Topical Anesthetics in Cryotherapy: For More Comfortable, Satisfied Patients

Anthony Vincent Benedetto, DO, FACP
Associate Professor
Department of Dermatology
The Johns Hopkins School of Medicine
Baltimore, Maryland

Introduction

Cryotherapy with liquid nitrogen is a common dermatologic procedure. While effective and easily administered, cryotherapy may be associated with significant discomfort, particularly after the treated lesion has thawed. Patients who have suffered pain with this procedure may resist additional treatments when they are necessary. The application of a topical anesthetic, such as L.M.X.4®, during cryotherapy helps alleviate the discomfort associated with the inflammation, edema, and vesiculation that freezing induces.

Recently, dermatologist Anthony V. Benedetto, DO, Associate Professor in the Department of Dermatology at The Johns Hopkins School of Medicine in Baltimore, Maryland, discussed his experiences with cryotherapy and the benefits of using topical anesthetics during the procedure.

Moderator: What is the role of cryotherapy in dermatology?

Dr. Benedetto: Cryotherapy is one of the main procedures dermatologists use to treat numerous types of benign and malignant lesions, including skin tags, warts, actinic keratoses, and superficial basal and squamous cell cancers. I use cryotherapy in the form of a liquid nitrogen spray. Some dermatologists dip a cotton-tipped applicator in a large container of liquid nitrogen and then press it firmly against the lesion they are treating. The liquid nitrogen freezes an area of skin and its blood flow, necrosing the tissue. In other words, freezing a lesion—such as a wart—can destroy it completely.

Moderator: Would you briefly explain the procedure?

Dr. Benedetto: Cryosurgery involves reducing the temperature of the skin to a point at which it freezes, producing an ice ball. The diameter of the ice ball is proportional to the depth and length of time that the lesion is frozen. For example, if you estimate that a wart is at least 2 or 3 mm deep, based on the length of time the patient has had it, its thickness, and its texture, the solid ice ball will have to be at least 2 or 3 mm in diameter as well. The ball of frozen tissue must reach the deepest point of the lesion. This creates intracellular ice formation and thrombosis of microvasculature, which eventuates in tissue necrosis. As the ice ball thaws, a blister forms between the epidermis and dermis, lifting the lesion and separating it from normal skin. If the depth of freezing is too shallow, the wart is only partially treated and will most likely recur.

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Moderator: Is there a typical patient who benefits from cryotherapy?

Dr. Benedetto: No. Patients range in age from young children to older adults. Basically, any patient with a treatable lesion is a candidate for cryotherapy.

Moderator: Is cryotherapy painful?

Dr. Benedetto: The procedure is associated with two types of pain. The first is the pain that occurs during the active freezing of a lesion; the second pain occurs with the posttreatment thaw and can last for hours. During freezing, the lesion is exposed to liquid nitrogen, with a temperature of approximately -195ºC. It is this drop in temperature that causes the initial pain. Soft tissue, nerve endings, and blood vessels in the area are frozen. As the area thaws, pain progresses for about 3 to 5 minutes and even longer. The cause of this postthaw pain, I believe, is the actual separation of tissue and the development of the intracutaneous blister that freezing induces. Generally, the severity of pain correlates with the depth that the tissue is frozen: the deeper the freeze, the more severe the pain. This acute postthaw pain can be even more distressing than the initial sensation of pain, or the pain associated with active freezing.

Moderator: How long does it take for a treated area to thaw?

Dr. Benedetto: It depends on the length of time the liquid nitrogen was applied to the lesion. There is a correlation between how long the liquid nitrogen is applied and the size, or diameter, of the ice ball that results. The longer liquid nitrogen is applied to a given area, the larger the ice ball grows in diameter. After the procedure is completed, the ice ball begins to melt. It can take anywhere from 15 seconds to 2 minutes or even longer for the ice ball to thaw completely.

Moderator: Does pain negatively impact the treatment of patients who must return for additional sessions?

Dr. Benedetto: Certainly. If a procedure hurts even though the effects are beneficial—most patients will think of excuses to avoid the experience again. And the posttreatment thaw pain associated with cryotherapy is intense. Injecting a lesion with local anesthetic can also be painful, and so this is often not the solution. Lesions such as warts can develop anywhere on the body, from the scalp to the tip of the toe, and in sensitive areas, such as the genitalia. With pediatric patients, every spot on the body is sensitive.

I have found that the younger the patient is, the more sensitive he or she is to both the pain of injecting local anesthetic and the pain from cryotherapy. If a 2-, 5-, or 8-year-old patient has a wart on the finger, just injecting and anesthetizing the lesion before cryotherapy can be extremely traumatic for the child and challenging for the physician. If the wart does not disappear with the first treatment, retreating the area may be next to impossible. With a child or an adolescent, we must often resort to extreme measures when retreating a lesion for a second or third time.

Moderator: What benefits do topical anesthetics provide in your practice?

Dr. Benedetto: Topical anesthetics help relieve the discomfort associated with many of the treatments that are necessary in dermatology. When used with cryotherapy, these agents help relieve pain associated with both the active and thaw phases of treatment. The only problem with topical anesthetics is that they must penetrate the epidermal barrier to be effective. Consequently, pretreatment with one of these agents may require anywhere from 20, 30, or 45 minutes to

an hour, depending on the product that's used. Even with occlusion, pretreatment can take as long as an hour and still not be thoroughly effective. Also, the physician must perform the procedure immediately after removing the plastic occlusive wrap, because the topical anesthetic begins to lose its effect, and the patient may regain some sensation in the area while undergoing treatment.

Moderator: Is there a point when applying a topical anesthetic is most beneficial?

Dr. Benedetto: A few years ago, a colleague and I found that applying a topical anesthetic in the posttreatment, or postthaw, phase of cryotherapy produced effects almost instantaneously. The reason for this is not yet clear, but the effect may result from the breakdown of the epidermal barrier by the formation of ice crystals. When a topical anesthetic is applied before freezing, it cannot penetrate the epidermis as rapidly as it does after the tissue is frozen. Thus, it produces little or no effect. If the topical anesthetic is applied *after* freezing and thawing of the tissue, it immediately penetrates the skin. This eliminates the most intense pain associated with the procedure.

More specifically, as the ice ball thaws, the treated area begins to turn red or hyperemic. This is the period in which the topical anesthetic should be applied. Patients don't feel much pain during the thaw period. It is right after this period, when the intracellular crystals melt and the epidermis and dermis begin to separate, that the pain is intense. This is also the point when the skin barrier is broken, allowing the topical anesthetic to penetrate. Once applied, the topical anesthetic takes only seconds to relieve pain. Because the pain of the procedure has been eliminated, the patient is much more likely to return for retreatment, should it be necessary. This is particularly true with a pediatric or adolescent patient.

Moderator: What experience have you had with pretreatment of warts?

Dr. Benedetto: I haven't found pretreatment of warts and lesions of molluscum contagiosum before cryotherapy to be very effective. The thick, hyperkeratotic surface of a wart forms a barrier that is difficult for a topical anesthetic to penetrate. Occlusion can help the topical anesthetic to penetrate, but it can take an hour or longer to macerate the tissue. Again, I have found that the best pain relief occurs when a topical anesthetic is applied after the thaw cycle of treatment.

Moderator: Do you ever use topical anesthesia as long-term treatment?

Dr. Benedetto: Not usually. Each product has a specific half-life. Depending on the product used, the effect of the topical anesthetic lasts for a certain amount of time, ranging from 15 to 20 minutes to an hour. Posttreatment thaw pain lasts anywhere from 10 to 15 minutes and sometimes for hours. Ordinarily, you only need to apply the topical anesthetic once. That treatment should carry the patient through the most uncomfortable phase. The posttreatment thaw pain is over by the time the effect of that anesthetic has diminished.

When postthaw topical anesthesia is not used, the pain from cryotherapy seems to last longer. This is especially seen when treating fingers, which throb incessantly after the procedure. The use of postthaw topical anesthesia eliminates this protracted pain. If the pain persists, the patient can reapply the topical anesthetic at home for extended relief.

Moderator: Do you use cryotherapy as multitreatment?

Dr. Benedetto: Yes, if I am removing several lesions at a time. I apply topical anesthetic directly to each lesion that I am treating. I may

also use cryotherapy to retreat a lesion, using the same technique of postthaw topical anesthesia.

Moderator: Do you find topical anesthetics helpful with other minor skin surgeries?

Dr. Benedetto: Yes. I use them with cosmetic procedures and laser treatments. Topical anesthetics are also useful for patients who have a low tolerance for pain or an intense fear of needles. I also use them with incisions in minor surgeries. If I use a topical anesthetic as pretreatment, I use it under occlusion. The occlusive wrap must remain in place for 30 to 60 minutes to allow the preparation to penetrate the skin barrier and produce its effect.

Moderator: Have you had good results with the topical anesthetic L.M.X.4®? How would you compare it with other products?

Dr. Benedetto: The advantage of a topical anesthetic lies in how rapidly it penetrates the epidermis and thereby anesthetizes an area. L.M.X.4® seems to penetrate faster than EMLA® Cream, which was the first product that was available to us. EMLA® took at least an hour and a half to penetrate the skin barrier. L.M.X.4® appears to be as effective as the earlier product but produces its effect in half the time—within 30 to 45 minutes under occlusion.

It is sometimes difficult to assess how well a topical anesthetic is working, because some patients have a higher threshold for pain. Certain products penetrate more rapidly and, as a result, are more completely anesthetic to a patient. Other factors that affect penetration are the area where the topical anesthetic is applied and the thickness of the stratum corneum and lipid barrier.

Moderator: Which patients do you find benefit most from topical anesthetics?

Dr. Benedetto: Topical anesthetics are useful when treating pigmented lesions and different types of warty lesions that present in children. I will use these preparations to treat vascular lesions, such as hemangiomas, or port-wine stains, even though they may cause vasoconstriction. Before applying the topical anesthetic, I use a marker to outline the lesion to be treated. The topical anesthetic is applied half an hour to an hour before starting therapy with either liquid nitrogen or a laser.

For patients undergoing cryotherapy, the anesthetic can then be reapplied as the treated area thaws. For those receiving laser therapy, the vasoconstriction may promote an even better result, because a smaller diameter vessel contains less blood and may be more susceptible to the pulse of the laser.

I have used topical anesthetics as pretreatment for laser hair removal in the axillae and bikini area; on the tops of the hands, knuckles, and feet; and on the faces of teenagers and adults.

Summary

Cryotherapy is commonly performed in dermatology to treat numerous benign and premalignant skin lesions and some selected superficial skin cancers. The pain associated with this procedure occurs in two phases, immediately at onset and as the treated site thaws. The posttreatment thaw pain is the most intense and may inhibit patients from undergoing retreatment, should it become necessary. Application of a topical anesthetic, such as L.M.X.4®, after a lesion has thawed relieves the pain associated with cryotherapy.