Basic Equipment for Cryosurgery

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Paola Pasquali

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P. Pasquali, MD
Department of Dermatology, Pius Hospital de Valls, 43800 Tarragona, Spain
e-mail: pasqualipaola@gmail.com

Key Points

- Dermatological cryosurgery utilizes specialized equipment.
- An overview of the different accessories necessary to perform the most common procedures will be shared.
- The most relevant features of each instrument will be discussed.

4.1 Introduction

Dermatologic cryosurgery requires its own set of equipment. When compared to other subspecialties in the field, cryosurgical equipment is relatively inexpensive. A basic starter kit for most dermatologists includes a unit, a set of spraying tips, and a cryogenic storage Dewar [1].

However, for those surgeons that want to do something more than a wart removal and an occasional seborrheic keratosis, the tool box will necessarily have to expand. One will need to have a whole set of gadgets in order to solve a difficult case, besides using all your cryosurgical wit. As in anything in life, once one becomes passionate about a technique, more equipment will be needed.

This chapter will take you step by step through the different equipment used in basic dermatologic cryosurgery using liquid nitrogen (LN) as the cryogen.

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The equipment and needed materials include:

1. Liquid nitrogen (LN), LN producers, storage Dewars, and other useful gadgets regarding manipulation of LN (gloves, withdrawn tubes)
2. Cryosurgical unit
3. Attachments for units:
   - Spraying tips
   - Probes
   - Chambers
4. Rubber cones, plastic plates, and other restrainers
5. Tweezers
6. Other equipment

4.2 Liquid Nitrogen (LN), LN Producers, Storage Dewars, and Other Useful Gadgets

4.2.1 Liquid Nitrogen and Storage Dewars

LN is readily available and purchased through specialized dealers. It is relatively easy to manipulate and fairly safe. Since it is used by other professions (veterinary, laboratory, engineering, computer, food industry), finding a dealer is not difficult. This is true for many countries, though each place has regulations that differ from one place to another, and in certain parts of the world finding an LN dealer is almost impossible. When available, most LN distributors will come to your office, pick up your storage Dewar (vacuum flask), and return it full (with the accompanying bill).

LN has to be maintained in special flasks. Throughout history, these vacuum flasks have received many names. Although first introduced in 1881 by Adolf Ferdinand Weinhold, it was Sir James Dewar who in 1892 invented and developed the first insulated flasks [2]. A researcher in the field of cryogenics, Dewars developed a double flask system (1892) (one flask inside another joined at the neck) separated by partially evacuated air that creates a semi-vacuum area which prevents heat transfer (Fig. 4.1).

It took two German glassblowers (1904) [3] to visualize the potential commercial use of the vacuumed flask for keeping drinks hot or cold. They rebaptized the flask into the "thermos," which 60 years later became a metonym for such containers.

Modern day Dewars are structurally the same: they are still one big container contained in another with a vacuum in between. However, they have been improved in many ways:

- They are available in different sizes. This gives you a whole range from which to choose, adapting it to different needs.
- They have improved insulating systems that make LN last longer.
- They are lighter because they are aluminum. This weight reduction has made Dewar handling simpler and more practical.
- They are safer thanks to improvements in the cap/neck system.

Size is an important issue when it comes to choosing a storage Dewar. The most commonly

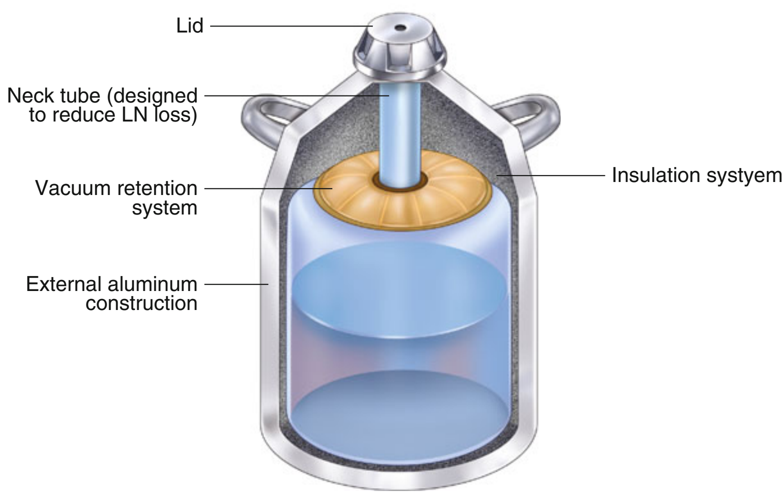


Fig. 4.1 Anatomy of a Dewar (taken from MVE): (**a**) lid, (**b**) neck tube (designed to reduce LN loss), (**c**) vacuum retention system, (**d**) external aluminum construction, (**e**) insulation system

Fig. 4.2 Dewars from MVE (Courtesy of Chart Biomedical)

Table 4.1 MVE Dewars: size, static holding time, empty weight, and full weight

Size (liters, l)	Static holding time	Static evaporation rate (liters/day)	Weight empty (lb)	Weight full (lb)
5 l	4–5 weeks	0.15	8	17
10 l	6–8 weeks	0.18	13	30
20 l	8–12 weeks	0.18	19	53.
Long last 20 l	220 days	0.095	19	53.
30 l	14–16 weeks	0.22	26	77.
50 l	14–17 weeks	0.49	34	123

Data courtesy of MVE Biomedical

used Dewars in dermatology range from 5 up to 50 liters (l). (Fig. 4.2). One commercial manufacturer is MVE [4], and the holding time and weights (empty and full) can be seen in Table 4.1. Small Dewars are easier to handle with the disadvantage that LN lasts a shorter period of time (they contain less), making continuous recharge necessary. They are useful in order to drain off the remaining LN from a larger Dewar that needs to be sent for refill. Larger ones (50 l) are more cumbersome but last longer. They are ideal for daily and continuous use (such as in a large dermatology department), weight being their sole drawback.

An excellent alternative is to have an intermediate-sized Dewar (20–30 l) and a small one (5 l), used to hold the little amount left in a larger Dewar that needs to be sent for refill. It might sound as an unnecessary precaution but one needs to take into account that most retails need at least 24 hours for picking up, refill and bringing back a Dewar. This spared LN in a small Dewar will allow doing cryosurgeries for a day, while waiting for LN delivery.

Dewars can be placed on a roller base, a necessary item for flasks larger than 20 l. This simplifies transferring from one place to another (for instance, for cleaning the floor) or for taking it away for refill.

LN can be withdrawn from the storage Dewar by:

1. Simple pouring. Pouring using a funnel is the standard procedure for small Dewars (5 l). It is not recommended for large Dewars: one might end up hurting ones back or accidentally pouring LN all over the floor. Another inconvenience with single pouring is pouring residues that are sitting at the bottom of the Dewar. This increases the risk of clogging the equipment.
2. Fixed device affix (Fig. 4.3): This is screwed at the top of the Dewar and left in place until refill is required. The fixed affix has its own pressure control and it works like a faucet. Once the LN is reduced inside the flask, so does the internal pressure, making refill necessary. This affix includes a filter that keeps the LN poured from inside the unit clean.

Fig. 4.3 Fixed device affix to leave on Dewar to withdraw liquid nitrogen (LN) (Courtesy of Brymill Cryogenic Systems)

Fig. 4.4 Removable device left on Dewar to withdraw liquid nitrogen (LN). It is placed with slight pressure once the cap is removed. It is meant to be taken out of the Dewar once LN is withdrawn (Courtesy of Brymill Cryogenic Systems)

3. Removable affix (Fig. 4.4). This is placed into the opening of the Dewar once the cap is removed. Once firmly placed, instant pressurization is obtained and unit refill can be done. It must be removed after each refill, and one must remember to place the Dewar cap right back in place to avoid evaporation. If the withdrawal procedure is to be done for several units one after another, the affix can occasionally get clogged due to freezing. If this happens, one must let it thaw for several minutes and restart the charging procedure of the units.

4.2.2 Other Cryogens

There are other cryogens available on the market and used for cryosurgery. Among them are argon gas (Ar, boiling point −187 °C), nitrous oxide (N_2O, −88 °C) [5, 8], carbon dioxide gas (CO_2, −78 °C), and other compressed gases that boil on the order of −55 to −75 °C.

Argon is mostly used in visceral cryosurgery (prostate [9], lung, bone [10, 11]). N_2O and CO_2 are used in dermatologic situations but should be reserved for benign lesions. Wallach [12, 13], Cryo S classic and mini by Metrum CryoFlex [14], Cryosucess by Schuco [15] and CryOmega by Premier Medical [16] are some of the options availble for carbon dioxide and nitrous oxide cryosurgery.

4.2.3 Dewar's Maintenance

Modern Dewars need little maintenance; however, they still need to be kept clean since there is a tendency for detritus accumulation at the bottom of the flask. With sufficient time, a dusty residue accumulates at the bottom and gets sucked into the unit during the LN withdrawal. This detritus will cause malfunction in the unit. The first "symptom" of an unclean Dewar is the darkening of the central pick up tube of the cryosurgical unit. It will start losing its brightness and begins to turn grayish. Once this process begins, the LN will start getting clogged, making maintenance necessary.

Cleaning Dewars is a usually a forgotten but necessary procedure both for the maintenance of the flask and cryosurgical unit. Cleaning the Dewar is a good idea to assure its long life. The best time to do this is right before you send it for refill. Just turn the Dewar upside down and let all the residues pour out. If one thinks that it needs extra cleaning, one can proceed to wash it. MVE suggests using any household detergent or mild soap solutions for sanitizing and decontaminating their Dewars (Table 4.2). They suggest spraying the solution into the inner vessel, although agitation of the solution inside the inner vessel will suffice. Rinsing is important, and the flask has to be thoroughly dry before use; accomplish this by setting the Dewar inverted to drain and dry. If cleaning a Dewar seems a difficult chore, have the technical support from your suppliers take care of this. Basically, cryosurgeons use Dewars to store LN and not as containers for specimens (semen, embryos, bone marrow). Therefore, cleaning is simplified since there is no need to use disinfectants for maintenance.

Another aspect to take into account is that Dewars can lose their vacuum if they are accidentally hit. Care should be taken when handling. Unfortunately, some LN dealers treat empty Dewars like suitcases. When dealing with careless LN dealers, it might be a good idea to put some external protection around the Dewar or change dealer.

Table 4.2 Dewar filling instructions, measuring and withdrawal of LN

Dewar filling instructions
To avoid damage to the aluminum cryogenic vessel which may result in premature vacuum loss, it is important to follow this procedure during the addition of liquid nitrogen to a warm vessel and on subsequent additions 1. Slowly pour liquid nitrogen into new or warm vessels with a funnel or transfer line when possible 2. Allow liquid nitrogen to settle in vessel for 2 h to completely cool 3. Fill the vessel to the desired level after the 2 h settling (cool down) time 4. If filling the Dewar from a pressurized source, make sure that the source tank is at a low pressure (1.52 bar or below) 5. If transfer hose is used for extracting liquid nitrogen from a pressurized liquid source, always use a phase separator on the end of the hose 6. Remember to always wear proper safety attire over clothing; also use face shield, cryogenic gloves, and apron 7. Never overfill your Dewar with liquid nitrogen. Overfilling the tank may cause pumped out components to leak, leading to immediate or premature vacuum failure to occur
How to measure liquid nitrogen quantity
1. Use wooden or plastic dipstick. Never use a hollow tube to measure liquid nitrogen 2. Level will be indicated by frost line, which develops when dipstick is removed
Liquid nitrogen withdrawal
1. Liquid withdrawal from Dewars must be accomplished by pouring or utilizing a withdrawal device. Withdrawal device pressurizes to approximately 0.35 bar and the pressure forces liquid up the withdrawal tube out the valve 2. Always wear proper safety attire: shield, gloves, and apron

Data courtesy of MVE Biomedical

4.2.4 Gloves and Apron (Fig. 4.5)

Proper safety attire is recommended when manipulating LN. A set of cryogenic gloves is a useful item to have, especially if filling is done by somebody not familiar with LN. Occasionally, LN can spatter on the dorsum of the hand and cause burning, particularly on fair skin. Glove use gives confidence. They are a good investment to maintain happy personnel and avoid lawsuits.

Fig. 4.5 Cryogenic gloves (Courtesy of Brymill Cryogenic Systems)

4.2.5 LN Producers (Fig. 4.6)

For those who have difficulty in accessing a reliable source of LN or live far away from the circuits of delivery, an LN generator can be the solution. This equipment looks like a water dispenser and works by taking nitrogen from the air and turning it into liquid nitrogen. Air is extracted through a particle filter and then compressed to a moderate pressure of 6–8 atmospheres. The compressed air is fed to a membrane that separates the nitrogen portion (78 %) from the air and liberates oxygen, carbon dioxide, and water vapor back into the atmosphere.

This nitrogen is later liquefied through a cryogenic system. Once full, the unit stops, and the LN is transferred by pressure into a liquefier and later forced out a transfer siphon into the Dewar or unit.

This equipment is called elan2™ Liquid Nitrogen Generators [17] and is based on MMR Technologies patented refrigeration technology. They are safe and allow for the production of liquid nitrogen in the office every time it is needed. These units are left powered on all the time. When full, they go into standby mode waiting to power back on as soon as the unit is less than full.

There are two types of units:

- The office unit: it comes with an internal storage container of 0.75 L. Once full (it takes roughly 4 h to produce this amount of LN), a button is pushed and it takes roughly 60 s to transfer it to the external container.
- The auto transfer unit automatically transfers from the internal Dewar to the external Dewar. It takes roughly 4 days to fill the 20 L Dewar, but you can use and take liquid nitrogen from it at any time using a provided transfer tube. Transfer from the 20 L Dewar to a handheld can take approximately 60 s.

Fig. 4.6 elan2 Liquid Nitrogen Generators (Courtesy of MMR Technologies)

4.3 Cryosurgical Units

Cryosurgery requires cryosurgical units. From the times when Zacarian and Adham (1960) immersed copper disks in LN, many advances have been made in this field. In 1966, Michael Bryne (Brymill Co.) developed the first commercially available handheld cryosurgical device which has been the prototype that has inspired all the equipment available in the market today.

With the existence of these units, the use of cotton swabs is long gone. Cotton swabs for cryosurgical purposes should be avoided for the following reasons:

- They do not allow a controlled application of LN. There is no temperature control whatsoever.
- Commonly used in benign lesions, they do not permit a precise application of cold, therefore destroying areas of healthy skin that should not have to be treated. One ends up with all the undesired secondary effects of cold with little of the expected results.
- Verrucous lesions have large amounts of keratin, a bad cold conductant. If a continuous spraying with margins included using a unit does not eliminate the lesion, needless to say a cotton swab will not either.
- Vascular tumors are nests of vessels with hot blood circulating through them. The destruction of such vessels requires previous pressure and a controlled application of cold via previously frozen copper probes. The use of cotton swabs for this purpose should be avoided.
- There is the bad habit of refreezing the cotton swab by plunging it back into the open unit after contacting the skin. This might cause contamination of the unit. If a cotton swab is reused, this should be immersed in LN placed in a Styrofoam cup which should later be discarded.

Therefore, a cryosurgical unit is a *must have* in order to perform cryosurgery correctly. The common characteristic of this device is that it delivers LN through different tips or probes in a safe, precise, and controlled manner.

The first units were cumbersome and heavy. Nowadays, they are light, easy to handle, and contain sufficient LN to treat several patients, without requiring continuous refills. The most common models come with 300, 350, or 500 cc bottles. The main manufacturer who developed the original units is Brymill [18]. Some other well known trademarks have followed and include Wallach [19], Delasco [20], Cortex [21] (Fig. 4.7a–d), Schuco [22], Premier Medical [23] and KS-2 by Kriosystem [24].

The main breakthrough of the past years has come with the new Cry-Ac® TrackerCam (Fig. 4.8), the new unit by Brymill which measures skin temperature and records the settings and procedures. It does so through infrared technology. Up to now, cryosurgeons used freezing time as a main parameter. However, this could be imprecise because it depended on the distance from the skin and the diameter of the spraying

Fig. 4.7 (**a**–**d**) Cryosurgical units. (**a**) Brymill's Cry-Ac (500 cc capacity) and Cry-Ac 3 (300 cc) (Courtesy of Brymill Cryogenic Systems); (**b**) Delasco's FrigiSpray (350 cc) (Courtesy of Delasco); (**c**) Cortex's CryoPro (500 and 350 cc) (Courtesy of CortexTechnology, Denmark); (**d**) Wallach's UltraFreeze (350 cc; also available in 500 cc) (Courtesy of Cooper Surgical, Inc.)

Fig. 4.8 The Cry-Ac® TrackerCam (Brymill) which measures skin temperature and records the settings and procedure (Courtesy of Brymill Cryogenic Systems)

tip, among other issues. Experience was determinant in assuring a correct procedure.

Temperature measuring and recording can be justified for the following reasons:

- It allows for a more precise freezing. One will freeze just until the desired temperature is reached: −10 to −20 °C for benign lesions and −50 °C for malignant lesions.
- It allows standardization of procedures.
- Help in training inexperienced cryosurgeons. For most benign lesions, an experienced cryosurgeon will probably not need to measure surface temperature. However, inexperienced cryosurgeons or doctors in training can certainly benefit from this information.
- By previously setting the temperatures parameters, the cryosurgeon will avoid over or under freezing.
- It allows you to keep a record of the procedure for the patient's chart and for future reference.

Freezing of the skin will turn it white; however, freezing time, distance from the skin, size of the spraying tip, anatomical area, and underlying vascularization are variables that can result in −10, −20, or −25 ° C temperature differences in local freezing. Whiteness of the skin should not then be the sole feature to determine correct freezing.

In the subsequent chapters, the advantages of measuring temperature will be discussed.

4.4 Attachments for Cryosurgical Units

4.4.1 Spraying Tips or Apertures

The spraying tips are probably the most commonly used attachments in cryosurgery. They are tips (mostly built in brass) with openings of different diameters that allow LN release from the unit. Some have a flat surface, and some are conical.

Depending on the manufacturer, the different tip apertures are identified by letters or numbers. Be careful because, depending on the brand, they can start from small to large or vice versa. A comparison between Brymill and FrigiSpray tips is shown in Table 4.3.

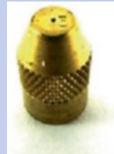
For larger apertures, more LN is released and freezing will be faster. Larger apertures allow faster freezing. Smaller apertures allow a better control of the margins of the lesions (since LN is released slower).

4.4.1.1 Other Options

Luer Lock Adapter (LLA)

You can attach an LLA at the end of the release. (Some units, like Wallach's, already have it incorporated.) This allows you to use disposable

Table 4.3 Comparison between Brymill and FrigiSpray (Delasco) apertures

Brymill 		Delasco 		
Tip aperture		Tip aperture	Tip aperture	
A	.040 in. (1.0 mm)	1	Extra small	0.4 mm (0.016 in.)
B	0.031 in (0.79 mm)	2	Small	0.5 mm (0.020 in.)
C	0.022 in. (0.56 mm)	3	Medium	0.6 mm (0.024 in.)
D	0.016 in. (0.41 mm)	4	Large	0.8 mm (0.031 in.)
SuperSpray E	0.013 in. with back vent (0.33 mm)			

Images courtesy of Brymill Cryogenic Systems and Delasco

needles of different diameters, previously prepared for the purpose: make sure the cutting edges are sanded down in order to avoid accidental pinching of the patient. By using needles, the options of tip diameters will be extended. Long needles work as extensions, allowing for hidden areas to be reached, such as the external ear canal or inside the mouth.

Extensions

These are used to reach difficult to reach areas such as lesions in the ear canal or inside the mouth. Some are bendable.

The Advanced Acne Aperture (Brymill) (Fig. 4.9)

This is useful for peelings. It gives a soft, vaporized spray for superficial desquamation.

Fig. 4.9 Acne aperture spraying tip (Courtesy of Brymill Cryogenic Systems)

SuperSpray E (Brymill) (Fig. 4.10)

This is a tip that delivers a stronger, more concentrated and streamlined spray. It treats lesions faster and clogs less.

4.4.2 Probes

Probes are close LN circuits. They are built with metal (an excellent cold-conducting material), and once LN starts circulating, the outer metal gets frozen and stays at a constant temperature as long as the LN goes through it. If properly applied, the temperature of the skin lesion will drop very fast in a continuous manner and in a circumscribed place.

Some probes are Teflon-coated in order to reduce the risk of sticking to the surface. This outer cover makes them ideal for treating lesions in the mucosa. Another way to reduce the risk of getting stuck to the surface is by previously freezing the probe before applying to the skin.

One might want to fix the probe to the lesion before the start of freezing for better accuracy.

Fig. 4.10 SuperSpray E Tip with back vent (Courtesy of Brymill Cryogenic Systems)

Fig. 4.11 Set of probes by Brymill, Delasco, Cortex, and Wallach

Such is the case for treatment of tumors in the eyelid. This can be done by applying a small amount of lubricant jelly or ultrasound gel to cover the lesion, touching the end of the probe to the gel but not the skin, and then beginning to freeze. In approximately 5–7 s, the gel will freeze and attach to the skin (cryo-adhesion) [25].

If concerned about underlying structures (nerves, vessels, tendons) and wanting to prevent any possible freezing, pull back slightly on the fixed probe, thus raising the skin, and continue freezing.

Once freezing has finished, allow the probe to thaw before trying to separate it from the skin/mucosa/gel. If the probe is stuck to the skin and one tries to force it off, the tissue may tear. The area has to thaw before the probe can be detached. To avoid excess freezing, pour warm water over it. A slight gentle twisting motion of the unit may expedite the release of the probe even when thawing is not complete.

Probes have to fit the lesion. They should be approximately of the same size. If such a probe is not available, then choose a smaller probe rather than a larger one. An oversized probe (larger than the lesion to be treated) will cover its margins and prevent visualization of the procedure. A much smaller one will cause excess freezing at the center before the freezing front reaches the margin. Instead, if the probe is just slightly smaller than the lesion, the outer margin of the lesion will be visible and the freezing front will be seen as it advances.

Probes come in various shapes and are commercially available through different manufacturers. The ideal situation is to have a set of different sizes and shapes (Fig. 4.11).

Probes have a silicone vent tube attached to the base from which LN is liberated once it has circulated through the conduit line. Care should be taken to point the hose away from anyone (patient, nurse, or even the operator) in order to avoid burns. Since LN comes out of a flexible hose, the initial released LN might cause a whiplash, a situation that can startle the patient. Holding the hose in the correct direction until frozen will maintain the position and avoid accidents. Once the tube freezes, it can be released. The tube will harden after approximately 5 s and remain in a predetermined fixed position.

Probes can also be custom made in order to satisfy various demands of cryosurgeons, as is the case with the half moon shape for the base of the mouth (Fig. 4.12), custom designed Teflon-coated tweezers for vascular lesions that need to

Fig. 4.12 Custom-made half moon probe for vascular lesion under the tongue

Fig. 4.13 Custom-made Teflon-coated tweezers for vascular lesions, placed in the posterior part of the tongue (custom made)

be "grasped" when placed in difficult to reach areas (like the base of the tongue) (Fig. 4.13), and the knob probe for "ironing" the surface of hypertrophic capillary malformations to reduce thickness (Fig. 4.14).

Depending on the type of procedure, probes will need to be cleaned and sometimes sterilized. For low-risk procedures (probes in contact with bloodless areas or with ultrasound probe cover), cleaning is sufficient. No immersion is necessary. Wipe with alcohol and properly dry with an absorbent cloth.

For intermediate- and high-risk procedures (contact to curettage lesion, blood, breaks in the skin, mucous membranes, genital and anal

Fig. 4.14 Custom-made door knob probe for flattening hypertrophic capillary malformations

regions), clean the probe and then sterilize it. Remove the silicone vent tube before sterilization.

In immunocompromised patients, sterilize the probe before and after the procedure.

Remember to replace the silicone vent tube prior to use.

If one wants to avoid contact with the skin (as in a Kaposi's sarcoma lesion), cover the probe with a latex or rubber protector (ultrasound transducer cover, vaginal probe cover, latex finger cover, finger glove, or simply cut off one "finger" out of a medical glove).

4.4.3 Chambers

Chambers are cylinders totally open at the distal end (the part that will touch the skin) and closed at the proximal end, with the exception of the opening through which LN will flow from the unit. The border of the cylinder that will be in touch with the skin is covered with a rubber band to prevent damaging and sticking to the skin.

This semi closed system confines LN and allows for a potent and precise freezing. They come in different sizes: 6, 10, 15, 18, and 31 mm (Fig. 4.15).

Chambers also have a silicone vent tube attached to the base as in probes. The tube will harden after approximately 5 s and remain in a predetermined fixed position. This position is determined by the operator. By doing so, the tube is pointed away from the patient, assistant, or user at the onset of the procedure.

Fig. 4.15 Set of chambers

4.5 Rubber Cones, Lexan Plates, and Otoscope Disposable Specula Tips

In order to restrain sprayed LN, cones can be fitted to the lesion. They have to be made either of plastic, neoprene, or rubber. They cannot be made of metal; otherwise they will freeze as well (due to the high conductivity of metal) and damage the healthy skin.

The use of these "restrainers" allows a more precise and localized freezing, limiting the sprayed LN just to the selected area and reducing spattering, a common cause of local discomfort; it also spares the perilesional healthy skin. Furthermore, freezing is more potent because LN remains in one spot instead of vaporing on the sides, concentrating all the cold in the limited area. Limiting the LN allows selective tissue destruction.

There are sets of neoprene cones commercially available that come in 6, 11, 16, 25, 30, and 38 mm (Fig. 4.16). There are also transparent Lexan plates with conical openings (4, 7, 9, and 12 mm). Otoscope disposable specula tips, which come in different diameters, work also very well for this purpose (Fig. 4.17).

Essentially, these attachments have to be made of nonconductant material, and the edge applied to the skin should not be sharp. Never use metal, and never use blunt edges.

Fig. 4.16 Rubber cones used for limiting spraying to a defined anatomical area

Fig. 4.17 Otoscope tips used for limiting spray to a defined anatomical area (Courtesy of Brymill Cryogenic Systems)

4.6 Tweezers

Teflon-coated tweezers (Fig. 4.18) are used to grab lesions. They allow treatment of small- and medium-sized protruding tumors. They are meant to be dipped in a styrofoam cup filled with LN

Fig. 4.18 Teflon-coated tweezers (Courtesy of Brymill Cryogenic Systems)

and left immersed for around 30 s until LN stops boiling. Lesions are then grasped, and the freezing front is allowed to advance just to the base of the lesion.

4.7 Other Equipment

There is equipment that is not specific to cryosurgery but indispensable. Since cryosurgery is a surgical procedure, one needs to have minor surgical equipment such as sterile gloves, syringes, local anesthesia, gauze, disinfectants, sutures, biopsy jars, curettes, and hemostatic solutions. One has to be ready for any situation: sticking the skin, stopping excess bleeding, curettaging, and so on.

Since cryosurgery has to be performed on bloodless skin, hemostatic solutions are frequently used, especially after curetting a lesion. If the chosen solution is trichloroacetic acid, keep in mind that it will leave a white spot. Care should be taken not to confuse it with the freezing front.

Keep a record of all your procedures. Part of this record includes an excellent picture of the lesion one plans to treat and a postoperative control picture. This is the best way to remember what has been done. A good before and after sequence will become the best teacher; it will also help in teaching others, and it allows both patient and operator to remember what was done. Believe it or not, the operator's memory is short and so is the patient's.

No freezing should ever be done unless there is certainty of the nature of the tumor. If in doubt, a biopsy is mandatory. Wait for the results before freezing a tumor of uncertain nature. With surgery, there is no place for rushing: things should be done correctly from the beginning. Do not freeze a pigmented lesion without previously confirming its diagnosis. Freezing a melanoma thinking that it is a seborrheic keratosis can be a fatal error no one should ever make.

This is why dermoscopy has become an indispensable tool for surgeons. Since many consultations have to do with benign lesions (solar lentigos, SK, warts, skin tags, etc.), a dermoscopic confirmation of benignity reassures the surgeon and allows correct decision making.

For tumors, it is important to know the depth of the lesion, and a high-frequency ultrasound is becoming indispensable for such purpose (Chap. 13). HFUS with Doppler will help identify the presence of a large feeding vessel. The presence of medium or large vessels is a common cause of recurrence of vascular tumors. If a nest of small vessels is destroyed using cryosurgery but a medium feeding vessel is left untouched, the tumor will recur.

When working with large vascular tumors, nuclear magnetic resonance with contrast is indispensable to visualize the extent of the tumor and the feeding vessels.

Confocal microcopy can be crucial to determine with certainty a diagnosis before freezing, especially if in doubt. It is particularly useful in pigmented lesions.

Essential Tidbits

- Standard equipment includes a Dewar and a handheld unit with different apertures and probes. It is essential to have a reliable LN delivery system.
- Maintenance is minimal, a trifle compared to other procedural alternatives.
- Rubber cones, Lexan disk, otoscope tips, extensions for apertures, and a reliable, simple LN delivery system are essential.
- The larger your toolbox, the better. The more probes, apertures, and attachments available, the more possibilities you will have to treat diverse conditions.

Conclusions

Cryosurgery requires a whole set of equipment, most of which is specific to this technique. Many manufacturers have products available, and one can find a vast selection of attachments to suit most needs.

Remember that cryosurgery is a surgical procedure: it is cryosurgery and not cryotherapy. Therefore, all precautions need to be taken.

Never freeze a lesion without being certain of the diagnosis, and keep a record of the whole procedure, starting with the consent form, clinical pictures, and a detailed description of the procedure including technique and temperature.

As in other surgical specialties, cryosurgery has improved its outcomes by actively incorporating diagnostic tools and procedures such as dermoscopy, high-frequency ultrasound, confocal microscopy, and optical coherence tomography, among others.

Glossary

Dewar Vacuum flask

Luer Lock A standardized system used for making leak-free connections between a male taper fitting (made in brass and screwed to the cryosurgical unit) and a mating female part (a disposable hypodermic syringe)

Probe Close conduit system made of metal and through which LN circulates. The end part of the probe contacts the skin

Spraying tip Attachment screwed at the releasing end of the cryosurgical unit through which LN is released through an orifice of a determined size

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