challenge for the dental practitioner is the need to remove and reinsert the appliance at various times during the restorative procedure. Once the clinician becomes proficient with its use, however, the insertion and removal process becomes a minor issue. The time savings and patient safety will override the inconvenience of reinserting the appliance at the various clinical steps.[2] In fact the patients may enjoy the brief periods of rest when the appliance is removed intermittently.

Prolonged interincisal opening does not appear to be a problem because of the bite-block feature of the dry field illuminator. We surmise that the flexibility of the mouthpiece promotes a more relaxed disposition of the patient, which is also instrumental in decreasing episodes of masticatory myalgia.

BENEFITS

The overriding benefit to the use of the device is isolation and protection of the soft tissues; illumination of the treatment area during preparation; and moisture control during impression making, provisional fabrication, and final cementation.[25–27] Use of a dry field technique reduces relative humidity intraorally to prevent contamination of the restoration sight, which is very important during placement of adhesive restorations.[28] Additional advantages include decreased mirror fogging; decreased dental aerosol spray, which can be further reduced by the staff incorporating an additional HVE at the operative site if needed; and increased patient safety because of the protection of the oropharyngeal airway.[27] These features could also contribute to improved ergonomic postures for the doctor and staff.[16] The critical reason for using the dry field illuminator is to create a dry oral environment to ensure a better quality, obtain a more detailed impression, and minimize the need to remake the impression.[1]

CONCLUSION

Rubber-dam isolation has been shown to improve the quality of treatment, increase the speed of the dental procedure, and save time by 40% to 50%.[29] For patients where rubber-dam placement is impossible, the use of the dry field illuminator is a viable alternative by combining illumination, retraction, mouth support, oropharyngeal protection, illumination, and suction all in one instrument.

In the authors' experiences, the technique presented has proven effective for the preparation, impression making, provisionalization, and delivery of routine indirect dental procedures in patients who present with physical, medical, or emotional characteristics that would greatly interfere with the delivery of quality care. The use of the Isolite i2 Dry Field Illuminator or a similar device can be easily incorporated into any dental practice for use in a multitude of other dental procedures, including clinical examinations, direct restorative procedures, sealants, and periodontal treatments while hand scaling or using the ultrasonic scaler.[25] The initial expense of the appliance is quickly recouped because of its ease of use and effective isolation, suction, tissue retraction, and illumination, all of which contribute to time savings at chairside.[2, 26,27] A dental practitioner whose patients previously required increased chair time to complete routine dental procedures due to medical, physical, or emotional challenges may find this impression technique with the use of the dry field illuminator an invaluable addition to his or her dental practice armamentarium.

In the case described, what would have been a very stress-filled appointment was converted to one where excellent dental care was provided in a totally well controlled, isolated, protected, and comfortable dental environment.

(Accepted 15 October 2012)

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