Chapter

1

Innovations in Basic Dermatosurgery and Preoperative Work Up

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INTRODUCTION

A dermatosurgery workspace has become a necessity in the routine dermatology practice. Inventions and innovations have enriched various fields of dermatosurgery. In this chapter, we are elaborating on the innovations in the basic dermatosurgery and pre-op workup (sterilization, investigations, theater setup, instrumentation and dermoscopy).

INSTRUMENTS

Gupta et al.[1] have proposed the use of a shaving blade and hypodermic needle or its plastic cover cap to make biopsy punches of two sizes (5.5 mm and 4 mm). For this, cut a razor blade into 17 mm (for 5.5 mm diameter punch) and 13 mm (for 4 mm diameter punch) long pieces. Using artery forceps, place these pieces into the plastic cap and the hub of the disposable hypodermic needle respectively to form a loop. This can be used as an alternative to disposable biopsy punches.[1]

Conventional Chalazion clamp is widely used for dermatologic procedures of lip, ear lobe and female genitalia. It helps to achieve hemostasis and also gives a better field of operation. To suit the needs of a dermatologist better, the size and shape of the ring can be modified. One such modification is by altering the shape of the ring to oblong along with increasing the inner dimension as proposed by Ashique and Kaliyadan[2] (Fig. 1). This gives a larger field of operation.

Skin hook is an important instrument that is needed for the fine surgeries on skin. In situations of non-availability of skin hook, Gupta et al.[3] have suggested an innovative skin hook that can be designed using hypodermic needle and mosquito straight artery forceps. Bend the tip of a hypodermic needle using artery forceps into the shape of a hook. Further, attach the needle to a syringe (insulin syringe) or straight artery forceps to act as a long handle. This hook can be used for gentle traction of skin.

The fine tips of surgical instruments have to be cleaned and protected well using caps after each use, especially while undergoing sterilization. Even a slight damage to the tip can render it useless. Ashique and Kaliyadan have proposed the use of needle cover of the hypodermic needles to prevent this.[4] Make holes on it to allow steam entry while undergoing

Fig. 1: Modified Chalazion clamp with an oblong shape and bigger ring size
Courtesy: Dr KT Ashique, Amanza Skin Clinic, Perinthalmanna.

steam autoclaving. The needle covers can be cut into desired lengths depending upon the instrument tip to be protected.

The use of smartphone as an alternative to Wood's lamp to examine the vitiligo lesions makes the device readily available. For this, download and save a blue image in the smartphone. Open the blue image after setting the screen brightness level and screen timeout time to maximum. The emitted blue light helps to visualize the vitiliginous lesions and the accentuation of lesions was found to be comparable to that of a Wood's lamp, as reported by Agrawal et al.[5] Furthermore, clicking a photo under this setting, and subsequent gray-scale editing of this picture increases its dynamic range. This highlights the lightest and darkest parts in the picture, and facilitates better demarcation of lesions.

Jangra et al.[6] have proposed a *simple chemical cautery pen* to deliver the chemical agent on to the skin surface in a controlled manner. It can be assembled using a 1 mL disposable syringe filled with the liquid cauterizing agent. Cut the proximal part of a micropipette tip with the help of a surgical blade. Insert a small wick of cotton into it such that a small portion of it comes out through the distal opening. Attach the micropipette tip to the syringe. The chemical moves in a controlled manner to the cotton tip through the wick. This avoids spillage and damage to the normal skin.

THEATER SET UP

Radiofrequency (RF)-based procedures and ablative lasers emit surgical smoke and plume. This poses a health hazard to the persons in the procedure room. Smoke evacuators are used to evacuate the smoke. Commercially available smoke evacuators work by a triple filtration method to capture large and small particles as well as odors and gases. The filters and absorbers used are to be replaced timely and disposed in a proper manner as these are biohazardous materials. High cost of the smoke evacuator and the expensive consumables needed for its maintenance makes it less accessible to all the dermatologists. Ashique and Kaliyadan[7] have suggested a more economical alternative for this—*electric-operated kitchen chimney*. It has a wall mounted fixed overhead part that sucks the smoke and an outlet that opens to the external environment. This is an added advantage of the system as it doesn't need an assistant to hold the inlet tube while doing the procedure nor any sterilization of the tubes as needed in the other smoke evacuators. Use of an air conditioner filter or activated charcoal in the outlet pipe helps to decrease the hazards of the emitted smoke. While using it in the laser room, its reflective surface can be covered with non-reflective tape or painted with matte finish paint. Other methods to evacuate smoke include use of local exhaust ventilation, room suction units and domestic vacuum cleaners. Though these methods cannot replace the smoke evacuator in effectively removing the harmful smoke, they can be used as more economical and easily available alternatives.

Gupta et al.[8] have set a *portable operating light* utilizing a mobile stand and an adjustable LED torch for use in resource poor settings. Fix the mobile stand on the operating table and attach the LED torch to it. The light of the adjustable LED torch can be modified to get the desired diameter and intensity of illumination. Unlike the pedestal examination light, the heat produced by the light is minimal. Since the torch is a battery operated device, the procedure can be done uninterrupted even in circumstances of power supply issues. The LED torch and the mobile stand can be procured easily through online shopping sites. Its chargeable battery can be replaced as and when needed. Similarly, an *operating microscope* can also be set up using a smartphone or a tablet. Fix the device on to the mobile stand and switch on the camera with flash light and the required magnification (Fig. 2). With good hand eye coordination, the surgery can be done with better precision. Unlike the conventional magnification devices like surgical loupes and operating microscope, using this technique the procedure can be recorded for teaching or medicolegal purposes.[9]

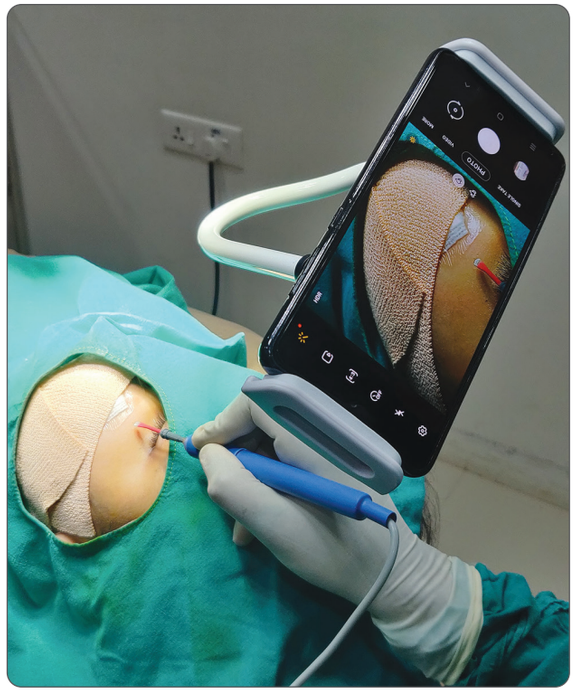


Fig. 2: Mobile phone as an operating microscope for dermatosurgery. Mobile phone attached to the operating table hand using a long arm mobile holder is being used as an operating microscope

ANESTHESIA

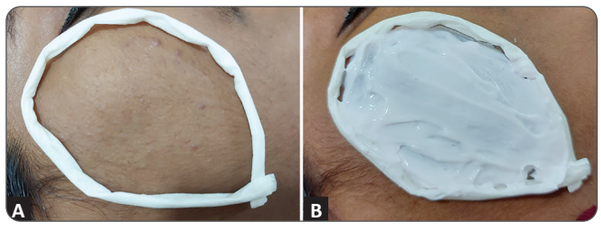
Topical Anesthesia

Topical anesthesia using anesthetic creams is used in most of the common dermatological procedures. To get adequate anesthesia, the anesthetic cream should be in contact with the area at a concentration of 1.5–2 g per 10 cm^2. This is achieved by applying the cream under occlusion. This causes spillage of the cream on to the surrounding skin from the borders of the occlusive dressing resulting in a lower concentration on the area to be anesthetized. Jangra et al.[10] have suggested making a boundary surrounding the desired area using surgical tapes to prevent this spillage. Take a long piece of surgical tape and roll it along the longitudinal axis such that its adhesive surface comes on the outer aspect. Apply it circumferentially around the area to be anesthetized. This gives a sticky boundary which also can contain the cream within it (Figs 3A and B).

Cryoanesthesia

This can be used to decrease pain during injections and procedures. Keeping ice cubes placed within surgical gloves or cryopen tips for some time over the area of injection are some of the methods used.[11] Agrawal et al.[12] have demonstrated another modification of cryoanesthesia by filling the *surgical glove with water followed by freezing it*. Place the cleaned glove on the skin surface for two minutes and the injection can be done in the space between the two fingers of the glove. This provides circumferential anesthesia while the injection is being done (Fig. 4).

Placing the surgical gloves filled with water in the chiller tray compartment of the refrigerator makes the water semi-frozen and is softer and flexible than the hard ice. It can be reshaped according to the contour of the body region.[13] Refrigerant jelly that is available in refrigerant gel packs can also be used instead of plain water.[14] All these can be used for intra and post procedure cryoanesthesia for intralesional injections in keloids, warts, fractional lasers and peeling. Vishwanath et al.[15] have proposed *immersion cryoanesthesia*—another simpler method that can be used for intralesional injections on fingers and toes. In this, the part that needs to be treated is immersed in water for around 20 seconds before the procedure.



Figs 3A and B: Sticky boundary (A and B). Tape rolled on itself with the adhesive surface on the outer aspect and applied to form a sticky boundary to the topical anesthetic cream

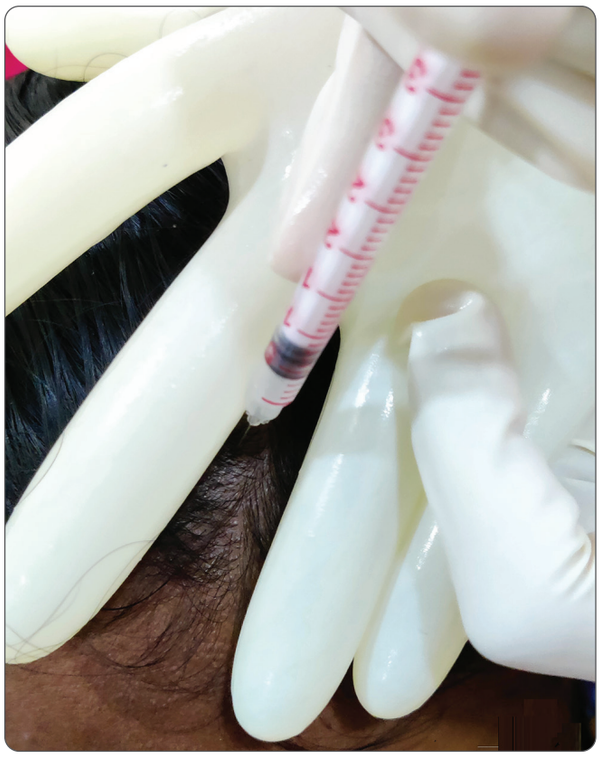


Fig. 4: Cryoanesthesia. Intralesional injection given in the space between two fingers of the glove with semi frozen water

Infiltration Anesthesia

It is one of the most commonly used type of anesthesia in dermatological procedures. In procedures involving a large area, multiple needle punctures are needed to deliver local anesthetic as the length of the commonly used hypodermic needle is 25 mm. Subhadarshani et al.[16] have used a 23G–27G *lumbar puncture (LP) needle* which has an average length of 90 mm, to reduce the number of needle insertion and thus the pain during needle insertion. The depth and direction of passage of needle can be tracked using two fingers on the skin surface.

INJECTION TECHNIQUES

While doing intralesional injections, it is important to maintain the depth of needle within the lesion for the best post procedure outcome. Gupta et al.[17] have suggested the use of *needle guard* to control the depth of injection. Initially, assess

Fig. 5: Needle guard. Needle cover cut at the level of marking on the needle to form a needle guard to control the depth of intralesional injection

the required depth of penetration by placing the needle close to the lesion and mark the depth on the needle using a marker pen. Insert the needle into the needle cover and make the marking on it parallel to that on the needle. Cut the cover at the level of marking with a scalpel blade and use it as a needle guard to control the depth of intralesional injection (Fig. 5).

DRESSINGS

Adhesive surgical tape strips and tissue glue are not suitable for wounds with tension or oozing. Afra et al.[18] have demonstrated the use of elastic adhesive tapes [3M™ elastic adhesive bandage (3M India Ltd, Bangalore, India)] for this purpose—*mortise and tenon type elastic adhesive bandage*. Take two rectangular pieces of elastic adhesive tapes of different sizes. The length of the smaller piece should be around 1–2 cm more than the length of the wound. Cut a rectangular portion from both the pieces to give the bandages a 'U' shape. Fix the tapes on either side of the wound such that the long axis of the tapes is along the long axis of the wound and the pieces fit well into each other in a mortise and tenon pattern approximating the wound margins (Fig. 6). Absorbent gauzes can be placed over the central tape free area. This also allows frequent wound inspection if needed. This mortise and tenon pattern of adhesive tape application can also be used to reduce the tension of the wounds closed by sutures.

The Dressing of the wound on the hairy scalp is difficult. Afra et al.[19] have proposed '*hammock' type head bandage* for this purpose. Place a piece of elastic adhesive tape on the temporal or the post auricular area as an anchoring bandage. The upper most gauze pad used for the wound dressing is sutured in its corner to these anchoring bandages as a hammock on the

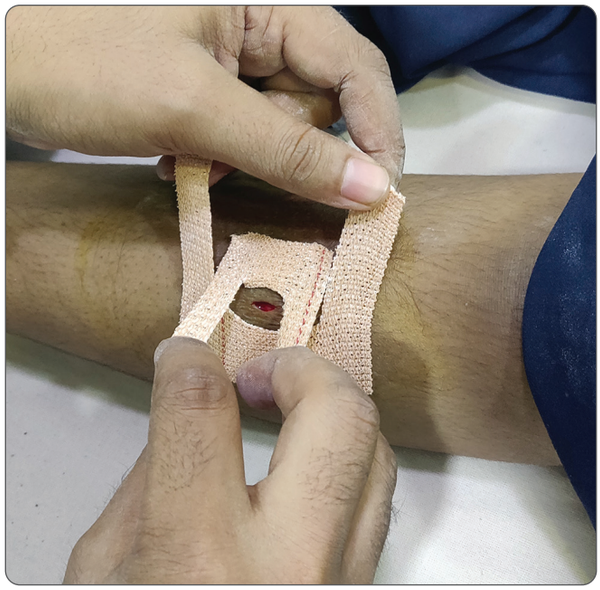


Fig. 6: Mortise and tenon type dressing. An elastic band is cut into two U-shaped pieces and the body of each bandage is attached to each side of the wound incision. The limbs of the bandage are pulled to opposite sides like a 'mortise and tenon' so that the wound margin gets approximated without any sutures

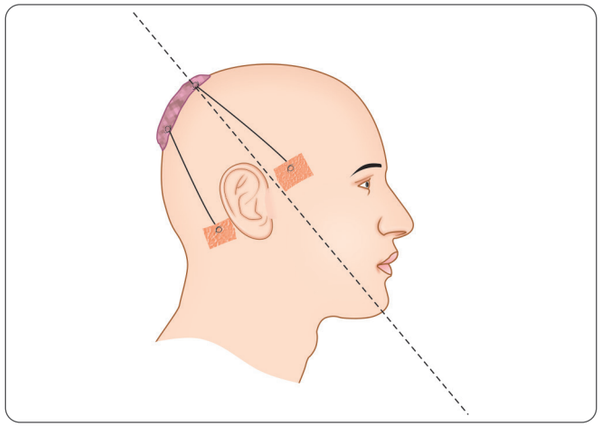


Fig. 7: Hammock dressing for scalp wounds. Elastic adhesive dressings are attached to pre- or postauricular areas depending on the location of wound on the scalp. Silk sutures from the scalp dressing are anchored to the elastic bandage so as to form a hammock type of dressing for the scalp wounds

wound. For wounds anterior to an imaginary line connecting the vertex to the chin, anchoring bandages are placed on the postauricular area. For wounds posterior to the line, they are placed on the temporal area (Fig. 7).

Such a contralateral placement helps to prevent slippage of the dressing. The elastic bandage can be repositioned in

the desired manner to make the silk thread taut thus ensuring adequate fixation of the gauze to the wound. Repositioning the bandage also helps to loosen the dressing thus allowing inspection of the wound, change of wet gauzes and application of topical antibiotic if needed. A similar dressing is tie-over dressing where the suture used to close the wound itself is left long and tied over the dressing to keep it in place. In contrast to this kind of dressing, hammock type dressing uses a separate anchoring suture so that the wound integrity is not compromised by any external forces that may influence the anchoring suture. Cheaper suture materials, unlike the costly sutures used for the wound closure, can be used for this purpose and the dressing can be removed easily by removing the elastic adhesive bandage irrespective of the wound sutures. Hammock type dressing is simple, inexpensive and aesthetically better for dressing of the scalp wounds.

PERSONAL PROTECTIVE EQUIPMENT

Use of personal protective devices such as isolation gowns, face shields and masks has become the need of the hour. The increased demand has created a shortage of supply of these. In such a situation, it is essential to get equipped with alternatives to these. Gupta et al.[20] have made a *makeshift face shield* using a transparent sheet such as that used in overhead projectors**.** Punch holes on the two sides of the sheet using a paper punch. Pass a long string through these holes and use it to tie the sheet around the head.

Individuals with foot dermatitis should protect their feet from allergens and irritants while doing their occupation or household work. *Polyvinyl chloride (PVC) anti-skid rain shoe* cover can be used for this purpose. It is cheap, washable, reusable and waterproof.[21]

DERMOSCOPE

A dermoscope is a non-invasive diagnostic device used to study the morphology of cutaneous lesions in a detailed manner.[22] Several simple modifications to the conventional method of using dermoscope has made the device more useful, especially in the setting of dermatosurgery. Though the utility of dermoscope is increasing, its high cost is still a limitation. Kaliyadan[23] has proposed that a simple *Jeweler's loupe* with 10x magnification and an inbuilt light emitting diode (LED) light can be used as an easily available and cheaper alternative. The images can be captured with the help of a digital imaging system such as a digital camera by manually holding the camera lens close to the loupe. The method gives a magnified view that helps to visualize most of the essential features of the lesion being studied. But in comparison to the images obtained using a proper dermoscope, the clarity is compromised making the study of finer aspects of the lesions a difficult task. Polarized dermoscopy cannot be done in this method. Another drawback of this method is that to record the image the camera has to be held manually to the loupe. This problem can be circumvented by securing the loupe with the digital camera using an adhesive tape after aligning the lens in the same line. The use of a smart phone camera as the image capturing device makes it simpler and more useful especially in the setting of teledermoscopy.[24] Images simulating dermoscopic appearance especially for the purpose of teledermatology can be obtained by using a drop of oil or sanitizer gel as described by Kaliyadan et al.[25]

Acharya and Mathur[26] have described the use of *a mobile application to stream the image/video* captured in a handheld dermoscope to other devices like laptops. Imaging using handheld dermoscope can be converted to large screen videodermoscopy using HDMI cables and wireless tethering. This can be particularly useful for live demonstration sessions and intraoperative dermoscopy imaging for a larger number of viewers.[27]

Preventing Infection

There are many innovations to prevent cross-infection and protect the contact plate during dermoscopy. Dermoscope may become a carrier of infective organisms in the context of contact dermoscopy of infectious dermatoses especially while being used intra procedurally. Most hand-held polarized dermoscopes come with the option of removing the contact plate for polarized dermoscopy. This allows better visualization of some structures, especially vascular structures, which might be otherwise affected because of the pressure of the contact plate and reduces the chance of cross-infection because only the rim is in contact with the skin surface. However, the rim itself can be a source of cross-infection. Readily available *plastic bottle caps can be used as a disposable rim* protector to prevent cross-infection through the dermoscope, as proposed by Kaliyadan and Jayasree.[28] A circular portion is cut and removed from the bottle cap and the peripheral rim is used to snugly fit into the rim of the dermoscope. A plastic sheet with a circular cut portion less than the diameter of rim can also serve the same purpose. Kaliyadan and Kuruvila[29] proposed the use of single layer of wide, *transparent adhesive tape* after applying the contact fluid (usually alcohol gel), for contact dermoscopy of potentially infectious conditions. The tape prevents direct contact with the dermoscope and thus the chance of cross-infection. The image quality is well maintained as the tape used is clear and transparent. This reduces the risk of cross infection and as long as the tape is completely clear and transparent, there are no issues with image distortion and quality.

Sorrel and Lauren[30] have proposed the use of Tegaderm Transparent Film Dressing (3M [TM], St. Paul, MN) as a

sanitary way to perform mucoscopy of genital and other mucosal lesions. Tegaderm is impermeable to water and particles larger than 27 nm. Hence, this can be exploited in the present COVID-19 pandemic also, since the novel coronavirus has a diameter range of 60–140 nm, and can theoretically be filtered by the Tegaderm dressing.[31]

'Gloving the dermoscope' is another modification proposed by Jakhar et al.[32] for examining the genital areas as well as potentially infectious lesions. The finger part of a rubber glove is cut and the proximal end is rolled on to the plastic front cap of the dermoscope such that it fits snuggly to the device. The distal closed end is cut so as to make an opening to allow visualization through the lens. This technique prevents direct contact between the dermoscope and the skin and provides a sterile interface between these. Gloving the dermoscope provides a better fit especially in the genital areas (Figs 8A to C).

Jakhar et al.[33] have proposed the use of *polyethylene tube as an attachment to universal serial bus (USB) dermatoscope* for preventing cross-infection. They used the plastic tube which forms the core of the leucoplast adhesive tapes for this purpose as a front attachment for the USB dermatoscope. It acts as a spacer separating the skin and the dermatoscope. Such plastic tube attachments of various lengths can also be utilized to *increase the field of view of a USB dermatoscope*.[34] Increasing the FOV helps to get an overall image of the lesion.

Jakhar et al.[35] have suggested the use of a *mobile screen protector* cut out to the size of contact plate as a trick to avoid scratch or physical damage to the glass contact plate of the dermoscope.

Therapeutic Dermoscopy

Apart from diagnostic uses, dermoscope has therapeutic uses also. It can be used to identify and remove foreign bodies in the skin. Sonthalia et al.[36] have demonstrated the removal of a foreign body using the aid of the dermoscope by noting the tail edge, and appreciating the tract of the foreign body. Naimer[37] demonstrated the use of a dermoscope for the visualization of retained suture material as well as for the routine removal of sutures with precision under the dermoscopic guidance (after attaching a smartphone in the photography mode to the dermoscope).

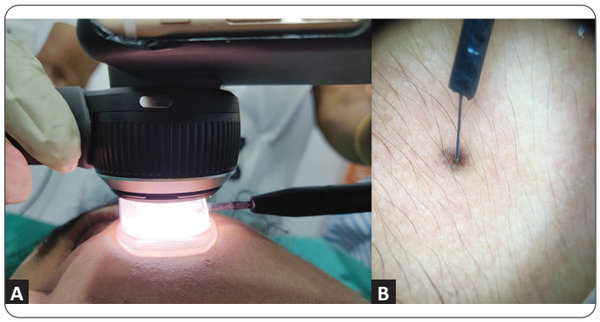
Innovations in Interventional Dermoscopy

Utilizing dermoscope during dermatological interventions may augment the precision in ablative procedures. However, lack of adequate space beneath the contact plate/probe of the dermoscope may be a hindrance to this. Sonthalia and Khurana[38] proposed making large *polygonal windows in the frame of the circular acrylic rim of the universal serial bus video dermatoscope* to allow the insertion and maneuvering of different treatment probes. With good hand eye coordination, the procedure can be done with better precision and in turn better cosmetic outcome. The window also allows passage of smoke and vapors formed during the procedure. Electrocautery, radiofrequency ablative lasers, cryotherapy, laser ablation or sclerotherapy of broken vessels, intralesional injections in small lesions and nail surgeries can be done using this technique.

For better clinicopathological correlation in skin biopsies, the sample sent should be from the most representative part of the lesion. Dermoscopy helps in this and improves the diagnostic yield. Once the part has been selected with the help of a dermoscope, the area can be marked or the biopsy can be done under the guidance of the dermoscope. Use of an appropriate sized cut piece of syringe barrel as an adapter to place the dermoscope helps to stabilize the dermoscope while this is being done. The length of the syringe barrel is adjusted depending on the focal length of the dermatoscope. Agrawal et al.[39] have proposed the *use of a 50 mL syringe barrel for dermoscopic guided biopsy*. A rectangular window made on one side of the barrel enables passage of marker pen or any instrument. The same barrel can be used for doing procedures like radiofrequency ablation under dermoscopic guidance (Figs 9A and B).

Kaliyadan and Puravoor[40] proposed some further modifications to increase the field of work during interventional dermoscopy. They attached *thermocol pieces*

Figs 8A to C: Gloving the dermoscope. Front plastic cap of the dermoscope covered with the cut finger part of the glove with central opening



Figs 9A and B: Use of syringe barrel for dermoscopy guided procedures. Radiofrequency ablation of acquired melanocytic nevus done under dermoscopic view using syringe barrel as spacer
Courtesy: Dr Puravoor Jayasree, Medical Trust Hospital, Kochi.

instead of a syringe barrel to the dermoscope using a double-sided adhesive tape. This attachment acts as a spacer and also allows dermoscopy guided interventions.

Innovations in Mucoscopy

Inherent shape of the handheld dermoscope makes the dermoscopy of body folds and deep mucosal sites difficult. Kaliyadan and Mohammed[41] proposed the use of *handheld rigid otoendoscope* for this purpose. The otoscope is attached to the smartphone camera with the help of an adapter. Since the otoscope doesn't have inbuilt magnification, the magnification of the attached camera is made use of. Its long and slender design helps to view less accessible sites like intertriginous areas and mucosa (Fig. 10).

Fig. 10: Otoscope for mucoscopy. Mucoscopy using rigid otoendoscope attached to the smart phone camera using an adapter
Courtesy: Dr Feroze Kaliyadan, SNIMS, Ernakulam

Jakhar and Grover[42] used the *disposable plastic tube that* forms the core of leucoplast adhesive tape after sterilization and then utilized it as an attachment for the USB dermatoscope. The tube is clenched between the incisors of the patient and the oral mucosal lesions were visualized using USB dermatoscope. Apart from preventing cross infection, this method also helps the patient to hold their mouth open for a longer period. Examination of oral cavity lesions with a dermoscopy is a difficult task owing to the difficulty in accessing the lesion. Tongue depressor is the usual instrument used in the clinics to retract and visualize intraoral pathology. However, the instrument will be a physical hindrance for imaging with a dermoscope. Using a *chalazion clamp* to hold and retract the lesion will circumvent this problem. Jha et al.[43] have demonstrated the use of chalazion clamp for better visualization of intraoral lesions with a dermoscope.

Misting up the dermoscope lens/contact plate is a difficulty posed while doing mucoscopy. Misting occurs due to condensation of water droplets to the cool contact plate of the dermoscope. The tiny water droplets thus scatter light and reduce the ability of the lens to give an image with contrast. Afra et al.[44] have demonstrated the innovative use *of soap water to prevent misting-up* during mucoscopy or hidroscopy. Here, the contact plate of the dermoscope is smeared with soap water and dried using a cotton sheet. The thin surfactant film that is left behind decreases the surface tension of water. The water instead of forming spherical water droplets spread out evenly forming a thin layer.

Oculoscopy and Hidroscopy

Jakhar and Grover[45] have demonstrated that a USB dermoscope can be utilized for the evaluation of ocular lesions like Lisch nodules with much ease compared to conventional contact dermoscopy. A mountable and moldable car phone holder can be utilized to further stabilize the USB dermoscope while performing oculoscopy.[46] Jakhar and Kaur demonstrated that the dermoscope can also be utilized for the evaluation of the sweat glands—hidroscopy.[47]

CONCLUSION

We have discussed various innovations in basic dermato surgery procedures, instruments or set-ups. These innovations have either simplified the procedure or made the procedure less expensive by re-inventing easily available resources instead of costly alternatives. However, these methods should be employed only if there are no better alternatives available and should not compromise the quality of care to the patients.

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