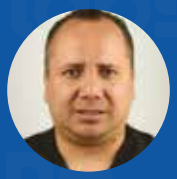
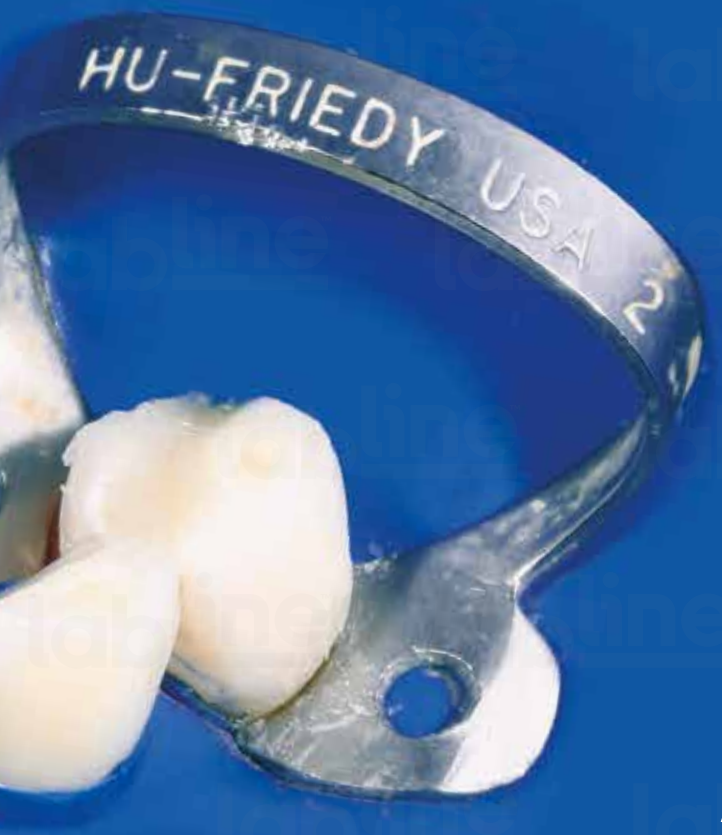
Absolute Isolation

THE KEY TO THE LONGEVITY OF ADHESIVE RESTORATIONS



By Dr. Nelson Diaz Simonin



ABSTRACT

Absolute isolation is a clinical procedure that contributes to the improvement of procedures in dental surgery, rehabilitation, odontopediatrics and endodontics, because it creates an appropriate atmosphere for the restoration materials, and also provides the patient´s security. For the purpose of promoting its use in practice, a literature review was carried out that includes the history, the elements of absolute isolation, recommendations and scientific evidence on their use.

Introduction

Isolation is a very useful procedure for the dentist before clinical procedures, such as endodontics, dental surgery, oral rehabilitation and pediatric dentistry.[1]
In fact, in the oral cavity there are many circumstances and disadvantages that affect the work of the operator, for example: limited access to the oral cavity, presence of a constantly humid environment, microbial flora and some structures such as lips, tongue, and perioral muscles, bleeding of mucous membranes and gums before the minor trauma, as well as mandibular movements.[1,2]

In order to control these circumstances and ensure a moisture-free environment (control of saliva and blockage of crevicular fluid), as well as to improve the visibility and access to the area to be treated, the use of absolute isolation is recommended. It will guarantee the safety of the patient, because there is a barrier that prevents the swallowing of material and instruments in both children and adults. On the other hand, it is necessary to protect the soft tissues from potentially irritating, caustic or acidic medications such as some irrigating substances and even demineralizing agents that can cause lesions in the mucosa or cause irritation reactions, which are undesirable during dental care.[1]
This procedure allows access to the tooth and its isolation from the buccal environment. The present review aims to present a series of general and relevant theoretical aspects to understand the benefits of the use of absolute isolation based on scientific evidence.

Historical background

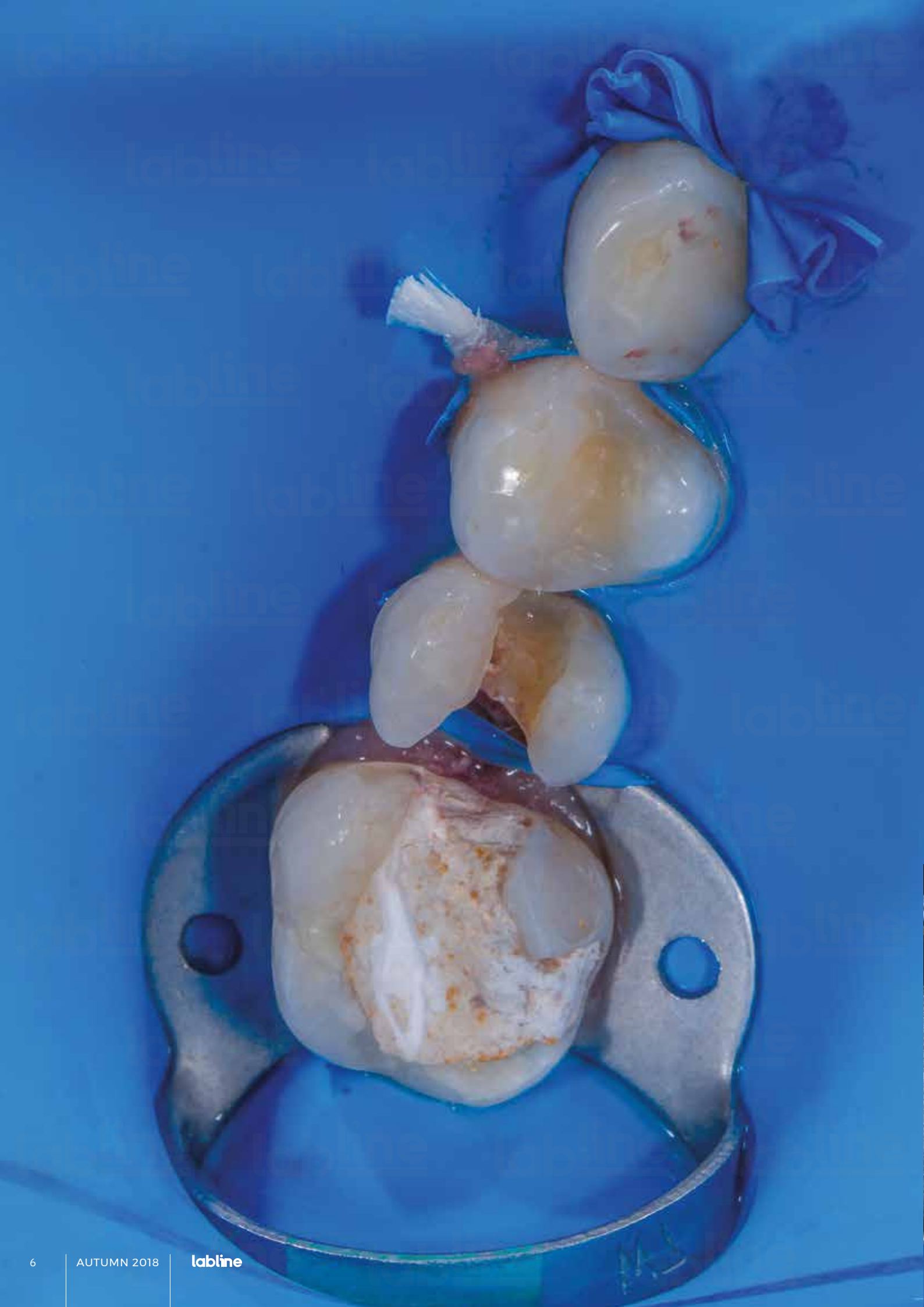
In 1864, Barnum performed the isolation of a lower molar with a piece of rubber cloth. He shared his idea, and over the years the rubber dam was recognized as an effective method to obtain better visibility and quality of dental procedures, as well as to protect patients from small instruments used in dentistry.[1,2]

Later, in 1882, the company SS White presented the model of the rubber dam, similar to the one currently used. In the same year, Delous Palmer introduced a series of staples or metal clamps that could be used for different teeth.[1]

Then, around 1894, staples or Ivory® Rubber Dam Clamps, present today, were introduced to the market for the first time. In 1972, Cragg published an article entitled "The use of rubber dam in endodontics" where he states: "what requires more time in the application of the rubber dam is to convince the dentist to use it", because the main argument for not using this type of isolation by the specialists is that it takes time during the consultation.[3]

In this regard, Lamper commented in 1977 that if the use of the dike is abandoned and the patient swallows or sucks an instrument, such care will hardly find legal protection before a court.[3]

Over the years and currently, the rubber dam has become an indispensable tool in endodontic procedures and has been of great help in dental surgery, oral rehabilitation and pediatric dentistry.3 Since then, it has improved until they have found systems that do not use staples or dikes that come with an integrated arc.



Elements of absolute isolation

RUBBER DAM – COMPOSITION

It is a latex composed of rubber hydrocarbons (30-35%), water (60-65%), proteins, lipids and carbohydrates (1%) and inorganic components (0.5%), which undergoes a process of vulcanization where plastic rubber is transformed in an elastic way.[3,4]

The rubber dams are cut in square shape of 5 or 6 inches (13 and 15 cm, respectively), in rectangles that can have three sizes (12.5 by 12.5 cm, 15 by 15 cm and 15 by 20 cm) or in long rolls of 18 by 21 feet in length. It also has variations in its thickness: thickness is available in thin (0.13-0.18 mm), medium (0.18-0.23 mm), strong (0.23-0.29 mm), extra strong (0.29-0.34 mm) and special strong (0.34-0.39 mm). Dikes of medium thickness, strong and very strong or 6 inches are useful and are recommended in restorative dentistry or dental surgery; the latter provide a better seal to the teeth and better retract the tissues than the finer dikes, as well as being more difficult to tear or break. In endodontics, medium and strong thicknesses are the most used, as well as 5-inch thicknesses.[1,3,4]

It is important to note that there is a wide variety of colors in rubber dams: black, blue, green, gray, pink, lilac, beige and purple. This variation is justified, since light colors allow increasing the visibility of the operative field, because they reflect light as well as being slightly transparent; On the other hand, dark ones are recommended or widely used in dental surgery, because they help to contrast the tooth and the operative field, because they reflect less light, which reduces visual fatigue. Some advice colors such as gray, black and blue, because they consider that they are better to match the tones of restorations with tooth color.[1,3,4]

The rubber dam usually has a bright side and an opaque one, the latter towards the operator, which decreases the brightness and visual fatigue.[4] The aforementioned colors can have an impact on the tooth color appreciation, which is why the color of the restoration is taken prior to the placement of the dam.[1]

Storage

The dam must always remain stored in the refrigerator or in cold places, because these increase its useful life, which is affected by the heat that ages it and makes it brittle. A rubber dam has a lifespan of six months to a year. Among the ways to verify that this dam is in an optimal state are: perform a hole through which it should stretch two times its original size; do not tear and return to its original shape. By means of finger pressure, observe it for transparency, the dam must recover its original shape.[1,3,4]

Rubber dam perforator

It is an instrument that allows circular perforations in the rubber dam. It has a clamp shape whose active part has a steel punch and a steel wheel or plate, which allows drilling with the shape of the punch, wheel or plate. It consists of 4 to 8 different holes: the ones of smaller diameter are used for lower incisors, followed by the upper incisors, canines, premolars, molars. The one with the largest diameter should be used for the tooth that receives the staple or clamp.[4,5]

It should be said that there are three basic models: Ainsworth, Ivor® and Ash. The Ash punch is the model less used by some professionals at present. It can have one or two drilling diameters, of 1.63 mm (small) and 1.93 mm (large). The other two are the most used, because they allow drilling of different sizes. The first has a 5-hole wheel or plate with holes of 0.5 to 2.5 mm. The second is the most recommended for clinical use, because it facilitates a circumferential pressure of the punch on the wheel or plate, which helps prevent holes partially perforated in the rubber dam. In addition, it confers more space to center the above-mentioned perforation, due to the more advanced location of the hinge.[1,3,5]

It is important to note that the perforations must be exactly round and without irregularities, complete and with a clean cut, otherwise incomplete tears or seals may occur. In order to determine the above, you must have a well-sharpened plate or wheel without any damage, as well as a punch without deformations in its tip; It is advisable to drill and stretch the dike in different directions, and it should not be broken.[1,3,5]

Rubber supports, arches or rubber holder

They are used to keep the rubber dam in tension position on the face of the patient, in order to retract the lips and cheeks. Arches that can be metallic or plastic are used to maintain the dam in tension; other methods are the supports that resemble a belt. The most prominent arcs or portadiques are the Young type and the Nygaard-Ostby.[1,3,4]

The first type was originally based on the design of Fernald; since then they have been manufactured by different commercial houses or manufacturers. It consists of a U-shaped stainless steel metallic wire, with pins at its ends to hold the rubber dam. It is available for adults and children, and it has a much longer half-life than plastic ones. The second type has an oval plastic, closed and with spikes on its ends to support the rubber dam. It has a variant called suaver arc, which is quadrangular, and the main difference is that it has hinges that allow it to bend and facilitate the realization of preoperative radiographs, as well as aspiration of saliva from the oral cavity.[1,3,4]

Arcs are bulkier and allow preoperative radiographs without lifting them, since they are radiolucent and can come in U-shape (manufactured by Hygenic). Their half-life is affected when they are subjected to heat sterilization. These usually have a convexity that is more comfortable for the patient. The location of the Young-type arch is generally outward, that is, it is not in contact with the patient, while the Ostby type is generally located inwardly, that is, in contact with the individual, by means of a napkin. [1,3]

On the other hand, the belt supports consist of tweezers that hold the rubber dam and an elastic band that joins them. They are placed around the patient's head for use. They are the following: bow of Cogswell, Wizzard, Woodbury, Mitchell, and Fernald, which are currently in disuse. These were uncomfortable for the patient, required more time for placement, covered the mouth and nose in a way that generated a feeling of suffocation.[1,3]

In recent years, rubber dikes with integrated thin plastic bows and rods have been introduced to keep the device open. They help retract the cheek and lips, and some do not even need staples or clamps. Among them commercially available are: HandiDam® (Aseptico), OptiDam ™ (Kerr), Insti-Dam Latex Free® (Zirc Company) and OptraDam® Plus (Ivoclar Vivadent).[1,3]

Clamp or staple

It is the usual means of retaining the rubber dam in the dental organ, and it is also used to retract the gingival tissue. They have different shapes to suit the different sizes of the teeth. They are manufactured from tempered stainless steel, chromed or high carbon content. The latter is the most used. Recently, plastic staples have appeared with the advantage that they are radiolucent, so they do not interfere with the radiographic image.[1,3-5]

A staple consists of an arch or clamp that provides sufficient elasticity for its application and must always be distal to the dental organ that is to be isolated. It has two arms that have the same shape; there is a hole in their central part that allows the introduction of the staple holder. It is important to note that some staples come without holes. The outer edges of the arms may have fins (two or four) or may not, and the internal edges form a concavity with four tips that adapt according to the tooth, whether incisors, canines, premolars or molars. Some have points in the gingival direction, being useful for the improvement of anchorage in partially erupted teeth and in the ones that require greater retention.[1,3]

It should be clarified that thanks to the manufacturers, there is a great diversity of design and nomenclature in the market related to staples or clamps, which is why the dentist must limit himself to a select number of staples in order to be more familiar and perform the absolute isolation procedure more effectively.[1,3,4]

Clamps or butterfly and cervical staples

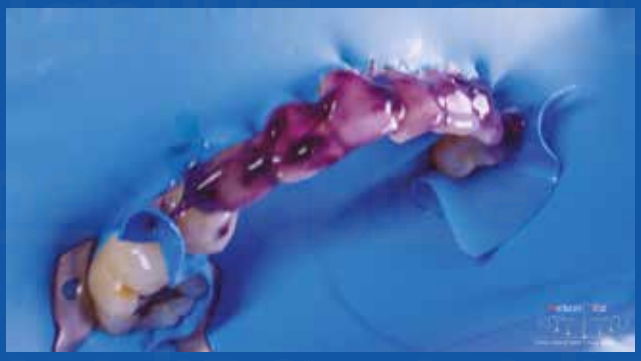
They are frequently used in the anterior sector for the restoration of class V cavities and occasionally class III. The most common numerical denomination is No. 210 in anterosuperior teeth and 211 in anterior teeth. Clamp No. 212 is universally used for restorations and cervical injuries. It is designed to retract gingival tissue. Given the proximity at their tips, it is recommended to use it as a compound to model and thus stabilize the clamp. In some cases, in order to improve access to the workplace, it is cut in half. It can also be used in premolars[1,3-5]

Staple holder or portaclamp

It is a stainless steel instrument with a scissor-shaped hinge, indispensable for the placement of the staple or clamp in the dental organ. There are the following distinguished in it: handles, spring, ring (to keep it open) and end or tip, which makes the fastening of the staple.[3,4] It should be added that there are three models represented by Ivory and the Stokes, which can sometimes have a modification called Palmer and the Brewer. Some authors mention that the Stokes model is generally more advantageous because it provides greater freedom for the rotation of the clamp.[1,3,4]

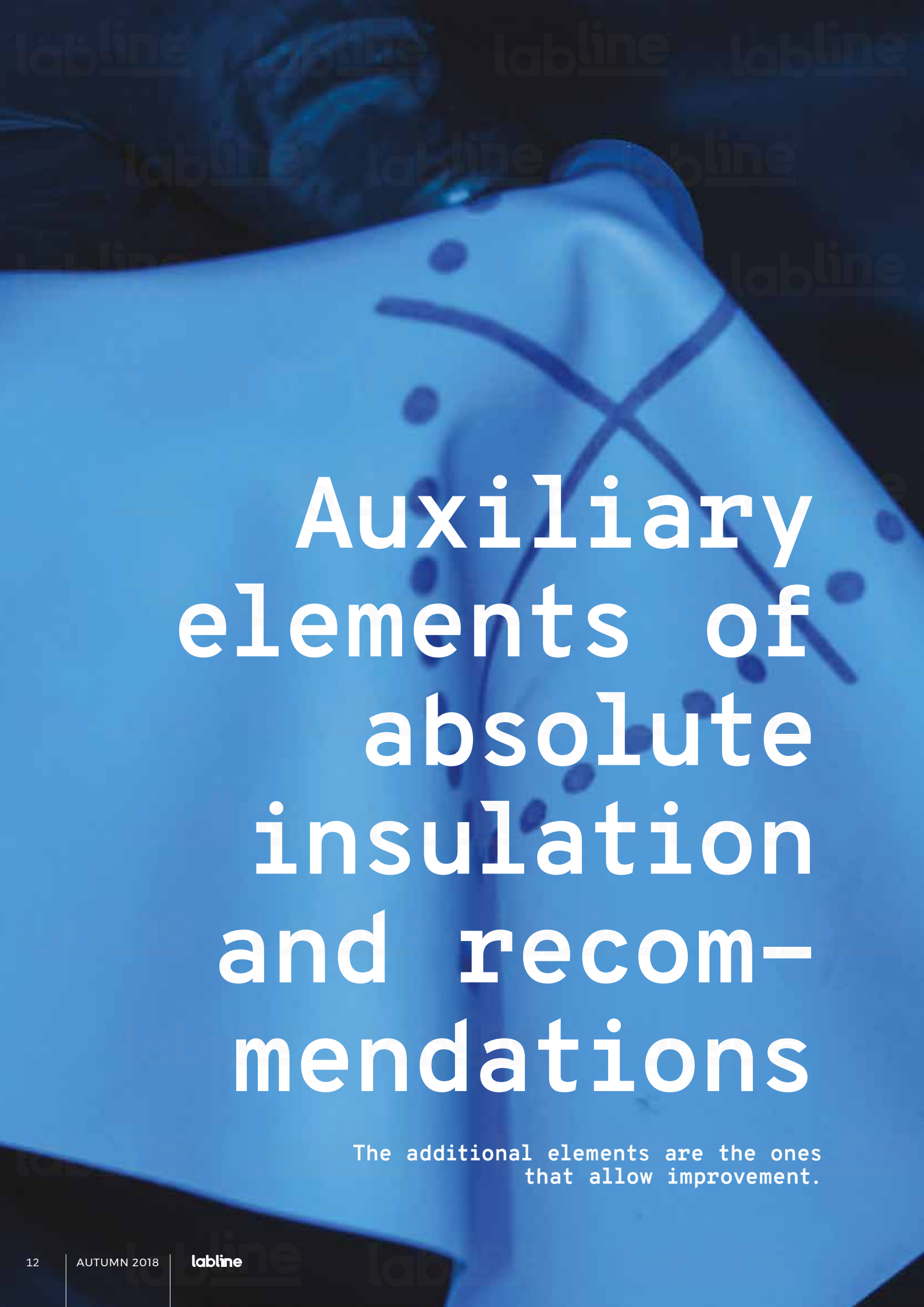
Clamps or staples for premolars

They are smaller; they consist of an arch and may have four fins (two mesial and two free) or may not have any. They also have two holes. The nomenclature of these staples will vary according to the manufacturer; the most common are 00, 1, 22, 27, 206 and 208.[1,4]



Clamps or staples for molars

They are larger, have a single arch with two arms, may have fins or may not and have two or four holes. These additional holes are towards the mesial and allow dismantling the rubber dam. As in the premolars, the nomenclatures vary according to the manufacturer, although the most frequent are 201, 202, W8A, 18, and 25.[1,4]



Auxiliary elements of absolute insulation and recommendations

The additional elements are the ones that allow improvement.

Napkins, dental floss and interdental gums

Some commercial establishments have napkins that have an opening in the center corresponding to the oral cavity. They are placed between the rubber dam and the skin of the patient. They absorb the saliva that filters at the corners of the mouth and give comfort to the affected in long appointments. A method to retain the rubber dam in the dental organ is dental floss, which is widely used as it helps to pass segments of the rubber dam in teeth and allows the realization of ligatures that help maintain the dam. Other similar elements are the interdental gums, which come in different colors and thicknesses.[1,4,5]

Compound of modeling, wedges of wood and plastic

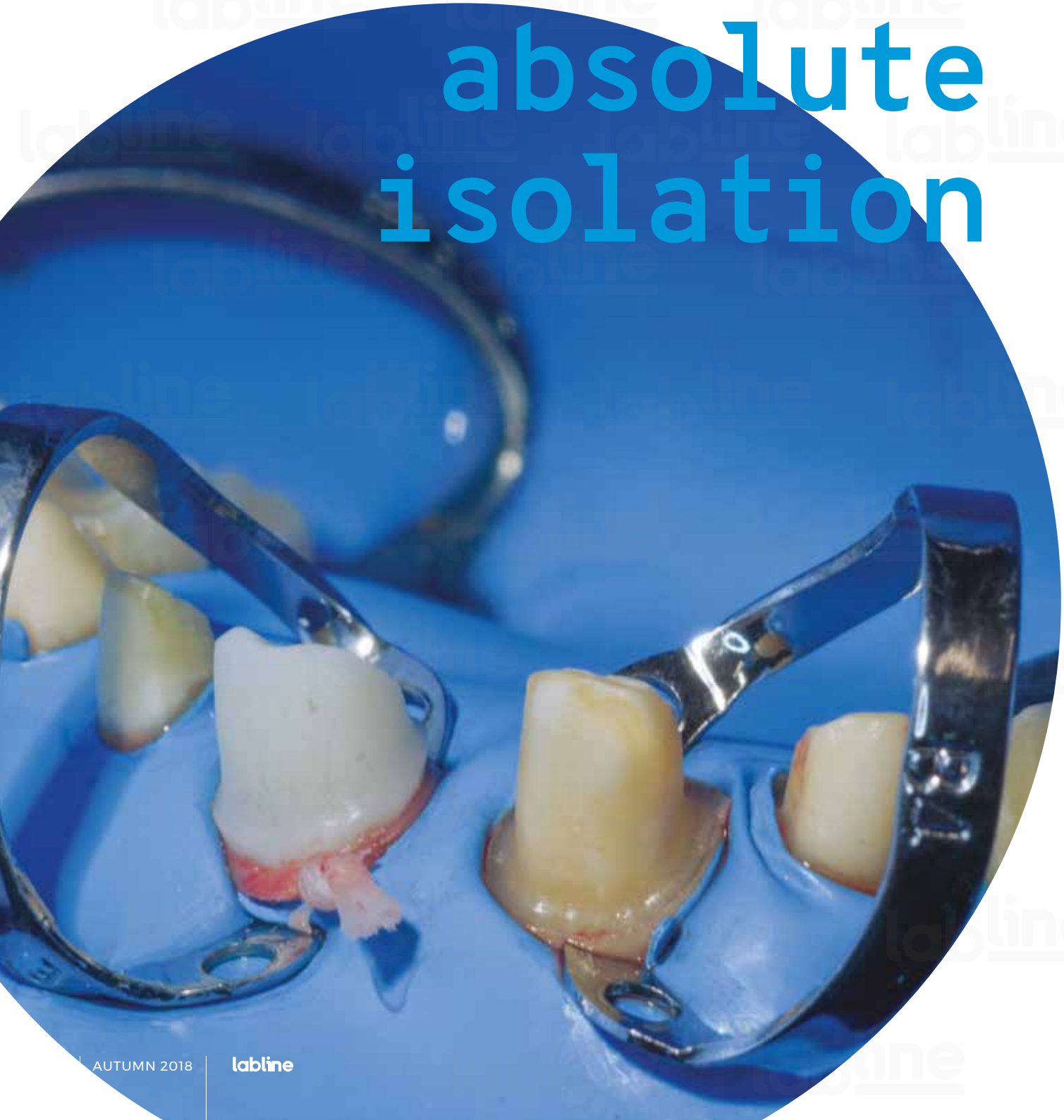
These compounds are of great help to guarantee the stability of the staple or clamp and are used when cervical restorations are made. However, when performing the absolute isolation procedure, it is important to achieve the inversion of the rubber dam, which allows blocking the salivary flow and the intracrevicular fluid, and which guarantees a dry environment. To do so, blunt instruments are used, with which the dam rises slightly and at the same time the area is aerated to achieve this inversion.[1,4,5]

The wooden or plastic wedges allow stabilizing the matrix and have access to the interproximal work area. Another element that helps is the rubbers used in orthodontics, which allow, like the wedges, access to the work area, the restoration of the area and the point of contact.

Vaseline, surgical soap and shaving cream

Sometimes, to facilitate the sliding of the rubber dam in the dental organs, petrolatum, cocoa butter and balsams are used, but due to their fat content, it is difficult to completely eliminate them from the work field. Therefore, it is preferable to use lubricants that are soluble in water such as surgical soap or shaving cream. The aforementioned oily content lubricants are suitable for lubricating corners and lips.[1,4,5]

Scientific evidence related to absolute isolation



Absolute isolation and dental surgery

There are many procedures that merit the realization of absolute isolation, which allows the specialist to use dental materials in an appropriate way and improve their clinical performance. In 2011, Aboushelib conducted a study of 30 cavities in premolars that would be extracted by the orthodontist to determine the performance of self-etching adhesives, where 15 of them were isolated. It was found that the rubber dam before cavity preparation significantly improves the clinical performance of the resins and reduces the possibility of failure. In 2010, Kermanshah et al[7] reported a decrease in strength in total-etch adhesives. On the other hand, in 2014, Patil et al[8] carried out an in vitro study in 112 central incisors divided into four groups, which shows that those incisors that did not present salivary contamination showed greater adhesion strength. Likewise, in 2015, Espinosa et al[9] evaluated the adhesion to the enamel and found that the samples in a dry environment presented a correct marginal adaptation, contrary to the others exposed to humidity and saliva. Therefore, they concluded that the rubber dam favors a dry and suitable medium for adhesion.

The use of the rubber dam is of special importance for the removal of decayed tissue, since it guarantees a moisture-free medium that prevents bacterial contamination from saliva, because it can invade the dentinopulpary complex and lead to infection. In 2006, Accorinte et al[10] evaluated the influence of absolute isolation on the response to pulp lining with calcium hydroxide and an adhesive system. They found that the aforementioned isolation decreases bacterial contamination from saliva. The groups that were not exposed to this isolation presented such contamination that caused necrosis and abscess formation in these groups. In 2015, Marques et al[11] conducted a prospective study on direct pulp lining with added trioxide mineral (MTA) and found that the rate of filtration and recurrent caries was 6.8% in restorations made under absolute isolation.

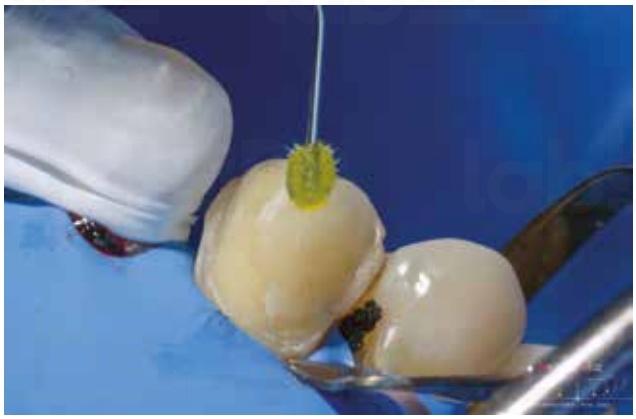
Although the use of absolute insulation is currently questioned due to the inconvenience that results, it has

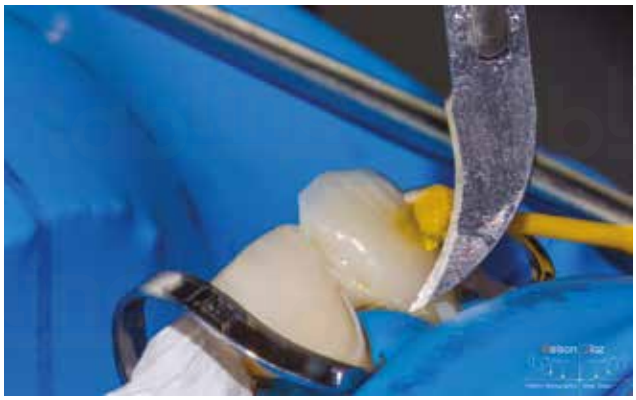
been found that the guarantee for a good result in subsequent restorations is always to control humidity. In 2000, Raskin et al[12] conducted a 10-year study comparing the effectiveness of the rubber dam with respect to the cotton rolls (relative isolation) and concluded that clinically the posterior composite restorations correctly applied with cotton rolls were not significantly different from those made with a rubber dam. In the same way, in 2017, Sabbagh et al[13] carried out a 2-year follow-up of the restorations carried out with absolute isolation and cotton rolls, but found no differences between them. Additionally, in 2010, Gilbert et al[14] evaluated the use of the rubber dam in dental procedures and found a low prevalence of its use during these procedures. In 2017, Blum et al[15] found that 80% of dentists surveyed in the United Kingdom do not use a rubber dam; however, in 2014, the Academy of Operative Dentistry-European Section, contraindicated the use of composite, when it cannot ensure proper control of moisture, which the rubber dam fully complies with.[16]

In 2013, Daudt et al[17], and in 2015, Loguercio et al[18] evaluated the effect of isolation on the performance of direct adhesive restorations in cervical lesions and found that the former does not influence class V restorations. The use of rolls of cotton and retractor yarn showed similar retention rates, as well, although they are not as effective as the rubber dam. However, a meta-analysis published by Mahn et al[19] in 2015 found that the use of the rubber dam positively influences the long-term performance of class V restorations, since there

was less loss of retention and better results than in the restorations where a rubber dam was not used. In another meta-analysis published by Heintze et al[20] in 2012, it was found that the restorations placed with a rubber dam showed a statistically significantly longer life than the ones where the rubber dam was not used. Its use reduces fractures in the material and promotes the overall success of restorations.

In 2014, Kemoli[21] evaluated the effect of temperature on the mixing of glass ionomer cement and atraumatic restorative treatment (ART) in deciduous molars and found that the materials in which a rubber dam was used showed higher values of survival than the ones where it was not used. In this regard, in 2017, Keys et al[22] mention that the rubber dam reduces the risk of failure in restorations.





Absolute isolation and bacterial contamination

Some authors[25-27] report that the rubber dam provides a safety barrier for the patient in areas such as endodontics, where the use of chemical and instrumental substances can put the patient's life at risk, making it the easiest procedure. It is common to avoid any kind of complications. In addition, in root canal treatments, there are no contraindications to its use. Another reason why it is emphasized, is to prevent root canal infections during endodontic procedures. In 2015, Kumar et al[28] analyzed the presence of Candida albicans and the possible failure in the endodontic treatment. They found that the use of the rubber dam is a crucial step to prevent the contamination of the root canal by saliva, which also prevents infection by the above-mentioned fungus and significantly increases the success rate.

In a study conducted in 2015, where the effect of temperature and humidity on the post-gel contraction was evaluated, Bicalho et al[23] reported that the increase of both significantly increases the deformation of the cusp, that is to say, causes stress in the structure of the tooth and the tooth / restoration interface. Therefore, the use of absolute insulation with a rubber dam for restorations in posterior teeth allows avoiding increased temperature and humidity, which decreases deformation, stress and improves adhesion strength. Likewise, in 2015, Barros et al[24] mention that the use of the rubber dam provides a clean field, the control of salivary humidity and the crevicular flow, which guarantees an optimal adhesive procedure, better access and gingival retraction similar to the retractable thread. A good adaptation of the rubber dam with the gum will allow the operator to properly visualize the emergency profile of the dental organ that is to be rehabilitated.

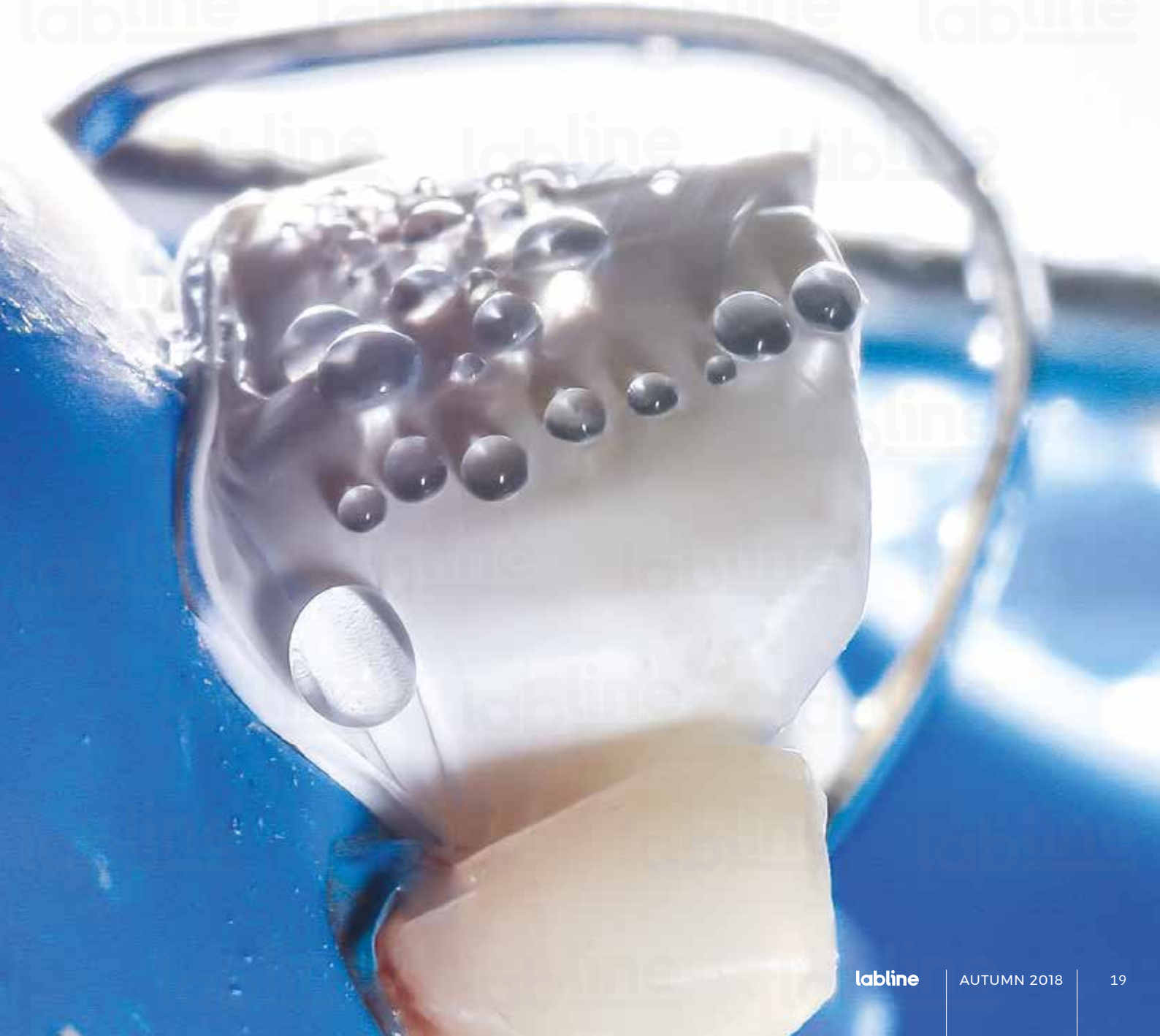
In 2012, De Amorim et al[29] evaluated bacterial contamination in teeth that were to be exposed to desobturation by fiberglass poles without absolute isolation and found bacterial contamination of Enterococcus faecalis. Therefore, this procedure must be carried out under aseptic conditions with appropriate irrigants and under absolute isolation, although the authors recommend other studies. Lin et al[30] mention that the use of the rubber dam increases the success rate of root canal treatment, as well as its survival.

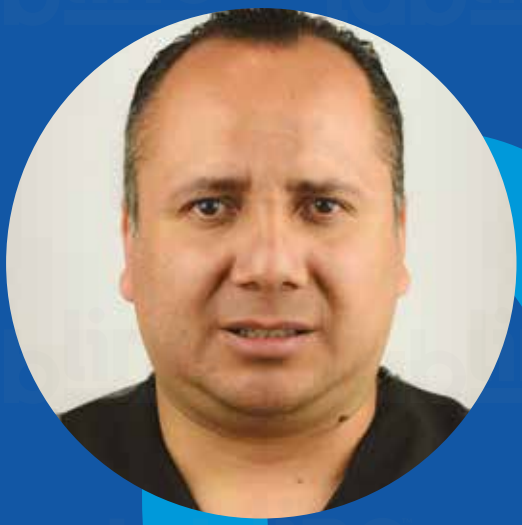
Absolute insulation and fiberglass posts

In 2013, Goldfein et al[31] reported that the success rate of the influence of the rubber dam on the cementation of the fiberglass pole in endodontically treated teeth was greater than 93.3%, compared with teeth that were not isolated (73.6%). However, the researcher recommends more studies in this regard. On the other hand, the authors of this article recommend the use of absolute insulation for the desobturation and cementation, as it will guarantee the aseptic conditions that prevent bacterial contamination and improve the success rate during adhesion.

Conclusions

Absolute isolation is a fundamental tool in clinical practice, and although there is a high percentage of dentists who do not use it when performing restorations, it must be mandatory in endodontic procedures. The quality and longevity of the treatments in dental surgery, oral rehabilitation, pediatric dentistry and endodontics, increase with the use of this procedure, which provides a dry, clean and safe environment for the patient. In addition, it allows moisture control and avoids any possible risk of contamination during the performance of dental procedures.





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- Labline Magazine, Volume VIII, Issue 01, Spring 2018 **"AN INNOVATIVE USE OF PORCELAIN VENEERS FOR THE TREATMENT OF AMELOGENESIS IMPERFECTA"**
- Labline Magazine, Volume VI, Issue 03 Autumn 2017 con el artículo **"CORRECTION OF VERTICAL AND HORIZONTAL OVERBITE WITH PORCELAIN VENEERS, USING THE TECHNIQUE OF DIGITAL SMILE DESING."**
- Labline Magazine, Volume VI, Issue 03 Autumn 2016, with the article **"CORRECTION OF VERTICAL AND HORIZONTAL OVERBITE WITH PORCELAIN VENEERS USING THE TECHNIQUE OF DIGITAL SMILE DESIGN"**
- 2015: **Published in Mexican Institute of Advanced Restorative Dentistry**
- http://www.imora.mx/casos-clinicos/Digital_Smile_Design.pdf

Courses:

- **2017 November:** Advanced absolute isolation course. Pachuca, Mexico
- **2014 October:** Clinical course of Photography, Art and Digital Smile Design, Puebla, Mexico
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