

## MacGyver Jobs in Dermatology

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### Abstract

**Background:** Hair loss is a common clinical presentation in any medical clinic. Telogen effluvium is considered among the most prevalent causes of hair loss particularly in female patients. Telogen effluvium may associate with significant psychosocial comorbidities and the medical treatment may be challenging. In this article we will review the recent literatures about epidemiology, etiopathogenesis, clinical presentation and management of telogen effluvium.

**Method:** An electronic literature search was performed using the PubMed and Google Scholar to identify relevant articles published between 1993 and 2017. Search keywords included "telogen effluvium" and "hair loss". We included studies published in English. Editorials, brief notes, conference proceedings, and letters to editors were excluded.

### Introduction

The Oxford Dictionaries state that to "MacGyver" is to make or repair (an object) in an improvised or inventive way, making use of whatever items are at hand. Origin comes from Angus MacGyver, the lead character in the television series MacGyver (1985–1992), who often made or repaired objects in an improvised way. Main character of show by the same name. Full name Angus Macgyver. Part secret agent for government and phoenix foundation, part handyman, part mad scientist, part community service volunteer. He might refuse to use guns, but nobody could ever call him a pussy. Macgyver can battle Soviet supersoldiers and serve soup at a homeless shelter all in one episode. Macgyver was the epitome of 1980s era optimism. Beats the commies, fixes the environment, cures aids, and can make a helicopter out of

garbage bags and bamboo. Most importantly, he's the only guy who ever looked cool in a mullet and is probably the only guy who could get away with it now [1,2]. In dermatology, we can solve different problems in a creative, resourceful, typically "jury-rigged" fashion as Macgyverism (**Table 1**).

### MacGyver Jobs with Skin Biopsy Punches

Punch instrument is a circular hollow blade attached to a pencil-like handle ranging in size from 0.5 mm to 10 mm available as a disposable, reusable, and automated instrument. Punch biopsy is an apparently simple procedure include the relative easiness to perform, minimal complications, and provision of a full-thickness sample. The skin punch is an instrument which is used almost exclusively by dermatologists. The skin biopsy is a relatively simple, but essential pro-

cedure in the management of skin disorders. Properly performed, it may confirm a diagnosis, remove cosmetically unacceptable lesions, and provide definitive treatment for a number of skin conditions. Variants of hand held punches are characterised by metallic punches with tapering or cylindrical tip; metallic handle with attachable tips; disposable, plastic handle punches; available in sizes from 0.5 to 10 mm in diameter. Power punches, here the shaft of the punch is mounted onto a hand machine with adjustable rotational speed varying from 2000 to 10,000 rpm. It is available in various sizes of 0.5-1.3 mm. It is a circular hollow blade attached to a pencil-like handle ranging in size from 1 to 8 mm. It is available as a disposable, reusable, and automated instrument. Disposable punches have the advantages of being presterilized, readily available, always sharp, and requiring no maintenance. Reusable steel punches are more expensive, require sterilization between procedures, get dull with repeated use, and must be maintained by proper, skilled sharpening [3,4].

### Uses of Punches Can Be Classified Into Three Categories

**A-Diagnostic purposes:** Skin biopsy for diagnosis of dermatological diseases. Punch biopsies are simple to perform, have few complications, and if small, can heal without suturing. For non-facial lesions, a 4-mm punch is sufficient; however, in granulomatous conditions or conditions with atypical features, biopsies of 5 mm or more are preferable[3].

**Basic punch:** Punch surgery tray should include alcohol pads, local anesthetic, a punch instrument of the desired size, forceps, scissors and gauze. After preparation of the site, the fingers of the nondominant hand are used to stretch the skin perpendicular to the direction of relaxed skin tension lines to produce an oval defect that is easier to close. The punch is withdrawn, and the specimen is retrieved by piercing it with the needle from the syringe used for anesthesia or by handling it with the forceps. If needed, scissors can be used to transect the subcutaneous tissue at its deepest portion. The advantages of punch biopsy include the relative easiness to perform, minimal complications, and provision of a full-thickness sample; because of that, it

is preferred over shave biopsy. Punch biopsy has some disadvantages. First, its small size and variable depth lead to difficulty in histopathologic interpretation in conditions involving adipose tissue such as morphea and panniculitis. Because of that, a modification called the double-trephine punch biopsy technique was proposed. Second, the shearing effect of the punch may cause loss of the blister roof. In such cases, a topical refrigerant such as ethyl chloride spray can be used to freeze the blister in place when a punch biopsy is taken [4,5].

**Modified diagnostic punch surgery:** Punch biopsy is an apparently simple procedure, but it has some pitfalls. Being aware of the pitfalls and ways to work around them helps in substantially improving the outcome of this diagnostic procedure. Most important is choosing the most representative lesion for the biopsy, which will yield a better diagnostic outcome. Always take a fully evolved, untreated lesion and avoid excoriated or ulcerated lesions unless there is no option. Avoid taking a biopsy over bony prominences or pressure-bearing areas as a sparse, nonspecific, lymphocytic infiltrate present over frictional sites can complicate its interpretation. Punch surgery does have certain risks, including possible disturbance of deeper underlying structures such as nerves and arteries. Therefore, physicians must be familiar with the underlying anatomy and the danger zones. Punch surgery in critical areas such as the digits or the eyelid overlying the globe are generally to be avoided. Caution should also be exercised over areas where there is little soft tissue between skin and bone because the punch can cut through the underlying bone [4].

**Split-punch biopsy technique:** This technique is used to obtain two tissue samples for different studies from one punch biopsy. The split-punch biopsy technique is used to obtain two tissue samples for different studies from one punch biopsy. It is done by advancing the punch just into the papillary dermis. This is followed by using a no. 11 blade held nearly perpendicular to the skin surface; the specimen is bisected to the subcutis. Then the punch is reintroduced and advanced to the subcutis. On removal of the punch, the bisected specimen is held in place only by a bit of subcutaneous tissue, which must be undercut to complete the procedure, result-

**Table 1.** MacGyver Jobs in Dermatology

Diagnostic Punches	Basic punch, modified diagnostic punch, splti-punch, double-trephine punch, string-of-beads biopsy technique, the pendulum (scoop) biopsy, nail biopsy, fine-needle aspiration, diagnosis of eyelid tumors, improving histologic examination of the tumor margin
Therapeutic Punches	Punch excision of acne keloidalis nuchae, moles, corn, tatoo, scrotal calcinosis, pathologic bone, glomus tumor of nail, enhance wound healing, extrusion of epidermal inclusion cyst, hidrocystomas, pilomatricoma, pilar sheath cyst, and pseudocyst of auricle, chondrodermatitis nodularis helicis, subungal haematoma, periungual exision refractory paronychia, molluscum contagiosum, wart, pyogenic granulomas etc, punch debridement of HS
Cosmetic uses of Punches	Punch grefting in vitiligo, punch excision of nevus and acne scars, small lipoma excision, for liposuction to make holes to insert cannulas, in earlobe repair (piercing earlobes), follicular unit extraction method by using micropunches for alopecia
Adding hyaluronidase to local anesthesia	For minimizing loss of surface contour and enhanced ease in undermining and dissection through subcutaneous tissue planes
Preoperative application of topical brimonidine 0.33% gel	Decreases blood loss and the need for cauterization
Combination of ligation and timolol before surgical excision of pyogenic granuloma	Increases the chances of success, prevents PG from enlarging and reduces tumor size, resolve PG, obviating the need for surgery
Cutaneous vibrators	To relieve pain associated with a variety of dermatology procedures including injections and laser treatments
Purse-string suture	To repair small, circular wounds easily after excision of skin lesions
Round excision	A better alternative to conventional fusiform or shave excision of benign, dome-shaped or papular nevi of the face
Extra-fine insulin syringe	To evacuation of subungula hematoma
27-gauge needle	To remove epidermal cysts
2 needle for intralesional steroid injection	For adequate delivery of drug and prevent the rupture of the cyst
Needle-assisted electro-coagulation of nasal telangiectasia	To puncture skin and vessel without an electric current, with minimal epidermal and surrounding dermal tissue damage
TCA and CO2 Laser combination for Nasal Telangiectasia	A simple, effective, and inexpensive method
Presuturing	A simple, inexpensive and effective method for large skin lesions
A standard dissecting forceps and perone lasik forcep	An effective extraction technique for eruptive vellus hair cysts, steatocystoma multiplex, comedone, closed macrocomedones, molluscum
Freer dissector	For the removal of trichilemmal cysts
Subcutaneous Curettage Combined with Trimming Through a Small Incision	A Minimally Invasive Procedure for Axillary Osmidrosis
Using 2 hairdryers	To reduction in the time required for suction blister formation
Intralesional normal saline injections	To treat corticosteroid lipoatrophy successfully
Focused cold therapy	For the reduction of hyperdynamic forehead wrinkles
Fractionated cryotherapy, intralesional cryotherapy, cryoanalgesia	To treat keloids, SCC, BCC and postherpetic neuralgia
Topical nitric oxide	Cutaneous leishmaniasis
Subsicion-suction method	To treat atrophic acne scars
Discarded human skin, excised keloid scar, human cadavers, live pigs, latex glove, rubberized synthetic skin models, pigs' feet, ox tongue, hot dog, tomatoes, burned oranges, cantaloupes, bananas, pillowcase baby	As Model to Teach Surgical Techniques and Laser treatment
Refrigerator magnet	For controlling surgical sharps
Micro-Drilling	To do micro nail penetration of topical terbinafine solution
Disposable 5-mL syringe with anticoagulant dextrose solution A and prostaglandin E1	To create PRP with high platelet-derived growth factor as economically 1-80

ting in a clean, bisected tissue split. This technique can be used to avoid taking two biopsies or splitting a single specimen, which might distort or crush the tissue [3].

**Double-trephine punch biopsy:** This technique is used to obtain tissue samples for diagnosis of dermatoses that affect the subcutaneous tissue. A 6 to 8 mm punch is inserted to obtain the initial sample. A 6 to 8 mm punch tool is inserted to the hilt of the instrument to obtain the initial sample. Once the superficial core is removed, a 4 mm punch is subsequently used within the center of the 8 mm defect to obtain the subcutaneous tissue [4,6].

**String-of-beads biopsy technique:** Diagnostic challenges often require a significant amount of tissue for a complete evaluation, which is done either by 6 to 8 mm punch biopsy or incisional biopsy followed by dividing the tissue sample into several pieces for multiple studies. These methods are time consuming, with associated risks of crush artifact on the specimen and a possible sharps injury to the physician. The string-of-beads biopsy technique is done by performing smaller, adjacent 4 mm punch biopsies in a row, and the individual biopsy defects may be closed in a linear or multiple O-to-Z/W design with nonabsorbable sutures placed using the simple interrupted suture technique. This method obviates the need for dissection of tissue in pieces [3].

**The pendulum or scoop biopsy:** The potential disadvantage of shaving a flat lesion or plaque is the inability to achieve a sufficiently deep or representative sample. The scoop ensures that adequate tissue sampling is achieved, thus making a histopathologic diagnosis readily available. The scoop also results in a smooth biopsy edge which results in less trauma and more rapid healing without scar. The scoop has the additional benefit of providing enough depth so as to make prognostication more accurate in cases of suspected malignancy. Observing standard surgical techniques, the lesion is cleansed and locally anesthetized. Counter traction is applied with the nondominant hand, and the biopsy-pen is inserted into the skin in a pendulous manner. The punch tool scoops the skin like a pendulum. Once the tissue is removed, the subcutaneous tissue

is visualized and a procoagulant, such as Monsel's solution or Drysol may be applied for hemostasis [4].

**Nail biopsy:** 2 to 3 mm punch biopsy is adequate for nail plate, nail bed, and nail matrix in most instances. For a biopsy of the nail bed, a two-punch method may be used. In this technique, a larger size punch is used to remove the overlying nail plate and then a smaller punch is used to sample the bed. Dermatologists have traditionally taken the nail matrix tissue by exposing the nail matrix after incising the proximal nail fold. Although this has offered much more histopathological information to dermatologists and shown a high success rate in achieving a diagnosis, it has many disadvantages. First, the method is a complex one which needs expert skills of the operator because it needs several steps until exposure of the nail matrix, so called cul-de-sac. Second, because of the anesthesia which needs much amount of local anesthetic, the patients surely suffer from harsh pain during injection. Third, the traditional nail matrix biopsy leads to decrease in the size of the nail plate, eventually. Therefore, the patient may undergo cosmetic problems. Finally, a long period of wound healing is necessary and a postoperative scar may result. Hence, some authors introduced a simple but informative method for patients with nail matrix disorders. After achieving local anesthesia that does not need lots of anesthetic as compared to the conventional method, they performed two 2-mm punch biopsies on the proximal nail fold for taking proximal nail matrix tissue. Considering the individual difference of the location of the nail matrix, they chose two different punch biopsy sites from the proximal nail fold. The 2-mm punch was advanced down to the nail matrix until the physician got the feeling of touching bone. Then, they punched through the nail plate of lunula to the underlying tissue using a 2-mm punch to obtain the distal nail matrix. Without suturing, a simple dressing with topical antibiotics was needed for three to five days. The advantages of their technique are: it is less painful, has a rapid healing time, there is almost no risk of scarring and morphological change. They adapted this simple technique for 18 patients which yielded the satisfactory results without exposing nail matrix. As a result they found that 17 out of

18 nail specimens contained the nail matrix. Almost histological findings were consistent with clinical diagnoses. The method especially benefited to classify twenty-nail dystrophy into several histological types. It showed a relatively high success rate in achieving a diagnosis, considering that 2-mm specimens are prone to crush injury during handling and are hard to interpret. However, matrix tissue was sometimes missing in tissue specimens because of its fragility and size. Thus they were developing an advanced technique to reduce the loss of tissue. Another limitation was that it was not suitable to be applied to a malignancy such as acral lentiginous melanoma because blind technique may not capture the atypical area of the lesion, correctly. In general, malignant lesions may be clinically distinguish from other benign lesions by using other devices such as dermoscopy, clinicians can choose more invasive and conventional technique to the doubtful cases. Therefore, this less invasive technique could be widely applicable to various benign nail disorders especially involving the nail matrix, like twenty-nail dystrophy and median nail dystrophy, and it can provide histopathologic information of whole nail tissues. The dorsal portion of the proximal nail fold, ventral part of the proximal nail fold, and the proximal nail matrix were sequentially shown in the specimen from the proximal nail fold. The specimen from the lunula shows the distal nail matrix just beneath the nail plate<sup>3,4</sup>. Since early 2009, they had got useful histopathologic findings from patients with various nail disorders through this technique. So far, no complications concerning the procedure have occurred and the physicians and the patients are all satisfied. In summary, the proximal nail fold-lunula double punch technique is both, a physician- and patient-friendly diagnostic tool. This enables the physician to take nail biopsies more easily and to detect more histopathologic findings of inflammatory nail disorders in the future. There are many types of nail unit biopsy, including biopsy of the nail matrix, which is done by retraction of the proximal nail fold; then a punch is introduced through the newly formed nail plate extending down to the periosteum of the terminal phalanx. In most instances, the plate will be avulsed first and the proximal fold retracted for complete visualization. Indications for nail biopsy include a pigmented

streak in the nail plate; suspicion of skin cancer, either melanoma or nonmelanoma; and space-occupying lesions, either benign or malignant tumors. Biopsy of the nail matrix is not to be taken lightly because of the real possibility of scarring, a permanent nail split, or other longitudinal dystrophy. The patient should be fully aware of these potential consequences [3].

#### **Saw-toothed power punch for effortless nail biopsy:**

A nail biopsy is an important diagnostic procedure for many nail diseases involving the nail bed and the nail matrix. The 3 methods commonly used for nailbed biopsies include excision biopsy, longitudinal biopsy, and punch biopsy using skin biopsy punches. The punch method is the least invasive method and conserves tissue, therefore, is more popular. A nail plate consists of a densely packed tough keratinized tissue; therefore, skin biopsy punches are unsuitable and often require excessive physical force leading to damage to the biopsy specimen and the surrounding tissue. Furthermore, it is difficult to insert a punch to the desired depth in one attempt because of the resistance produced by the tough nail plate. To overcome this, a 2-punch method has been proposed. In this method, a larger punch is used to remove the nail plate and then a smaller punch is used to take the nail bed or matrix biopsy. In such biopsies, the absence of the attached nail plate leads to loss of orientation of the biopsy specimen. All these factors sometimes lead to inconclusive histology reports. If the nail plate is thick, such as in patients with pincer nails, obtaining a nail bed or nail matrix biopsy specimen requires removal of the complete nail plate first; this causes undue trauma and delayed healing. To overcome these problems, the authors introduce use of saw-toothed motorized punches of 3 mm or more in diameter for obtaining a nail biopsy. The dimensions of these punches have been made to fit in the hand piece of the micromotor dermabrader machine, which is usually available in dermatology operating rooms. These motorized saw-toothed punches penetrate even the toughest of the nail plates at 2000 to 3000 rotations per minute without excessive manual force and easily reach to the level of the periosteum. The specimen so obtained has an attached nail plate so that tissue orientation is not lost. Moreover, the nail plate removal is not needed for nail bed or

matrix biopsy even in the presence of a very thick nail plate, and healing is faster. The currently available micromotor dermabrader hand pieces have very good hand control, so there is a minimal risk of going too deep. They need to stop when they feel the “give” on reaching the nail bed to avoid trauma to the deeper structures [7].

**Window Nail Plate Avulsion:** Nail problems limited to a confined portion of the nail bed can be accessed using a window plate avulsion. This technique is helpful when removing a localized foreignbody in the nail bed, exploring the nail bed for a welldemarcated neoplasm, evacuating a subungual hematoma, or draining an acute paronychia. It is performed using a 5mm, 6 mm, or larger punch to drill through the localized area of nail plate. Then a no. 11 blade is used to pry open and lift the circular porthole window of the nail plate, exposing the underlying bed. Then a smaller punch can be used to biopsy the appropriate underlying tissue, if necessary. If these windows of nail plate do not require processing for pathology or microbiology, they can be replaced and secured with a single suture or Steril-Strips. The procedure can be faster if the punch is heated [8].

**Skin punch as an adjunct to fine-needle aspiration:** Use of the punch is helpful in diagnosing solid organ tumors that are close to the skin surface, such as lymph nodes, the breast, and the thyroid, especially if the FNA yielded a non-diagnostic result. Fine-needle aspiration (FNA) is a percutaneous procedure that uses a fine-gauge needle and a syringe to sample fluid from a cyst or remove clusters of cells from a solid mass. The advantages of FNA are that it is a fast, easy method for biopsy, the results are rapidly available, it does not require stitches, and patients are usually able to resume normal activity almost immediately after the procedure. An important disadvantage of FNA is that the procedure obtains only very small samples of tissue or cells from the lesion. If the sample is benign fluid, then the procedure is ideal. However, if the tissue is solid or if a sample of cloudy, suspicious-looking fluid is obtained, the small number of cells removed by FNA allow only for a cytologic diagnosis. This can be an incomplete assessment because the cells cannot be evaluated in relation to the surrounding tissue. Moreover, it is difficult to use the FNA to

aspirate lesions that are small, ill-defined, fibrotic, or dermal in location. Consequently, use of the punch might be very helpful in diagnosing solid organ tumors that are close to the skin surface, such as lymph nodes, the breast, and the thyroid, especially if the FNA yielded a nondiagnostic result. In one study, the use of a punch gave a diagnosis in 17 of 21 breast tumor cases in which FNA was non-diagnostic because of scant cellularity[9].

**Diagnosis of Eyelid Tumors:** The management of eyelid tumors requires histologic diagnosis, which is usually obtained by biopsy. Although incisional biopsy is consistently recognized as the gold standard, a certain degree of surgical skill is necessary, and the procedure is time consuming. In a retrospective analysis of 20 consecutive incisional biopsies and 20 consecutive punch biopsies done by Rice and colleagues, the histology obtained by both biopsy methods was compared to that identified at the time of tumor excision. The accuracy rates were 95 and 85% for incisional and punch biopsy, respectively. Punch biopsy has the advantage of being a quick technique requiring minimum equipment. In addition, the operator requires no specific surgical skills. The biopsy specimen can easily be taken at the patient’s initial clinic visit, allowing a more rapid diagnosis and facilitating more efficient tumor management and fewer visits to hospital [10].

**Improving Histologic Examination of the Tumor Margin:** Histologic examination of the surgical margins of skin tumors removed by standard surgical excision is not always accurate. Vertical sections of surgical specimens represent check points of the margin only 7 microns thick. This means that most of the surgical margin is not checked microscopically, allowing small tumor islands at the margin to remain undetected. To avoid this and be more accurate, a new punch with concentric cutting edges separated by 2 mm has been made to obtain a 2 mm strip of tissue representing the entire lateral border of the excision. This specimen is easily mounted as a flat section for frozen or paraffin processing. These sections will be cut to show the entire lateral excision margin to be checked for tumor. It requires little additional skill on the part of the surgeon and is easily handled by the pathology laboratory [3].

**B-Therapeutic uses:** Punch excision of the mole can be done for therapeutic reasons. A punch size is chosen that is 0.5 mm larger than the maximum diameter of the mole to ensure its complete removal. The depth of the excised tissue should be adequate to include all pigmented tissue. The procedure can be stopped here and the defect sutured or followed by grafting from the postauricular area a skin punch graft that is 0.5 mm larger than the recipient area to allow contraction of the graft and expansion of the recipient socket. The recipient site is dressed with nonadherent tulle. Alternatively, it can be dressed with lubricating jelly. If the lesion is large and oval in shape, it can still be excised with a punch, as described by Warino and Brodell, where a punch is held at a 45° angle with the cutting edge of the punch touching the skin at one pole of the lesion. An oval mole is then squeezed into the opening of the punch as the handle is reoriented perpendicular to the skin, so that the cutting edge is flush with the skin surface; then the punch is rolled and excision is followed by suture closure. The use of punch for excision can be performed for other conditions, such as Spitz nevi and small tattoos [3,4].

**Punch excision of acne keloidalis nuchae:** The punch should extend deep into the subcutaneous tissue so that the entire hair follicle is excised. After excision is performed, the wound edges can be injected with 10-40 mg/mL of triamcinolone acetonide to reduce inflammation. Silk sutures may be used to reapproximate the skin [4].

**Punch excision of corn:** The hyperkeratotic tissue surrounding and over the corn area is pared using number 20-24 sterile surgical blade which makes the central core or kernel clearly visible. According to the size of the kernel punch with slow gradual rotatory half circular motion is pushed into the tissue. The punched out tissue is gradually pulled without cutting and pressure bandage is applied. Hard corns are firm, small, dome-shaped papules with translucent central cores, which occur on the palmoplantar region of toes and hands due to repeated trauma. Medical management of hard corns is difficult and sometimes requires surgical excision. Punch incision is a technique which is performed using a circular blade or trephine attached to a pencil-like handle. It might serve as an alternative method to surgical excision in the

treatment of recalcitrant corns. Punch incision is a simple and effective technique for the treatment of small corns on the palms and soles. Punch incision is a technique performed using a circular blade or trephine 2-6 mm in diameter and 1 cm in length, attached to a pencil-like handle. The advantages of this technique versus classical elliptical excision are that it facilitates obtaining deeper and narrower tissue, causes less damage to peripheral tissue, is associated with more rapid healing and less scarring and is simpler and easier to perform. The authors recommended the use of a punch tool that is the same size or larger than the corn. Based on the above study it can be concluded that punch incision is a simple and effective technique for the treatment of small corns on the palms and soles [11].

**Pinch punch excision of scrotal calcinosis:** Scrotal skin is pinched to highlight the subcutaneous nodules and using appropriate size of punch, nodules/cysts are excised. Sometimes scrotal calcinosis requires excision if the subcutaneous nodules are symptomatic, draining chalky white material, or causing deformity to the scrotum. This can be done with a pinch-punch excision, using tumescent anesthesia, 1:10,000 epinephrine and 0.1% lidocaine neutralized with sodium bicarbonate. Use of a tumescent anesthetic exerts a hydrodissecting effect, thereby separating the cysts from surrounding connective tissue and the superficial scrotal fascia. Then you can pinch scrotal skin to highlight the subcutaneous nodules; after that, incise the skin with an appropriate-sized punch. Suture closure is not necessary because of the small-sized wounds, the hemostatic effect of the tumescent agent, and the contractile nature of the scrotal skin [12].

**Pathologic Bone Excision:** Osteoid osteoma is a benign skeletal neoplasm of unknown etiology that is composed of osteoid and woven bone. The tumor is usually smaller than 1.5 cm in diameter. It causes focal bone pain at the site of the tumor. The lesion can be completely excised with a skin punch. This method has proven to be both minimally invasive and effective in the management of patellar osteoid osteoma [3].

**Punch excision of glomus tumor of nail:** A window is created in nail plate by using 5-6 mm punch and tumor in nail bed is excised

by taking a smaller punch incision (3-4 mm) and sutured [4].

**Use of the punch to enhance wound healing:** The full thickness punch grafts (3 mm) are harvested from the buttocks or thigh. Punch holes (2-2.5 mm) are made in the floor of the granulating ulcer 5 mm from each other, and grafts are pushed into these recipient holes. To increase granulation tissue, the punch is used in nonhealing ulcers and central ear lobe defects. Nonhealing ulcers create a great therapeutic challenge to the clinician. Large ulcers that fail to epithelialize with local dressings for 3 to 4 weeks despite healthy granulation tissue are usually taken up for grafting. Moreover, use of skin punch biopsy to provide an autologous full-thickness skin substitute for healing chronic wounds is reported to have a high success rate. External ear defect can be healed with secondary intention if the surrounding intact cartilage has its perichondrium. Granulation and reepithelialization will proceed somewhat more slowly than when the perichondrium is intact, but if the denuded cartilage is more than 10 mm in diameter, trephining with 2 mm punches to expose the perichondrium and dermis of the posterior aspect of the ear may facilitate development of granulation tissue in the wound bed and speed healing [3].

**Punch can be used for extrusion of:** epidermal inclusion cyst, hidrocystomas, pilomatrixoma, pilar sheath cyst, and pseudocyst of auricle with a punch hole technique and the contents of cyst are drained and pressure bandage is applied. Pseudocyst of the auricle is a benign, asymptomatic, noninflammatory pseudocyst that contains yellow, viscous fluid resembling olive oil. If left untreated, a permanent deformity may occur. It can be treated by a small, superficial punch incision on the lower part of the cyst to allow for open drainage, avoiding cartilage injury, until an oily viscous fluid is drained from the punch biopsy opening. Then taped with a pressure bolster as dental roll for 2 weeks, with daily cleaning and reapplication of the bolster. Extrusion with a punch hole has been used with good outcome in other cutaneous conditions, such as small, isolated epidermal cysts or hidrocystomas, drainage of infected or inflamed cysts, and epidermal inclusion cysts. Removal of pilar cysts can also be achieved using the standard punch incision technique. First, inject 1% lidocaine with epinephrine

overlying the cyst; then use a 4 mm punch to incise the lesion. After that, the contents of the cyst are expressed with lateral pressure [3,4].

**The punch and graft technique in chondrodermatitis nodularis helices:** A punch biopsy is applied perpendicular to the skin surface and advanced until a deep punch of underlying cartilage is cut. Then the same-sized punch of a full-thickness skin graft from the postauricular area donor site is harvested and fixed in place with 6-0 interrupted sutures. Chondrodermatitis nodularis helices is a painful inflammatory condition that affects the helix of the ear. A punch biopsy, of a diameter similar to that of the lesion, is applied perpendicular to the skin surface and advanced until a deep punch of underlying cartilage is cut. Then the same-sized punch of a full-thickness skin graft from the postauricular area donor site can be harvested along with underlying fat. The graft is fixed in place with 6-0 interrupted sutures, such that the contour of the helical rim is preserved [13].

**Subungual haematoma:** Hematoma is drained by making an opening through the nail plate with either number 11 blade, electrocautery or punch of size 1.5 or 2 mm or larger. Punch is preferred as it remains patent after decompression and allows further drainage without the opening getting sealed. The procedure was easily undertaken in the accident and emergency treatment room. No infiltration of local anaesthetic or ring block was required in our series and none of the adults or children complained of pain during trephination. All patients had an uneventful outcome at the 1 week hand clinic follow-up. This technique can be easily learnt by junior doctors as well as accident and emergency nursing staff, employs a portable, cheap, sterile and easily available instrument and also avoids re-accumulation of the haematoma. Additionally there is no danger of electrical or thermal burns which may occur with diathermy or heated needles [14,15].

**Periungual Exision:** The excision of inflamed tissue on chronic, refractory-totreatment paronychia can be done with nail-fold punch biopsy as described earlier [4].

**Punch is used to remove:** molluscum contagiosum, wart, pyogenic granulomas, etc [4].

**Punch can be held like a pencil or a pen:** which can mimic the cutting angle of a standard curette. With alternating flexion and extension of the wrist one can use the punch as a curette when curette is not available. Punch can be used as an alternative to other surgical tools, such as curettage. Curettage with a punch has the advantages of low cost and easy availability, which makes it a good alternative when a curet is not available. It can be used for debulking tumor before excision, curettage and desiccation, and treatment of benign conditions such as warts, molluscum, or syringomas after light electrodesiccation. The punch has a sharp circular cutting edge similar to that of the disposable curet. It can be held like a pencil or a pen, which can mimic the cutting angle of a standard curet. With alternating flexion and extension of the wrist, one can use the punch as a curet [3].

**Punch debridement of hidradenitis suppurativa:** Punch debridement (mini-unroofing) is perfect for the management of early or small acute or subacute inflammatory lesions, often involving only 1 folliculopilosebaceous unit (FPSU). This is a simple procedure performed in the office, clinic, or emergency room setting. Use a 5- to 8-mm circular disposable biopsy punch. Center the excision over the acutely inflamed FPSU nodule, include a small amount of surrounding tissue, and ensure that a deep specimen is obtained by using a firm twisting action. Remove the plug, submit for histology, and obtain bacterial cultures if purulent. Aggressive debridement involves digital pressure to remove purulent elements and then curettage and/or simple grattage (scrubbing) with gauze wrapped around a cotton swab. The specimen will contain the fractured FPSU with its associated sebaceous glands and more importantly, the “bulge” area of the pilar unit of the FPSU that contains the stem cells, which are hypothesized to be responsible for growth of the IPGM and the sinus tracts. For hemostasis, ferric chloride 3.8 molal (37.5%) is applied with a cotton swab, and the excess is wiped away. A thick layer of petrolatum is applied directly to the wound, held in place with a gauze pad or simple bandage. No drain is used. Healing is by secondary intention. Pain relief and healing are swift. Recurrences do not occur, but additional FPSUs in the treated

area are at risk until preventive measures are effective [16].

### Cosmetic uses

**Miniature punch grafting in vitiligo:** Punch grafting can be used on many depigmented diseases, such as vitiligo, chemical leukoderma, lichen sclerosus, and postburn leukoderma. Punch grafting is also used on hair transplant procedures. Refractory and stable vitiligo can be treated with surgical replenishment of melanocytes by various methods. One of these methods is punch skin grafting. Punch grafts of 1 to 2 mm may be used to yield better cosmetic results. Sockets are created in the recipient area at a distance of 5 to 10 mm, and harvested grafts are placed in these sockets. The cosmetic result and cobblestoning problem depend on the punch size. The smaller the punch size, the better the cosmetic result and the lesser the cobblestoning. This method consists of taking miniature punch grafts of sizes varying from 1 to 3 mm in diameter from donor site, grafting them in appropriate punched out areas spaced 2 to 5 mm apart at the recipient site and further securing them by firm pressure. Punch grafting is used in different parts of the world, variable success for the surgical treatment of vitiligo. Flip-top transplantation (FTT) is a relatively new procedure for the treatment of vitiligo and has been tried in many patients with various skin types. In a study done by Falabella and colleagues, 59.1% of patients showed excellent repigmentation with Mini Punch Grafting (MPG). In an Indian study done by Pasricha and colleagues, 75.2% of patients showed excellent repigmentation with MPG. Similarly Savant and colleagues, in their study of MPG in stable vitiligo, found that 91.9% of patients had excellent repigmentation, and 8.0% did not show repigmentation with MPG. In a study done by Malakar and colleagues, 74.5% of patients showed excellent repigmentation with MPG, and 10.6% did not show repigmentation. In the study done by McGovern and colleagues on FTT, 75% of patients showed excellent repigmentation. The authors felt that high graft uptake rate in FTT was due to the flap that covers the underlying graft, which works as a biological dressing and retains the graft in place. The reasons for nonsurvival of punch grafts could be excessive exudation of serum, thicker dermis that may favor infection, or inadvertent crushing during handling. The reason could

be that grafts used in FTT are superficial, unlike the grafts used in MPG, so there is less exudation of serum under the graft and greater possibility of survival of the graft. Flap necrosis could also induce infection, reducing the chance of graft survival. In this study, maximum pigment spread with FTT was 8.1 mm in the head and neck area, and minimum pigment spread was 1.2 mm, also in the head and neck area. In MPG, maximum pigment spread was 4.5 mm in head and neck area, and minimum pigment spread was 2.8 mm, on the trunk. The differences in pigment spread between the two techniques were statistically significant. In a study conducted by Savant and colleagues, maximum pigment spread was 5 to 10 mm, in the head and neck area, with MPG, whereas McGovern and colleagues found maximum pigment spread to be 6 to 8 mm, in the head and neck area, with FTT. The greater pigment spread with FTT is because of preservation of follicular reservoirs and melanocytes in depigmented lesion because we do not remove skin from recipient site, whereas in punch grafting we remove skin and thus melanocytes reservoir from recipient site. Nevertheless, more surgical dermal manipulation may result in more scarring, cobblestoning, infection, and other complications. When minigrafts or epidermal grafts or epidermal suspensions are used, fewer side effects will also occur. An excellent outcome means not only a high repigmentation rate, but minimizing unsightly side effects also is equally or even more important. In the study done by Malakar and colleagues, onset of repigmentation ranged from 15 to 20 days, and completion of repigmentation was seen in 16 to 20 weeks in MPG, whereas in the study done by McGovern and colleagues, onset of repigmentation ranged from 15 to 20 days, and completion of repigmentation was seen in 16 to 20 weeks in FTT. This study concluded that treatment variables that affected the development of cobblestoning were donor and recipient punch sizes; the smaller the donor and recipient punch sizes, the lower the incidence of cobblestoning. Fongers and colleagues also advised smaller punch sizes to minimize cobblestoning. Cobblestoning is slightly more common in MPG than FTT, but it was seen in both procedures in this study. Variegated appearance is mainly seen with FTT and usually does not occur in MPG. More cobblestoning is seen in PG, because fitting a 4-mm punch graft into a 3-mm

recipient site may result in two effects: reducing the radius by 1 mm may decrease melanocyte and pigment spread and because punch grafts are definitely thicker than thin shaved grafts. Furthermore, retraction of a 3-mm recipient site during healing may force a 4-mm graft upward, enhancing cobblestoning in spite of an apparent appropriate recipient site at the moment of grafting. Variegated appearance is mainly seen with FTT because of inability to regulate depth while attempting to obtain ultrathin grafts. Hyperpigmentation is seen with both techniques, but this is regarded as a temporary phenomenon that decreases spontaneously over time. The cost of a razor blade, the main surgical instrument used in FTT, is 1.0 Indian Rupee (US\$0.02), versus 80 to 90 Indian Rupee (US\$1.79–2.01) for the punches used in MPG. So FTT is more economical. Although this difference in cost is large, in practical terms, both are inexpensive, and for repigmentation purposes, it is more important to avoid cobblestoning or hyperpigmentation and to achieve appropriate repigmentation than to worry about such small costs. FTT was equally effective as PG for treating stable vitiligo. In FTT, the graft uptake rate was higher, there was greater pigment spread, and the cost of the procedure was lower than with PG [17].

#### **Smashed skin grafting or smash grafting:**

A number of new therapeutic options for vitiligo have become available over the last decade or so both on the medical as well as surgical side. One among them is the smashed skin grafting or simply smash grafting, which is a modification of split-thickness grafting. In this method, the graft undergoes “smashing” before being applied to the recipient site. Though a simple and effective procedure, very few people are doing the procedure either due to lack of awareness or due to lack of published data. Smashed skin grafting is a simple procedure with fewer side effects, better outcome, and high patient satisfaction or, in simple words, it can be considered as an alternative to various conventional surgical modalities like punch grafting and melanocyte cell culture methods. Various surgical modalities for vitiligo available now include autologous suction blister grafting, split-thickness grafting, punch grafting, minipunch grafting, single follicular unit grafting, smash grafting, cultured epidermal suspensions, flip-flop pigment transplantation, and

autologous melanocyte culture grafting. Some of these procedures have been combined with phototherapy to achieve optimal results. One major issue with surgical therapy is complications like scarring and incomplete pigmentation. Though a lot of alternatives, for example covering up the lesion with cosmetic camouflage or tattooing the lesion, are available, they are not longstanding and not suitable for all areas and many times need expert surgeons. Common surgical modality like punch grafting is easy to perform and does not require any sophisticated instruments, but it carries a high risk of scarring on the patient in the form of cobblestoning, which is a major problem for people coming for cosmetic treatment. Recently, a new technique known as smashed skin grafting or smash grafting is being popularized in India by certain dermatologists and plastic surgeons and is quite an alternative for all the conventional surgeries and is giving results similar to melanocyte cell transfer techniques. The biggest advantage of this new method is the simplicity of the surgery in itself and the high rate of repigmentation with this method. Even the beginners in the field of dermatosurgery can perform the procedure without much difficulty and get a very satisfying result. Though the journal search for smashed skin grafting or smash grafting yields very few results, some dermatology surgeons in India have reported, in various conferences held in our country, a very promising result with this new method. Though it is very effective, very few people are doing this surgery, and especially in poor countries it is sad to know that this new technique has not been embraced with the same enthusiasm shown to other methods. This is mainly because of the lack of awareness about the method among the dermatologists and non-availability of the published data. So far the literature search yielded only two articles mentioning this technique. Another important factor is the advancements made in the melanocyte cell culture method that more dermatologists prefer this method over smashed skin grafting. Though cell culture techniques are giving good results, the procedure needs costly equipment, its time consuming, and cost to the patient is very high. Smashed skin grafting on the other hand hardly needs specialized equipment and is cost effective to the patient. Most comparison studies on grafting techniques in vitiligo have shown that maximum repigmentation is achieved with

either suction blister grafting or split-thickness grafting. Smashed skin grafting is a variant of the split-thickness graft with a slight modification. In this method, the split-thickness graft obtained from the donor site undergoes a process of "smashing" before being applied onto the donor site. Smashing of the donor tissue can be performed using a simple sterile scissor. The amount of graft needed in the case of smashed skin grafting compared with the conventional split-thickness grafts is much less. The amount of donor tissue needed is roughly 1/10th the size of the recipient area. This technique also gives an excellent color and texture matching after repigmentation, and it has been observed that the incidence of repigmentation with this technique is quite high. Surgical therapy for vitiligo has undergone a lot of advances in the past decade. But the accessibility of the patient to them has been limited by the high cost of the procedure. Moreover, many of the procedures are complicated and time consuming. Cell culture and melanocyte transfer methods need sophisticated workplaces unlike smash grafting, which can be performed in a minor operation theatre under local anesthesia. Smashed skin grafting has evolved into a simple and effective method for the treatment of vitiligo. Advantages of smash grafting over other surgical modalities can be summarized as follows: Need simple instruments, cost effective to the patient, minimal residual changes at the donor and recipient sites, unlike suction blister and thin split-thickness graft where the graft needs to be applied with the dermal side coming into contact with the recipient area, smash graft can be applied without any side consideration, easy to master with training and expertise. A few modifications have been added to this technique by various dermatologic surgeons, for example: Kocher's forceps can be used for holding the razor blade, hand dermatome, Humby's knife or Silver's knife can be used, instead of vaseline or antibiotic gauze, we can use a thin linen that is moistened with normal saline to cover the recipient area, collagen sheets are better dressing agents, assuming that the patient can afford them, erbium-YAG laser ablation for the donor area is also a good alternative for dermabrasion. Large-scale studies have to be undertaken to fully evaluate smash grafting, including the long-term complications, if any. Because smashed skin grafting is a simple procedure, it is necessary that

it should be popularized as it is a very cost-effective method for the patient [18].

**Chinese Cupping: A Simple Method to Obtain Epithelial Grafts for the Management of Resistant Localized Vitiligo:** The introduction of surgical techniques provided a major development in the management of resistant vitiligo and replaced other conventional unsuccessful therapies. Most of these procedures require special devices and experience that prevent many dermatologists from utilizing them. The aim of this work is to evaluate the introduction of a new simple technique that can be used in epithelial grafting for recalcitrant patches of vitiligo. Twenty vitiligo patients, nonresponding to classic phototherapy, were candidates in this study. A simple Chinese cupping device was used to induce blisters on the inner aspect of the thighs of the patients and the resulting blister roofs were used for grafting on dermabraded vitiliginous patches. The patients were followed up for 1 year. Blister roofs induced by Chinese cupping were able to repigment vitiliginous patches in 80% of the patients with admirable coloring match, and the donor areas did not show any cosmetic disfigurement at the end of the study. Chinese cupping is a simple and easy-to-use method to obtain epithelial grafts for vitiligo management [19].

**A simple office-based procedure for patients with extensive vitiligo:** The setup required for various grafting techniques for vitiligo is difficult, and specialized reagents along with expertise are requisites to perform them. The color matching and repigmentation may not be uniform in all cases, particularly at the margins. To surpass these drawbacks, the authors tried simple microneedling with a dermaroller device as an inexpensive and quick office-based procedure; it can also be used as transdermal drug delivery modality for large-molecular-weight drugs such as tacrolimus. Microdermaroller-mediated drug delivery can substantially increase effectiveness by passing the stratum corneum barrier and delivering this drug in adequate concentration to the melanocytes and keratinocytes. The site was anesthetized with topical lidocaine cream. A Dermaroller with needle length selected according to skin thickness and site of vitiligo was used to cause pin-point bleeding by rolling it for 15 to 20 minutes with parallel pressure strokes in a crisscross pat-

tern. A thin layer of tacrolimus ointment 0.1% was applied during the final pressure strokes. Avoidance of harsh chemical applications, topical antibiotics, and sunscreens was advised to the patient in the immediate postoperative period. There was mild discomfort to the patient for 1 to 2 days. This procedure was done at an interval of 7 to 10 days for a period of 2 to 3 months. Vitiligo Area Scoring Index (VASI) scoring was done before and after procedure. After approximately 7 to 8 sittings of the procedure over a period of 3 months there was 70% to 80% repigmentation without scarring. Wood's lamp examination confirmed the results. Dermaroller with tacrolimus is a simple, effective, office-based procedure with much less downtime that can be used for patients with extensive vitiligo [20].

**Punch excision of melanocytic nevus:** Round excision may be a better alternative to conventional fusiform or shave excision of benign papular or dome-shape nevus (<5 mm) of the face because it leaves an almost imperceptible scar [21].

**Punch excision techniques in acne scars:**

-Punch excision and closure: If the scar is >3.5 mm in size, it is excised and sutured after undermining.

-Punch incision and elevation: If the depressed scar has a normal surface texture, it is incised up to the subcutaneous tissue and elevated to the level of the surrounding skin.

-Punch excision and grafting: Depressed pitted ice pick scars up to 4 mm in diameter are excised and replaced with an autologous, full-thickness punch graft.

**There are two types of acne scars;** atrophic deep dermal scars and hyperplastic scars. Atrophic scars include icepick, rolling, and boxcar scars. The icepick scars are usually smaller in diameter and deep with tracts to the dermis or subcutaneous tissue. Boxcar scars are deep and are often 1.5-4 mm in diameter. They have sharply defined edges with steep, almost vertical walls. Soft, rolling scars can be circular or linear, are often greater than 4 mm in diameter, and have gently sloped edges that merge with normal-appearing skin. Examples of hyperplastic acne scars are hypertrophic scars and keloids. Punch biopsy is a treatment option for deep dermal scars through different techniques such as punch excision, punch elevation, and punch repla-

cement grafting. Punch excision, done for scars less than 3.5 mm, removes a pitted scar with a straight wall by a punch that is slightly larger than the scar being addressed. The site may then be allowed to heal by second intention, or sutures may be placed to close the wound. This technique is preferred for icepick scars. A scar requiring a punch larger than 3.5 mm is repaired by elliptical excision or punch elevation because these larger defects lead to “dog ear” formation on the face. Punch elevation is similar to punch excision except that the scar that is punched out is not discarded. It is useful if the scar is 3 mm in diameter or greater with a good color match and straight walls. The tissue cylinder is incised down to the level of the subcutaneous fat. The scar is allowed to float up until it is the same level as the surrounding skin. If it does not rise easily, it may be transected free at the level of the fat. The cylinder of tissue will be fixed in place by the patient’s serum and sits as a graft, held in position by some surgical tape. Punch elevation is a method of treatment for boxcar scars. Punch replacement grafting is useful for deep fibrotic scarring. The scar is excised as with the basic punch excision technique. The scar is discarded and is replaced with a slightly larger full-thickness punch graft, usually from the postauricular area. It is critical to allow each anesthetic wheal to flatten completely to prevent distortion of scars. Unless the graft is traumatized, it will usually survive well. Some of the grafts will heal with the same skin surface level and some will be elevated. Donor holes should be approximately 0.5 mm larger than the recipient holes. These seal in 5 to 7 days with a fibrin clot. Dermal graft for atrophic scar, 3-5 mm punch biopsy up to deep dermis is done in covered parts of the body. The epidermis part is excised and only dermal part is preserved. Subcision of the scar is done 1 week prior to the dermal graft. Depending on the size of the atrophic scar, appropriate size of dermal graft is inserted to the atrophic scar after making the pockets below the scar with 18-G needle. Seal the entry point with Steri-strip [22].

**Small lipoma excision through narrow hole extrusion technique (NHET):** In NHET, a small, circular punch defect is created in the skin and then the lipoma is extruded through the hole by applying lateral pressure. A curved hemostat can be inserted in the defect to

separate the lipoma from the surrounding tissue. Lipomas of subcutaneous fat are among the most common benign neoplasms observed in humans. Patients often come to their dermatologist for evaluation and removal of these tumors. Standard treatment commonly includes incision with extrication or elliptical excision. Unfortunately, these treatments often elicit a large scar. Many persons have multiple lipomatous lesions. For patients with multiple lipomas or angiolipomas, such conventional surgical treatments may be excessively scarring and cost prohibitive. The common cutaneous punch may regularly be applied to remove most lipomas in a variety of locations. The cutaneous punch is customarily used to perform biopsies. Extended uses of the punch previously published include removal of epithelial cysts, dermabrasion Loo-punch excision technique for removal of acne-induced osteoma cutis, and trephine punch for diagnosis of panniculitis. Brief mention of the biopsy punch to remove a variety of lesions including lipomas was reported earlier, as was instruction on the use of the punch for treatment of lipomas. The lipoma is identified by palpation and visual inspection. The area overlying the center of the tumor is marked with gentian violet. The area is subsequently anesthetized with 1% lidocaine with epinephrine at the subcutaneous level and the incision site. A 4-mm punch is inserted into the marked center of the epidermis overlying the lipoma. The punch should be inserted to the hub of its cutting surface. The lipoma is then firmly grasped between the thumb and the other digits. Firm pressure and squeezing are applied at the base of the lipoma in an upward fashion. The force is directed towards the incision site. This will usually result in the extrication of the lipoma. Larger tumors may require both hands to accomplish this removal. A deeper blunt probe or dissection within the incision site may be required to loosen the lipoma. Often, small clumps of fatty fibrous tissue will appear at the opening just before expulsion of the entire tumor. When the fibrous capsule of the lipoma appears at the opening, the tumor can often be expressed in toto with additional pressure. If the lipoma appears fibrosed and is difficult to extricate, then a semidestructive step may be required. The 4-mm punch is held in one hand and a firm upward grasp of the lipoma is held in the other. One performs a repetitive up-and-down

chopping motion with the cutaneous punch within the previous punch incision site to loosen the upper fibrous portions of the lipoma. The lipoma is then expressed piecemeal through the punch incision site via firm lateroinferior pressure. Continued deep pinching and upward pressure in a kneading motion may be required to remove all of the portions of the lipoma. Once the lipoma is completely removed, exploration of the defect for residual lipoma should be performed. This can be performed with curved hemostats. The incision site usually heals well by either second intention or the placement of 1 to 2 interrupted cutaneous sutures. The postoperative wound requires care similar to that of any punch biopsy procedure. The incision site will generally heal with minimal scarring, especially in comparison to conventional excision scars. Excellent locations for the punch expulsion of lipomas are the extremities and face. Appropriately, these are areas of greatest cosmetic consequence for any surgical procedure. Because it is important to be able to gain a firm grip under the lipoma, areas of the body with thickened dermis or minimal skin pliability are difficult areas for this technique. Thus removal of lipomas on the torso by this method is variably successful because of the thickened cutis. Nevertheless, most cases warrant a trial removal attempt with this technique. If no success at removal is attained, other conventional surgical methods may be attempted. This technique often requires moderate manual physical effort to expel the lipoma, especially in areas of thickened integument. However, there are many obvious benefits to this removal method. Risk of hemorrhage and infection may be minimized secondary to the decreased degree of invasion. In cosmetically sensitive areas, this technique is an effective and aesthetically pleasing method for removal of single lipomas and tender angiolipomas. It is especially applicable to the patient with multiple lesions, in that many tumors may be easily removed at a single office visit. NHET is widely used. In this technique, the lipoma is removed through a narrow punch hole done by punch biopsy, and the site is left to heal secondarily or one to two interrupted cutaneous sutures are placed. Modification of the NHET, called the pot-lid technique, aiming to improve the aesthetic outcome, was described recently. After doing a punch, the punched-out piece of skin

is kept in normal saline. Then you proceed with extrusion of lipoma, as in the NHET, and then the punched-out piece of skin is repositioned to cover the defect and sutured into place [23].

**‘Pot-lid’ technique for aesthetic removal of small lipoma on the face:**

A 5-mm punch inserted deep into the center of the lesion to create a circular hole. The punched-out piece of skin kept in normal saline. The lipoma is extruded with the help of a hemostat and by squeezing pressure. After achieving hemostasis, two absorbable buried subcutaneous sutures are placed to create support for the graft. The punched-out piece of skin is then positioned to cover the defect, like a “lid on a pot” and dressed. Patients presenting with an asymptomatic subcutaneous facial lipoma desire its removal in order to restore the contour of the face. The standard treatment for lipoma is excision, with the size of the incision being about one-half of that of the tumor itself. The long linear scar resulting from simple excision may fail to improve the appearance of the patient. The removal of the lipoma through a small incision or a punch hole decreases the size of the resulting scar, but does not eliminate it completely. They improved the aesthetic outcome of the commonly used technique for lipoma removal, known as the narrow hole extrusion technique (NHET), by modification. Four patients (three men and one woman) with small lipomas on the face (three on the forehead and one on the cheek) were selected for the procedure. A 5-mm punch was inserted deep into the center of the lesion to create a circular hole. The punched-out piece of skin was kept in normal saline. The lipoma was extruded with the help of a hemostat and by squeezing pressure. This resulted in the formation of a subcutaneous cavity. After achieving hemostasis, two absorbable buried subcutaneous sutures were placed to create support for the graft. The punched-out piece of skin was then positioned to cover the defect, like a “lid on a pot” and dressed. The color and texture match of the graft with the surrounding skin were excellent in three of the four patients by the end of 6 months. The graft, which was depressed in the fourth patient, improved through spot dermabrasion. The proposed modification of the NHET for lipoma removal improves the cosmetic outcome.

NHET is probably the most widely used technique; it is simple and gives a good cosmetic outcome. In this technique, the lipoma is removed through a narrow punch hole and the site is left to heal or one or two interrupted cutaneous sutures are placed. This results in a circular scar of healing or a linear scar with tissue protrusion ("dog ear"), respectively. Even though the size of the scar is small, this may not be acceptable when the lipoma is located at cosmetically prominent sites. Punch excision and grafting has been in use for some time for the management of a variety of skin conditions of the face, such as the removal of moles, small skin cancers, and traumatic and ice-pick acne scars. The commonly used donor site for grafts in these conditions is the retroauricular area. Although it is a good match for facial skin, some mismatch in color, texture, thickness, degree of actinic damage, and sebaceous quality is expected. This may result in a conspicuous graft. Therefore, they decided to remove the lipoma through a narrow punch hole and to place the punched-out piece of skin back to cover the defect, like a "lid on a pot." This gave us an excellent cosmetic result with no conspicuous scar, as it was a small, full thickness grafting procedure in which the donor and recipient sites were the same. There were two procedural problems in this technique. First, after the removal of the lipoma, a dead space was created and no recipient bed was left for the graft. Second, due to the effect of the elasticity of the skin, the punched-out piece of skin tended to shrink and the defect expanded, which resulted in a mismatch in the size of the hole and the graft. This was more pronounced in younger patients. To overcome these problems, they placed two buried subcutaneous sutures. The lightly tightened sutures reduced the size of the defect to match it with the size of the graft. The sutures also supported the graft and prevented the sinking of the graft into the dead space. Although the artificially created support does not fulfill the essential requirements for an ideal recipient bed (i.e. rich vascularity for capillary ingrowth and fibroblasts to support collagen<sup>18</sup>), the graft survives by the "phenomenon of bridging." In this phenomenon, the requirements of a small-sized graft are fulfilled satisfactorily from the walls of the defect and the survival of the graft is not jeopardized. Rather, it helps to prevent elevation of the graft (cobblestone formation) a common complication of punch grafting), as

the excessive growth of fibroblasts and deposition of collagen do not occur. Hypo/hyperpigmentation at the grafted site, if it occurs, disappears with the passage of time and the grafted site becomes almost imperceptible 3±4 months later. The potential complications of the procedure include hematoma formation, which can be avoided by achieving hemostasis and applying a firm pressure bandage. Another potential complication is failure of the graft to take hold due to mobility of the part or necrosis. In this case, the final outcome will be no worse than that seen in NHET. In conclusion, the described technique has excellent potential for the removal of small lipomas located at cosmetically sensitive sites [23].

**Liposuction:** Punch is used to make holes to insert cannulas. A micro-aidit used in tumescent liposuction is a small circular hole made by a tiny skin biopsy punch facilitate and promote the drainage of residual blood-tinged anesthetic solution associated with tumescent liposuction [24].

**In earlobe repair:** Using a punch biopsy instead of the scalpel blade to excise the partial cleft in an elliptical fashion. The opposing margins are sutured together in a straight line. Piercing earlobes is a common practice all over the world. Several methods have been described for repair of an unwanted lengthened earring hole. One of these methods is using a punch technique that removes the preexisting hole and then subsequently suturing the newly created nonepithelialized tract [25].

**Tattoo removal:** Very tiny tattoos, in particular remnant of post traumatic tattoos or first attempts at self-tattooing (traditional green tattoo on forehead), may be removed by a punch biopsy closed by a single suture [26].

**Follicular unit extraction (FUE) method by using micropunches for:** Androgenetic alopecia, eyebrow transplant, eye lash implantation, vitiligo surgeries for poliosis etc. In FUE, the extraction of intact follicular unit is dependent on the principle that the area of attachment of arrector muscle to the follicular unit is the tightest zone. Once this is made loose and separated from the surrounding dermis, the inferior segment can be extracted easily. Because the follicular unit is narrowest at the surface, one needs to use special micropunches of size 0.6-1.0 mm and therefore

the resulting scar is too small to be recognized. Uses of the punch to diagnose and treat many medical and surgical conditions make it important to many other specialties beside dermatology. We can propose a punch technique as a novel method for dermatosurgical treatment of various lesions with curative and good cosmetic results when compared with other existing surgical methods. A simple and an inexpensive skin biopsy punch have vast applications in dermatology. It is not only used to confirm a diagnosis, but used to remove cosmetically unacceptable lesions, and provide definitive treatment for a number of skin conditions. The use of skin biopsy punch is not only limited to the field of dermatology but also extended to the other specialties. Punch surgery is a simple, readily available, cheap tool that has many advantages, such as easiness to perform and no need for general anesthesia. Punch surgery also has a low risk of infection and bleeding and can be done in an outpatient setting. Uses of the punch to diagnose and treat many medical and surgical conditions make it important to many other specialties beside dermatology [27].

**The use of hyaluronidase as an adjunct to surgical procedures:** Although the use of hyaluronidase as an adjunct to anesthesia is frequently described for plastic surgery and ophthalmologic procedures, its use in dermatologic surgery has not been well investigated. They reviewed the advantages and disadvantages of using hyaluronidase in dermatologic procedures. The effect of adding hyaluronidase to local anesthesia was evaluated in 72 operations performed over a 1-year period. Although the duration of anesthesia was slightly decreased, the addition of hyaluronidase to local anesthesia offers the benefits of minimizing loss of surface contour and enhanced ease in undermining and dissection through subcutaneous tissue planes. The onset of anesthesia using hyaluronidase was immediate and the area of anesthesia appears increased over anesthesia without hyaluronidase. They recommended the adjunct of hyaluronidase to local anesthesia as a useful advancement in surgical technique [28].

**Topical brimonidine for hemostasis:** Chen et al evaluated the use of topical brimonidine for hemostasis during Mohs micrographic surgery. Although topical brimonidine had been previously reported as a hemostatic agent in ophthalmologic surgery and oto-

laryngology, this case report was, to our knowledge, the first describing its use in dermatologic surgery. This pilot study by Chen et al analyzed the use of brimonidine 0.33% gel (1 g) applied topically approximately 15 minutes before beginning MMS in patients taking anticoagulant and/or antiplatelet agents. The results demonstrated that preoperative application of brimonidine decreased blood loss and the need for cauterization. The safety of topical brimonidine gel has been studied for its US Food and Drug Administration approved indication, rosacea; however, it has yet to be studied for its use as a topical hemostatic agent. However, 2 cases of central nervous system depression with topical brimonidine gel when used for hemostasis have been reported. Both patients experienced reversible but serious central nervous system depression requiring hospitalization. In these cases, larger quantities (10 g) of brimonidine 0.33% gel were used under occlusion in actively oozing open surgical wounds on the face. Brimonidine should not be used for hemostasis in open surgical wounds, particularly in the head and neck. Although safety outcomes were not directly reported by Chen et al, the preoperative topical application of a small amount of brimonidine 0.33% gel to the surgical site can be reasonably assumed to yield exposures and risks similar to those with its use in rosacea [29,30].

**Tripod vibration anesthesia:** Cutaneous vibrators have been introduced to relieve pain associated with a variety of dermatology procedures including injections and laser treatments. The simple tripod massager described in this report is effective and acceptable to patients for cutaneous injection anesthesia. Most pain associated with cutaneous procedures results from injection of the local anesthetic. Smith et al. have described vibration anesthesia in this journal as an adjunct to any injection procedure, eliminating the need for local anesthesia for some procedures. The authors recommend several units including the Acu Vibe Softouch™, the Hitachi Magic Wand™, and Conair™ double headed massager. They had used the technique they describe, and found it quite helpful for minimizing the pain of injections. These rather large massagers can be intimidating to some patients. Two of the three vibrators (the Acu Vibe Softouch™ and Hitachi Magic Wand™), have electric cords and therefore take a little extra

time to use. Some of the vibration units recommended by Smith et al. are apparently sold for sexual stimulation and may be recognized as such by some patients. They found the inexpensive Homedics Mini Massage-On-The-Go™ massager to be useful for reducing the pain of injections. The unit is cordless and can be managed by a single operator. They cover each "foot" of the unit with a small sheet of Allrap All Purpose Adhesive Covering as a barrier for antisepsis. The injection is done within the triangular region formed by the 3 feet of the unit. One of the feet should be positioned so that it is proximal to the injection site. The unit has a toy-like appearance and may contribute to reduction of anxiety in pediatric patients. The arch allows placement of ice, if desired, followed by injection without needing to move the unit. The tripod technique is limited to broad surface areas such as the trunk and proximal extremities. For other sites such as fingers, two of the feet may be placed along the finger, one foot proximal to the injection site [31,32].

**Purse-string suture:** Purse-string suture enabled us to repair small, circular wounds easily after excision of skin lesions. It is an excellent alternative to other reconstructions and a rapid, simple method to close skin defects with minimal scarring, achieving an excellent long-term cosmetic and functional outcome. Round and oval skin lesions, like facial pigmented nevi, are common and are traditionally sutured linearly for closure after excision, leaving scars longer than the nevi themselves, which greatly influences their appearance. The purse-string suture enabled us to repair small, circular wounds easily after excision of skin lesions, especially in the faciocervical region, and is suitable for people with different skin characteristics. Based on the principle that tensile force converges toward a central point when the purse-string suture is employed after incision of circular lesions, tension placed on the suture uniformly advances the skin from the entire periphery of the wound, resulting in a significant reduction of the defect size by the greatest extent, making it much easier for cells at the wound edge to sprawl to repair the wounds. Also, because the suture compresses both the larger vessels in the reticular dermis and the smaller vessels in the papillary dermis, enhanced hemostasis is achieved. So the wounds heal in the slightest tensile force, re-

ducing the possibility of scar hyperplasia. The transition of the wounds from circles to points by this method, in our point of view, is a kind of leap geometrically. It is an excellent alternative to other reconstructions and a simple method to close skin defects with minimal scarring, achieving an optimal long-term cosmetic and functional outcome [33].

**Round excision:** Round excision may be a better alternative to conventional fusiform or shave excision of benign, dome-shaped or papular nevi of the face. Round or circumferential excision is carried out just outside the perimeter of the lesion. This technique may be chosen when the region involved overlies cartilage (i.e. nasal tip or ear rim) or when the best repair orientation or approach is not apparent before the excision. Round excision has been recommended for the excision of nevi, but as round excision and primary closure may cause tissue protrusions or dog-ears, many dermatologists avoid this procedure. The possibility of dog-ear formation is related to skin elasticity as well as the length of the incision. In areas of the body such as the face, the skin is quite elastic and easily movable and dog-ear formation is rarely observed. Although the defects left after removal of nevi by this technique are circular, stretching the skin perpendicular to the lines of relaxed skin tension whilst performing the procedure often results in an elliptical defect. These elliptical defects were easy to undermine and close with interrupted sutures or buried and interrupted sutures in combination. The use of the round excision technique results in an elliptical defect with a shorter long axis when compared to that created by the conventional elliptical excision technique. Less skin is excised in the round excision technique (approximately half that removed using a fusiform excision) and therefore a significant amount of skin is preserved. Undermining is usually not necessary and the round defect quickly assumes an oval shape which is ready for closure, usually with one or two buried, absorbable sutures and then two or three superficial sutures. The resulting wound is shorter than that expected with elliptical excision. As is usual for certain sites on the face that have a concave surface (e.g. temple, inner canthus, nose), there is a risk of a surgical scar spreading with time, but, again, it is usually a much smaller scar than would have been accomplished with elliptical

excision. In our experience, round excision may be a better alternative to conventional fusiform or shave excision of benign, papular and dome-shaped nevi of the face, because it leaves an imperceptible scar, gives cosmetically superior results, and requires a smaller incision, minimizing tissue trauma [34].

**Extra-Fine Insulin Syringe Needle: An Excellent Instrument for the Evacuation of Subungual Hematoma:**

The most commonly used treatment method for subungual hematoma is nail trephining, which has some disadvantages. We introduced a very simple and well-tolerated treatment technique for this common problem. We used an extra-fine, 29-gauge insulin syringe for evacuation. We inserted the needle very close to the nail plate to minimize pain. We drained the blood from the hyponychium under the nail plate using this extra-fine needle. The technique described herein is very fast and simple, and the patients tolerate it well. It is particularly successful for the treatment of smaller subungual hematomas of the second, third, and fourth toenails, in which the trephining is harder. For these reasons, we suggest this technique as a practical alternative to the traditional nail trephining methods. Trauma to the nail and systemic pathology, medication and drug reactions, and aging usually cause subungual hematoma. Hematoma formation occurs because of the disruption of the highly vascular nail bed. A sudden, blunt, external force or repeated microtrauma causes bleeding beneath the nail plate. The collection of blood produces intense pain that is caused by pressure and a bluish discoloration. The most common method of treatment has been the nail trephining. For decades physicians have used a heated paper clip for this purpose. In addition to a heated paper clip, a heated needle, a dental bur, a fine-point scalpel blade, a drill, a cautery device, and carbon dioxide laser have been used for trephining, and nail avulsion, proximal incision or distal incision beneath the nail tip, pressure dressings, and observation have been employed in the treatment of subungual hematoma. However, the throbbing pain is relieved only when the blood is evacuated. Nail bed lacerations and fractures of the distal phalanx require further treatment. However, nail plate removal and nail bed exploration are not required for subungual hematomas as long as the nail and the nail margin are intact. Regardless of size, only

simple trephining for symptomatic relief is required for simple subungual hematomas, and aggressive surgical treatment, as suggested in previous studies, is unnecessary. Prompt decompression will significantly alleviate pain and decrease the likelihood of delay in the regrowth of the nail plate and secondary dystrophy that might result from pressure on the matrix caused by accumulated blood under the nail and allows nail bed healing. Therefore, evacuation should be done no later than 6 to 12 hours after injury. We used an extra-fine, 29-gauge insulin syringe for evacuation. We drained the blood from the hyponychium under the nail plate using this extra-fine needle. Nails should be trimmed before the procedure. The toenail is cleaned and prepared with alcohol and allowed to dry. The area of blood pooling under the nail is visualized under a good light. The most distal part of the hematoma is selected for evacuation. If the distal part of the hematoma is on one level, the lateral side is preferred for evacuation. The patient grasps the affected toe between index finger and the thumb and fixes it. Grasping the toe also gives the patient a pressure feeling and reduces the pain, and the patient feels more confident. The sterile, disposable, extra-fine insulin syringe with a 29-gauge mounted needle is held between the thumb and index finger of the dominant hand. It is inserted to hyponychium, parallel to the nail plate. We keep the needle very close to the nail plate, avoiding contact with the nail bed as much as we can to reduce pain. While slowly progressing to the hematoma with a gentle push, we give a back and forward drilling movement to the needle. No sudden movement is necessary. If the patient feels pain, we stop moving for 3 to 5 seconds and start to progress again closer to the nail plate. Once the hematoma is penetrated, the needle is withdrawn. The trapped blood is evacuated rapidly because of the pressure through the small hole. Total evacuation of the hematoma is achieved with light pressure to the nail. The drained blood is removed with sterile gauze. If evacuation is incomplete, this may be due to a septum between hematomas, and in this case, the procedure is repeated from the other side. The drainage is usually completed in seconds. The treatment of a simple subungual hematoma requires subungual decompression, which is usually achieved by creating small holes in the nail plate. However, there are several disadvantages of nail

trephining. A heated paper clip can sear the blood and plug the hole, and the metal may have to be reheated several times. Drilling the nail can be quite painful because of the pressure needed to puncture the nail plate, and a digital nerve block may be required. However, draining the blood with an insulin syringe needle from the hyponychium is significantly less painful than one injection of digital nail block. It is well tolerated by the patients; therefore, there is no need for anesthesia. Because we insert the needle adjacent to the nail plate, where the tissue is not viable, it does not cause significant pain. As this tissue is not as hard as the nail plate and does not show resistance while progressing the needle, the procedure is very simple and fast. In addition, our technique is very successful in the treatment of smaller hematomas of second, third, and fourth toenails, which have very small nails that are hard to trephine. In early cases, as in our patient, the hematomas of second, third, and fourth toenails are in a very small space with very high pressure; therefore, they always appear very obscure at first. In late cases, they become more widespread because of progression of the blood peripherally between nail plate and nail bed because of the pressure. Thus, the late lesions appear larger and can be observed easily. However, in late cases, this progression may cause secondary dystrophy if it reaches to the matrix. Therefore, early treatment is very important. We do not suggest performing this evacuation technique with thick syringe needles because they may cause significant pain, especially if the hematoma is located proximally. Because the needle is sterile, the risk of infection is minimal. It is cosmetically superior to nail trephination because the nail plate is left intact. We also performed this technique successfully to the older hematomas. However, we did not have a chance to perform this technique to the patients with significant onychogryphosis and in patients with significant subungual keratinaceous debris as tinea unguium. We have been performing this technique for 3 years and have not observed any complications such as infection and cosmetic or functional deficits yet. According to our experience, even in promptly treated cases, once the detachment occurs, the nail plate could not attach to the nail bed again. After the evacuation of hematomas, a nail can be broken or shed in the following

months, as the attached distal part of the nail plate becomes smaller as it grows out. In summary, this is a very fast, simple, and well-tolerated technique and is particularly successful for the treatment of subungual hematomas of the second, third, and fourth toenails. For these reasons, we suggest this technique as an alternative to the traditional nail trephining methods [35].

**Eruptive vellus hair cysts: an effective extraction technique for treatment and diagnosis:**

We treated the lesions by using cautery and a standard dissecting forceps under topical anaesthesia. After puncturing the overlying skin in the centre using the sharp-tipped cautery point, we grasped the base of the cyst using a standard dissecting forceps and we extracted the cysts out. Over 150 cysts were extracted with this technique in two patients. The technique was simple, quick and tolerated well. No lesion recurrence was observed after 4 months. On histopathological examination, extracted cysts were observed to have cyst walls. In patient 2, the diagnosis was made within minutes by microscopic examination of the potassium hydroxide preparations of the extracted material. Our extraction technique is a simple and effective treatment option for these cysts. It can be regarded as curative since the cyst walls were also extracted. Microscopic examination of the potassium hydroxide preparation of the extracted cysts suggests that this technique can also be used as a simple diagnostic procedure [36].

**A simple open comedone extraction technique for Favre-Racouchot disease:**

Favre-Racouchot disease (FRD) is a common disease characterized by solar elastosis and large open comedones and cysts. This disorder mainly affects elderly Caucasian men who have had a great deal of exposure to the sun. Patients having FRD continuously develop numerous large open comedones that could cause a cosmetic problem. We performed a simple and effective extraction technique for these open comedones using a standard dissecting forceps. This technique is well tolerated and no complications were observed. We suggest this comedone extraction technique as a simple alternative treatment for this common cosmetic problem [37].

**The use of the freer dissector for the removal of trichilemmal cysts:**

Trichilemmal cysts are keratin-containing cysts, usually si-

tuated on the scalp. They often show an autosomal dominant inheritance pattern. Excision is the treatment of choice. We described a practical surgical technique that eases the removal of these cysts. A 24-year-old woman presented with a 5-year history of cystic lesions on her scalp, clinically diagnosed as trichilemmal cysts. She was treated with the new technique. After making a small incision under local anesthesia, a freer dissector (Aesculap OL 165 R) was used as a blunt dissector. The freer dissector was inserted through the incision. A blunt dissection was made to dissect the cyst free from the surrounding dermis and, by using the dissector as a lever, gentle pressure was applied to the opposite side to ease the cyst from the dermis. Four cysts were removed with this technique. The treatment was well tolerated by the patient. No complications developed during or after the procedure. This modified technique is simple and practical. The slight curve at each end of the freer dissector makes it easy to grasp the cyst and, functioning like forceps, the cyst can be eased from the dermis. We believe that the use of the freer dissector in the surgical excision of trichilemmal cysts aids and speeds up the procedure [38].

**Multiple epidermal inclusion cysts of the eyelid: a simple technique for removal:**

More extensive cyst removal with skin excision followed by skin grafting would have led to an unsightly end result, as there was no donor skin of like consistency available. The 27-gauge needle technique is simple and repeatable and is associated with little recovery time and rapid healing [39].

**A simple surgical technique for the treatment of steatocystoma multiplex:**

Since steatocystoma multiplex is an uncommon disorder, its treatment has not been discussed in detail in the textbooks and surgical excision is the most commonly mentioned method. We described a very simple surgical technique, which was developed by modifying previous reports. A 29-year-old woman, diagnosed clinically and histologically as steatocystoma multiplex, was treated with this modified technique. We punctured the cysts under local anesthesia with a sharp-tipped cautery point and evacuated the contents by squeezing the cyst with a fine forceps. Then, the cyst wall was grasped by the forceps and the sacs were extracted through small holes. More than 50 cysts were treated. The treat-

ment was well tolerated by the patient. No complications developed during or after the procedure. After 14 months follow up no recurrences were observed and the results were cosmetically excellent. This modified technique is very simple and time saving. Its cosmetic and longterm results are successful. We believe that it must be considered as the treatment of choice for steatocystoma multiplex [40].

**A Minimally Invasive Procedure for Axillary Osmidrosis: Subcutaneous Curettage Combined with Trimming Through a Small Incision:**

Though minimally invasive procedures often yield excellent esthetic results for axillary osmidrosis, the high recurrence rates of malodor limit its further application. Incomplete removal of the apocrine glands would lead to recurrence of the axillary bromhidrosis, while excessive resection of the apocrine glands firmly attached to the dermis would easily result in local skin necrosis. Therefore, accurate management of the apocrine glands is extraordinarily important, particularly with a limited access. Herein, we would like to introduce an effective and minimally invasive procedure combining subcutaneous curettage and trimming for the treatment of axillary osmidrosis. A 5-mm incision was marked at the inferior pole of the central axillary crease. Subcutaneous undermining was done clinging to the axillary superficial fascia. The whole procedure was performed in the following sequence of “scraping–trimming–scraping” against the undermined skin flap until the remaining hairs were easily pulled out. All the wounds healed primarily without significant complications. Out of 300 axillae, 294 (98 %) showed good to excellent results for malodor elimination. Scars were invisible in 280 axillae (93.3 %) and slightly visible in 18 axillae (6 %). The dermatology life quality index score decreased significantly after the operation. The procedure is an efficacious and minimally invasive method for the treatment of axillary osmidrosis. Level of evidence was IV of this article [41].

**Faster suction blister formation using 2 hair dryers:**

Suction blisters are important for surgical treatment of vitiligo. One of the main limitations of suction blisters is the time required to create them. Several methods have been described in the literature to shorten the duration needed for the development of suction blisters. All described methods aim

to increase the local temperature to facilitate blister formation. One recently described method is the use of a hair dryer. The time required for blister formation was reduced from 120 minutes to 70 minutes. This is still considered a long duration and additional methods to shorten the duration would be appreciated. Using 2 hair dryers from opposite directions would further reduce the duration required for blister formation. Two suction (5-mL and 3-mL) syringes were used. The syringe plunger was removed and the proximal part of the syringe was placed on the skin. The distal part of the syringe was attached to a 3-way valve. A 10-mL syringe was used to apply suction through the other end of the 3-way valve. A hair dryer operating at low heat was then directed towards the suction area from an; 20-cm distance. At this distance, there is mild to no pain associated with the procedure. When using 2 hair dryers from opposite directions, there is an; 10-minute reduction in the time required for blister formation. Some blisters form in a multilocular fashion. Applying gentle lateral pressure allows formation of a unilocular blister [42,43].

**Perone LASIK forcep for molluscum:** Molluscum contagiosum, a common viral infection, is a self resolving condition. However, intervention in the form of ablation or curettage is desired in a number of cases. Molluscum lesions pose a challenge when they are present around eyelid margins. Patients, as well as the dermatologists, are apprehensive regarding the use of available modalities for the removal of eyelid margin molluscum. Mechanical treatment modalities and chemical treatment modalities might not be advisable because of the proximity to the eye. We can use of the Perone LASIK forcep for easy extraction of eyelid margin molluscum. The Perone LASIK forcep is commonly used in LASIK (laser in situ keratomileusis) surgery for holding the corneal flap. This forcep is available for purchase through surgical instrument vendors or through online shopping. This forcep has a circular ring on both tips, which enables a firmhold on molluscum lesions. Molluscum can be held between the circular rings and then extracted with gentle pressure. The procedure is painless and the degree of damage to the skin is less extensive [44].

**Combination of ligation and timolol before surgical excision of pyogenic granuloma:** Pyogenic granuloma (PG) is a benign vascular

tumor that commonly grows on fingers and the orofacial region. While many therapeutic options exist, surgical excision is associated with the lowest probability of recurrence. However, surgical excision leaves a linear scar, which can be a cosmetic or functional challenge, especially in the digits and orofacial area. Immediate surgery is not always feasible due to either the patient's or surgeon's schedule, and a delay of the procedure is inevitable. For PGs that cannot be removed immediately, it can be ligated the base with 4-0 black silk followed by application with timolol maleate ophthalmic 0.5% solution (2 dropsx4/daily). A previous study showed that ligation of PG base with suture material leads to necrosis. Recently, timolol, a nonselective b-blocker, was introduced for PG treatment. However, these methods frequently fail to involute PG. The combination of ligation and timolol strangulation increases the chances of success. This preoperative combinatorial approach has a few advantages. First, it prevents PG from enlarging and frequently reduces the tumor size before the planned surgery. In addition, this procedure might completely resolve PG, obviating the need for surgery. Therefore, the combination of ligation and timolol represents an acceptable therapeutic strategy for PG before surgery [45].

**Successful treatment of lipoatrophy with normal saline:** Margulies and Morris presented a case of lipoatrophy treated successfully with intralesional normal saline injections. Localized lipodystrophy, or lipoatrophy, presents as focal loss of subcutaneous fat with variable overlying skin changes and depth depending on the cause. Lipoatrophy could result from both oral and local intralesional corticosteroid use, with the buttocks and proximal extremities being the most commonly affected sites with oral use. Minimal literature exists about corticosteroid-induced lipoatrophy. Localized reactions to injected corticosteroids are thought to occur in less than 0.5% of cases, which primarily include hemorrhage, atrophy, secondary infection, changes in pigment, hypersensitivity reactions, and panniculitis. The observed lipoatrophy typically begins 2 to 3 months after injection and can resolve spontaneously. Here the authors reported a case of acquired localized lipodystrophy, which results mostly in cosmetic concerns but has limited treatment options to offer patients. They described the

technique for intralesional saline injections to assist clinicians in use of this treatment. Success of this technique has been previously described, and their case report confirms this previous report but uses different time intervals between injections. Corticosteroids are commonly used intralesionally for hypertrophic scars, alopecia, and other skin conditions. Glucocorticoids suppress leukocytes from adhering to endothelial cells, which limits the ability of leukocytes to enter the nearby tissues and decreases inflammation. In addition, corticosteroids are potent vasoconstrictors, reducing both oxygen delivery to the wound and reepithelialization. Collagen synthesis is also slowed by the steroid's antimitotic effects. Decreasing inflammatory molecules with intralesional corticosteroid injections can improve scar pliability, shrink scar size, and reduce pain. Although steroids such as triamcinolone are efficacious in this scenario, side effects can include subcutaneous tissue atrophy, capillary dilation, and hypopigmentation. Many articles cite known side effects of the drug. However, it is difficult to find how many patients experience corticosteroid-induced lipoatrophy. One study found that lipoatrophy was preceded by an injection in 62% of patients. Histologically, it has been found that after corticosteroid injections, adipocytes decrease in size and number and are surrounded by hyaline. The fat cells were noted to resemble embryonic fat cells because of prominence of vessels, termed involutinal fat. Macrophages, some with yellow-gray and mucin-positive granules have been found in the area of interest as well. In some instances, macrophages were shown to engulf adipose tissue, thereby becoming lipophages. As the microscopic findings of the substance engulfed by macrophages disappeared, the lipoatrophy faded as well. Serial saline injections on a weekly basis are found to completely resolve the cosmetic effect of lipoatrophy within 4 to 8 weeks of the initial saline injection. In one case report, autologous fat injection was used to treat atrophy with results noted 6 months after treatment began. Intralesional poly-L-lactic acid acts to induce fibroblast and collagen formation, has been used for treatment of human immunodeficiency virus associated facial lipoatrophy, and was recently reported in a case of corticosteroid-induced lipoatrophy. Maximal improvement of the lipoatrophy was noted in 3 to 5 months. Their patient was followed over a 9-month period.

The alternative treatments mentioned above are expensive and inconvenient, potentially prohibiting patients from following through with experimental treatment. On the other hand, monthly intralesional bacteriostatic saline can be a convenient and affordable treatment for lipoatrophy attributed to intralesional or intra-articular steroids. Their patient had improvement in the appearance of her skin lesions while undergoing monthly injections and had no significant side effects. There may have been faster improvement if she had undergone weekly injections as described previously. However, further studies may help determine if a synergistic effect between time and saline injection is possible, further delineating the need for injections on a monthly versus weekly basis. It is hypothesized that injecting saline where steroid crystals lie would put them back into suspension, where the crystals could then be recognized as foreign bodies and naturally removed from the body. The pathogenesis of post-injection induced localised lipoatrophy remains unclear. Several reports identified the cluster of differentiation 68(+) macrophages in their patients' specimen and suggested that they played an important role in the development of the lesions. Iftikhar Ahmed postulated that macrophages may be activated through non-immunologic means and was a natural response of the body to eliminate those injected foreign materials. The post-injection localised lipoatrophy occurred in various medications and seemed to affect women predominantly. The exact causes for this gender difference remained speculative. Presumably, there are hormone-related differences in resistance of adipose tissue or it is a result from the heterogeneous receptor status of human adipose tissue. There is no specific treatment for corticosteroid injection induced localised involutinal lipoatrophy but the majority of the lesions resolve spontaneously within 1–2 years. Shumaker et al. performed localised intralesional normal saline infiltration in four patients with persistent cutaneous atrophy following the corticosteroid injection and gained satisfactory results after 5–8 weeks, respectively. Saline is a non-allergenic, inexpensive and readily available material and they suggested the saline was capable of re-suspension and redistribution of poorly soluble corticosteroid crystals [46,47,48].

**Cold Therapy:** Palmer et al assessed the clinical safety and effectiveness of focused cold therapy (FCT) for the reduction of hyperdynamic forehead wrinkles. Subjects treated for forehead wrinkles showed significant clinical improvement with high subject satisfaction and no serious adverse events. Focused cold therapy seems to be an effective, safe nontoxic alternative to popular wrinkle-reducing treatments. Second-degree nerve injury involving Wallerian degeneration of the axon occurs at temperatures of  $-20$  to  $-100$  °C. Treatment in this range results in a reversible degeneration of the axon and myelin sheath. However, the structural elements of the nerve bundle remain intact; therefore, the axon is able to regenerate along the previously established path to reinnervate the muscle at a rate of approximately 1 mm/d. Focused cold therapy (FCT) uses the well-established principles of cryotherapy to induce a second-degree nerve injury, resulting in reduced muscle activity. When applied to temporal nerve branches of the facial nerve, the result is temporary reduction in forehead animation and a corresponding reduction in hyperdynamic wrinkles. This study demonstrates that the application of low temperatures to the temporal branches of the facial nerve results in a temporary interruption of target muscle function and relaxation of hyperdynamic forehead wrinkles. Treatment with FCT resulted in an effective reduction in forehead wrinkles. Less dramatic results occurred for the treatment of glabella because of the FCT treating 1 (corrugator) of the 3 muscles (corrugator, depressor, and procerus) involved in glabellar furrowing. Most subjects (91%) appreciate continuing effectiveness at 1 month after treatment with the majority noting an improvement in the forehead wrinkle after the treatment. The duration of effect due to treatment with FCT is most comparable with that of neurotoxins. In comparison with the duration of effect, 16 to 32 units of botulinum toxin Type A for forehead wrinkles and 25 units of abobotulinum toxin A for glabellar wrinkles retained its effect in 40% of the subjects after 12 weeks, although another study showed that 40% of the subjects may retain effects to 180 days after the treatment. Given that the nerve regenerates at a rate of approximately 1 mm per day, future treatments will be placed at sites further from the innervation site (2–3 cm) to prolong the effect. Focused cold therapy results in an immediate effect, whereas in other met-

hods, particularly neurotoxins, the effect is delayed. An immediate effect can be in part due to the effects of a lidocaine block, however care was taken to inject lidocaine superficially to avoid any interactions with the nerve. The 7-day results for the horizontal forehead lines indicate that a small percentage of subject (6%) results did not carry over from their immediate experience. This percentage of subjects was larger for the glabellar region (21%), although this may be because of the superficial nerve branch innervating the corrugator muscle where the lidocaine was injected. The side effects reported were mild, transient, and consistent for a needle-based treatment, and the reporting rate of 10% for headaches is lower than 30% for injectable neurotoxins for the treatment of hyperdynamic wrinkles. Although the incidence of epidermal cold injury was somewhat high (22%), recent device improvements have shown promise for the reduction or elimination of this side effect. It is believed that hyperpigmentation and dimpling are secondary to epidermal cold injury development and will be reduced with device improvement. It is estimated that 25% of patients exploring treatments for hyperdynamic wrinkle reduction have reservations about toxins. The results demonstrate that FCT is a safe, effective minimally invasive nonsurgical treatment option for reducing hyperdynamic forehead lines. Focused cold therapy may appeal to patients who are averse to the use of toxins and fillers but remain interested in the reduction of forehead rhytides. This study demonstrates that the application of FCT to temporal branches of the facial nerve can induce a temporary nerve injury, leading to reduced muscle contraction and a corresponding reduction in hyperdynamic forehead wrinkles. Focused cold therapy could fill an, as of yet, unmet clinical need for an effective, safe, and toxin-free alternative for temporary dynamic wrinkle reduction [49].

**Fractionated cryotherapy:** Cryotherapy is a commonly performed procedure in dermatology outpatient departments for destruction of pathologic tissue. It is an easy-to-perform, inexpensive, and sutureless technique and carries a minimal risk of infection. However, the procedure is associated with many complications and sequelae such as blistering, ulceration, necrosis, and permanent or longstanding pigmentary alterations. This limits its use on cosmetically sensitive sites

and for indications like facial rejuvenation, particularly in people with pigmented skin. Fractionated cryotherapy can reduce the complication rates and expand its indications in rejuvenation and aesthetics. For this, thin plywood or transparent plastic plates (poor conductors of heat) have been taken and created multiple uniform holes using a drill machine. The size and distance between holes can be customized depending on the site and indication for which fractionated cryosurgery is planned. Closely placed larger holes are suited for indications for more aggressive cryotherapy such as thick keloids on the chest and shoulders. Templates with closely placed smaller holes and sparsely placed smaller holes with alternate rows are suited for less aggressive cryotherapy on cosmetically sensitive sites such as post herpes zoster hypertrophic scars on the face. Sparsely placed smaller holes are well-suited for resurfacing, like cold slush peels and rejuvenation. The plate was firmly placed on the area of skin to be treated and liquid nitrogen was sprayed by the spiral or paint brush method over the entire plate. The duration of freezing is generally longer than that for conventional continuous freezing. Two to three 30-40 second freeze-thaw cycles (after repositioning of the template) may be used for thick nonfacial keloids, and one or two 15-20 second freeze-thaw cycles may be used for facial scars. This leads to fractionated freezing and a rapid thawing of the frozen tissue resulting from the dispersion of thermal energy from intermittent areas of unfrozen tissue. After treatment, improvement might be seen without pigmentary changes. The procedure is much less painful as compared with conventional uniform freezing. Using this technique multiple times can be safely done in 1 session, and the procedure can be repeated at frequent intervals. For curved surfaces, mouldable plastic material can be used. Transparent plastic templates allow better visualization of the area to be treated under the template. Fractionating has the potential to expand the indications for cryotherapy in aesthetics and rejuvenation [50].

**Safety and Efficacy of Imiquimod 3.75% Cream When Used After Cryotherapy in the Treatment of Hypertrophic Actinic Keratose:** Cryotherapy plus imiquimod 3.75% cream resulted in a statistically significant improvement in the reduction of hypertrophic

actinic keratoses (HAKs) than cryotherapy alone at 14 weeks. In this study, the authors show a benefit of using imiquimod 3.75% immediately after cryotherapy for the treatment of HAKs. For patients with HAKs, combination treatment of cryotherapy plus imiquimod is superior to cryotherapy alone in reducing lesion count [51].

**Intralesional cryosurgery for Keloids:** In 1993, Weshahy described his new technique for applying cryosurgery in depth, i.e., intralesional cryosurgery (ILC), by using Weshahy's cryoneedles in order to achieve a higher degree of effectiveness and avoid many of the disadvantages of the conventional surface techniques. Some trials have been published using the ILC for treatment of keloids and hypertrophic scars. Cryosurgery has been successfully used to treat keloids and hypertrophic scars. Better results may be explained by the more time we gave until the ice cylinder formed extended 2 mm outside the clinical borders of the lesions, and by the deep insertion of cryoneedles at or immediately under the base of the lesions, targeting the blood supply of the lesion, others might do the procedure more superficially. The therapeutic effects of cryosurgery depend on direct cell damage and changes in the microcirculation provoked by freezing that cause vascular damage and blood stasis within the keloid tissue leading to cell anoxia, the keloid is composed mainly of fibrous tissue that resists the freezing process. The contact and spray techniques are the two mostly practiced methods for cryosurgery. However, the depth of freezing attained by these two techniques is not enough to complete the operation in one or two sessions, and can't reach the base of the lesion effectively leading to high rates of recurrence. Surface cryotherapy also produces an open, oozing wound which is considerably larger than the size of the lesion due to the lateral extension of cryodestruction that usually takes several weeks to heal. In addition, a certain degree of skin atrophy and longer hypopigmentation is also inevitable with this approach because of melanocyte sensitivity to low temperatures. Therefore, this characteristic probably renders surface cryotherapy in dark-skinned patients less than optimal. It destroys the core of the keloid immediately due to destruction of the cellular element and blood vessels at the base which are more sensitive to the

cryoprocess than the fibrous core causing its necrosis, with a minimal limited damage to the superficial tissue and melanocytes. In contrast, the lethal zone, which is created by the contact probe, includes the epidermis, melanocytes, upper dermis, and to a lesser extent, the deeper dermis due to the counteracting heating effect produced by the blood vessels so the efficacy is minimal and the rate of recurrence is high. This technique can transfer the maximum intensity of cold directly to the base avoiding that counteracting heating effect of the blood vessels [52].

**Successful treatment of cutaneous squamous cell carcinoma and basal cell carcinoma with intralesional cryosurgery:** Wide excision or Mohs surgery is the standard treatment of skin squamous cell carcinoma (SCC). Superficial SCC or tumor smaller than 1 cm has been treated successfully with open spray cryosurgery. Larger tumor may not be as effective because tissue destruction is usually superficial. Intralesional cryosurgery (IC) may provide a deeper and better cell killing effect in larger tumors. Lee et al investigated the safety and efficacy of treating nodular SCC in 4 patients with IC. Complete remission was noted in all tumors (100%) in 2 months. No recurrence was noted during follow-up. All patients were satisfied with the results. This observation suggests that IC could be simple and effective alternative treatment for SCC patients whose condition is not suitable for or who refused operation [53]. A single intralesional cryosurgery session can also completely eradicate BCC on the lower extremities in elderly patients. This technique is associated with relatively minor complications, is well tolerated, and represents a safe and effective therapeutic modality for BCC of the lower limbs [54].

**Cryoanalgesia for post-herpetic neuralgia:** The existent therapeutic options for post-herpetic neuralgia (PHN) are varied, albeit not sufficiently effective. The aim of this study was to try a new treatment modality for PHN. A spray of liquid nitrogen (LN) was used in 47 patients suffering from PHN as a stimulator of a mechanism not yet completely understood. The LN spray was carefully applied (so as not to freeze the skin surface) along the diseased sensory nerve dermatome, at weekly sessions lasting for 30 seconds each, with a mean of three applications per patient. The area corresponding to the dermatomes affected

by the herpes zoster satisfactorily attenuated the herpetic neuralgia in all patients. Before the sixth treatment session, good or excellent improvement was obtained in 94% of the study patients. Pain was eliminated with one session in nine patients (19%), and with two sessions in eight patients (17%). They concluded that this non-freezing technique is absolutely safe and injury-free, and is very efficient in calming PHN [55].

**Is topical nitric oxide and cryotherapy more effective than cryotherapy in the treatment of oldworld cutaneous leishmaniasis?**

Current systemic treatments for cutaneous leishmaniasis (CL) are limited by their toxicity, high cost, side effects and the emergence of drug resistance. New approaches, including topical therapies, are urgently needed. Nitric oxide (NO) produced by human and canine macrophages has long been demonstrated to be involved in the intracellular killing of *Leishmania*. There is evidence from several experiments that NO is involved in the microbicidal activity of macrophages against a number of intracellular pathogens including *Leishmania major*, *Trypanosoma cruzi* and *Toxoplasma gondii*. However, the cellular and molecular mechanisms whereby NO exerts its cytotoxic activity are not yet well described. Recent studies found that apoptotic processes and several targets in organisms may be affected by NO. The leishmanicidal effect of NO seemed to be the consequence of induction of a programmed cell death-like process. However, both in vitro and in vivo immunological studies indicate that NO radicals within *Leishmania* lesions could reduce the parasite number. Application of NO donors/inducers could mediate the leishmanicidal activity of macrophages and may prevent progression of infectious diseases. Delivery of supplementary NO to target areas where the protective effects of endogenous NO have been lost is an attractive therapeutic option. Topical treatment for CL, in which the parasites are found in the dermis up to a depth of 5 mm or more, is problematic because of the very limited penetration of drugs through the skin. Because NO is so freely diffusible, we reasoned that it may be possible to apply an acidified nitrite cream over the lesions of CL and thereby generate enough NO exogenously to kill *Leishmania* without causing damage to host tissue. In one study, 16 Ecuadorean patients were treated with a SNAP (NO-donor, S-nitroso-N-acetylpenicillamine) cream administered on

lesions for 10 days. All lesions were parasitologically cured and clinically healed by day 30. In another study, a different NO-producing cream was employed to treat 40 Syrian patients. Only 11 (28%) of 40 patients showed improvement and only five (12%) of 40 were cured at 2 months. This study was designed to determine the clinical responses and effectiveness of NO plus cryotherapy for the treatment of old world CL. A double-blind, randomized, placebocontrolled clinical trial was performed for the evaluation of therapy with topical nitric oxide 3% and cryotherapy in 63 Iranian patients with CL in the south of Iran. Thirty of 36 participants (83.3%) had complete improvement in the treatment group as did 20 of 27 (74.1%) from the control group ( $p = 0.627$ ). This study could not show any more effectiveness from combining a 12-week course of treatment with 3% nitric oxide cream and a once-weekly treatment with cryotherapy in comparison with cryotherapy and placebo in patients with CL [56].

**Local anesthesia injection technique for aesthetic removal of dermal nevi:** Dermatologists should be aware of the surgical techniques that reduce the level of skin distortion following biopsy procedures. (1) a dilution of lidocaine with bacteriostatic 0.9% sodium chloride and (2) injection of the solution directly into the nevus. The nevus balloons in size and shape and becomes tenses resulting in a change in the skin level permitting for easy shave. Good injection technique of anesthesia may represent a simple, but important means to improve postoperative cosmetic outcomes. Zaiac et al found good cosmetic result with (1) a dilution of lidocaine with bacteriostatic 0.9% sodium chloride and (2) subcutaneous injection of the solution directly into the nevus. Our solution consists of 3 mL of 1% lidocaine in 30 mL of bacteriostatic 0.9% sodium chloride in a 1:10 ratio, in which each mL contained 9 mg of sodium chloride and 9 mg of benzyl alcohol. Using a 30-gauge needle, this solution is directly injected into the nevus. The nevus balloons in size and shape and becomes tenses resulting in a change in the skin level permitting for easy shave. This technique results in a smooth-surfaced area devoid of stitches that heals in an aesthetically pleasing manner [57].

**A Simple Elastomer-Pad Vibratory Damper to Maximize Pain Control of Injections in Patients' Undergoing Dermatological Surgery:** For many dermatology patients,

pain associated with procedures is a frequent complaint and may be a reason that they avoid the treatment for both medical and cosmetic dermatology issues. According to information cited by these authors, almost 3 quarters of surgery patients have inadequate pain control. Although the advent of safe and effective local anesthetics made much of dermatologic surgery more comfortable, the injection of these anesthetics is a source of discomfort. Clearly, there is ample room for improvement, and this article suggests a modality that seems to be simple and effective. Using the gate theory of pain control, these authors have proposed an "anodyne" device made from a few cotton balls, a disposable glove, and a vibrating massager. Placed on the site before injection, it inhibits transmission of pain in a manner that minimizes discomfort. The authors further postulate that this type of vibratory stimulus can be comforting to patients. It is always important for physicians to try to improve the experiences of the patients. This modification of readily available, inexpensive products is 1 potential means of doing so. Given its simplicity and minimal risk, it is likely that it will be tried by many of our colleagues [58].

**A simple and effective treatment for nasal telangiectasia; Needle-assisted electrocoagulation:** Nasal telangiectasia is a common phenomenon and can cause significant cosmetic and psychological problems. Although there exist various lasers and chemical treatments for nasal telangiectasia, insufficient effect and side effects such as purpura and postinflammatory hyperpigmentation are common. They used needle-assisted electrocoagulation as treatment for nasal telangiectasia with success. Electrocoagulation has been reported to be safe and effective in hereditary hemorrhagic telangiectasia, especially with epistaxis. The authors used Surgitron® for needle-assisted electrocoagulation. After 30 minutes of local anesthesia with lidocaine/prilocaine cream and applying grounding plate underneath the patient, a 30G needle tip was placed in the telangiectatic vessel lumen through the skin overlying the vessel. Then an electric current with a power intensity of 30 W was delivered through it for 1 second. With an electric current, the blood vessel disappeared, instantly. The same procedure was repeated along the vessel at about 1 to 2 mm distance between needle punctures. The total procedure time was approxima-

tely 10 minutes. There may be a slight stinging sensation during the procedure, made tolerable with just the EMLA cream. Conventional electrosurgery tips, even the finest one, cannot easily puncture skin by itself. Using a needle tip enabled us to puncture skin and vessel without an electric current. Then an electric current was delivered directly into the vessel lumen. Because the electrical resistance of blood is much lower than that of epidermis or surrounding dermis, selective coagulation of the vessel walls with minimal epidermal and surrounding dermal tissue damage can be achieved. Immediately after the procedure, only needle marks exist, which heal well without dressing. Patients can see the improvement of telangiectasis immediately after the procedure. There was no purpura with a minimal risk for postinflammatory hyperpigmentation. They used Surgitron®, but they think this method may be applicable with other bipolar devices. A patient with nasal telangiectasia showed dramatic improvement after 1 session. After 4 sessions, almost complete clearance was obtained and there was no recurrence during the 2 years after last treatment [59].

**Presuturing: A simple technique for excision of large skin lesions:** Excisions of large skin lesions, for example, congenital melanocytic nevi, often require staged excisions or more sophisticated reconstructive procedures. A simple and reliable way to reduce the number of staged excisions and risk of wound dehiscence is the so-called presuturing technique. Under local anesthesia, multiple non-resorbable sutures are placed across the lesion, pulling the edges and folding the adjacent skin over the area that is to be excised. The sutures should be placed at least 24 hours up to 5 days before excision. The principle behind this technique is the stretching of adjacent skin beyond its inherent extensibility to reach sufficient skin laxity. Thus, reduction of the number of staged excisions or a complete 1-stage excision of the lesion with a standard primary closure technique can be achieved. The amount of undermining can be reduced or even eliminated, maintaining a better vascularity. For the subsequent primary closure, we suggest the use of pulley stitches and butterfly sutures with a slowly absorbable material. Although tissue expanders are also an long-proven alternative for skin expansion, the described presuturing

technique has several advantages. The technique is simpler and faster with less morbidity and an improved cost-benefit ratio compared with tissue expanders, which requires the insertion of a prosthesis. Although for defects localized on the forehead or temple, presuturing can be considered, it should be noted that in localizations with less skin laxity, for example, lesions on the scalp, the presuturing technique is not suitable. In these cases, tissue expanders are a good choice for skin expansion. If appropriate regarding defect size and localization, the presuturing technique can be used before excision of congenital nevi and benign lesions and correction of scar tissue. Presuturing enables primary wound closure for defects that would normally necessitate staged excisions or reconstruction with a more sophisticated technique, such as local flaps or skin grafts. It is a reliable, inexpensive technique with a low complication rate that provides an excellent cosmetic outcome and is especially suitable in an outpatient setting [60].

**Ligation of the base of pyogenic granuloma—An atraumatic, simple, and cost-effective procedure:** Pyogenic granuloma (PG) is a common, benign, acquired vascular tumor mostly presenting as a rapidly growing red and sometimes pedunculated papule. Commonly described treatment options are complete surgical excision, shave excision, or curettage followed by electrodesiccation, various forms of laser operation, cryotherapy, or injection of sclerosing agents. The authors described an atraumatic, simple, fast, and cost-effective alternative treatment option. The PG is ligated as closely as possible to its base using soft surgical suture material. This maneuver can be facilitated by lifting the PG with forceps. The tumor is then ligated with knots that are as tight as possible and the suture material is snipped so short that it will not irritate the surrounding skin. The ligated tumor can be covered by a wound dressing. The tumor will become necrotic and fall off in several days. Patients, parents, or both need to be advised that bleeding could occur from the nurturing blood vessel. This unusual event can be controlled by self-applied simple compression of the lesion for several minutes. Only clinically obvious cases of PG should be treated by this technique because no histologic examination will be available. This procedure is very simple, fast, and can be

performed even in small children. No anesthesia is required because it is atraumatic. This smaller lesion can be easily treated, eg, by laser operation or light electrodesiccation. A persisting vessel can also cause recurrences as described after shave excision or curettage followed by electrodesiccation. It is so simple and fast that it can be performed in any dermatologist's office, and it is less expensive than most alternatives. In case of persistence or recurrence of the PG, complete excision can still be performed [61].

**A Simple Technique for Treatment of Nasal Telangiectasia Using Trichloroacetic Acid and CO2 Laser:** Nasal telangiectasia is a common disfiguring condition and may cause significant psychological distress. Although lasers are effective in treating such lesions, there are many disadvantages, such as purpura, scarring, and cost. objective. Twenty patients with nasal telangiectasia were treated with CO2 laser 2 weeks after modified sclerotherapy using 80% TCA. After one treatment session, all patients had excellent results with more than 75% vessel clearance. There were mild side effects, such as transient erythema and fine frosting. After follow-up of 1 year, there were no relapses. They concluded that CO2 laser after modified sclerotherapy using 80% TCA appears to be a simple, effective, and inexpensive method for the treatment of nasal telangiectasia [62].

**Intralesional drainage injection of triamcinolone acetonide for epidermal cyst:** Inflamed but noninfectious epidermal inclusion cysts are often injected with intralesional triamcinolone acetonide before surgical excision. This method helps reduce inflammation. However, giving an excessive amount of fluid during the injection has the potential to rupture the cyst, further aggravating the inflammation and potentially causing a secondary infection. Hence, it is of utmost importance that an optimum amount of steroid is injected into the cyst cavity. Two needles can be inserted into the cavity of the cyst. Sudden loss of resistance while inserting the needle indicates that the needle is in the cavity. One needle is attached to a syringe and used for injecting the steroid and the other needle is not attached to a syringe and preferably positioned in the punctum, if present. As the steroid fills up the entire cyst cavity, the excess steroid overflows into the other needle. This indicates the cavity is full. Both needles may be pulled out,

and the breaks in the skin can be secured with gauze. This ensures an adequate delivery of drug, preventing the rupture of the cyst [63].

**Medical Student Preference for Simulation Models:** The pig foot model is preferred for teaching dermatologic surgical skills. These results re-affirm that the pig foot model is an effective, low-cost solution for training. The Il Duomo Basic – With Tumor is the first apparatus on the market designed for dermatologic surgery with respect to tissue planes (epidermis, dermis, and fat), underlying anatomy, and simulated tumors with margin indicators. This mannequin is anatomically sophisticated and provides a more-robust training experience for dermatology residents than others on the market, but it is expensive. With it, trainees can perform local anesthetic administration, nerve blocks, suturing techniques, punch biopsy, elliptical closure, random axial and interpolation flaps, skin grafts, botulinum toxin injections, tumor excision with realistic margins, and scar revision. The layers simulated are skin, subcutaneous fat, facial muscles and nerves, blood vessels, parotid glands and ducts, superficial muscular aponeurotic system, nasal cartilage, skull, and auricular cartilage. The cost is more than \$1,500 per mannequin. Despite its sophistication, the medical students in the surgical skills laboratory least preferred the Il Duomo mannequin. It scored poorly in epidermal and dermal quality because they felt that it did not resemble the feel of human skin. Its highest average scores came in the underlying anatomy and reusability sections. One disadvantage of the Il Duomo simulator for medical students is that the platform is designed to teach moresophisticated skills such as large lesion excision rather than simple surgical skills such as a punch biopsy and suturing. In contrast, a recent study by Nicholas and colleagues using the Il Duomo mannequin found that dermatology residents rated the Il Duomo platform for initial training of advanced procedures in dermatologic surgery as very beneficial. The SynDaver Basic Surgical Pad was chosen to represent the nonfoam skin simulator group because its tissue planes, moisture content, and feel are similar to those of human skin. Uses for this platform include subcuticular and subcutaneous suturing, subcutaneous injections, fine dissection, and surgical stap-

les and adhesives. Layers simulated are epidermis, dermis, hypodermis, subcutaneous fascia, and fat. Unique features of this model are realistic puncture resistance and compatibility with electrocautery, laser scalpel, radio frequency ablation devices, harmonic blades, monopolar and bipolar devices, gamma knives, ultrasound equipment, computed tomography, and magnetic resonance imaging. This product represents the two classes of more-typical "bench model" simulators in the student skills laboratory. It is more limited than the Il Duomo mannequin but represents a class of models within reach of many programs' budgets. Anastakis and colleagues, in a study comparing efficacy of different simulators, found that bench models have training capabilities equivalent to that of cadavers and emphasized that underlying anatomy is not essential for learning some procedural skills. Data from the student surveys reveal that the skin pad was the second most preferred of the three groups. It scored poorly in underlying anatomy, because this product group does not recreate underlying anatomy beneath the subcutaneous fat. This model's highest scores were in movement, pliability, and reusability. Students felt that this model moved and felt like human skin and survey results demonstrate that this model is a viable option for basic dermatologic surgical skills laboratories. Olson and colleagues recently published their experience with the use of hydrophilic foam pads as a suturing model. This inexpensive simulation platform suffers from the limitation that it does not reproduce underlying anatomy, although it provides an excellent model to practice wound eversion, demonstrating "step off" deformities created by uneven height of everting dermal sutures, and running subcuticular closure. Medical student preference data from this study demonstrate that the pig foot model is an effective, low-cost solution for teaching basic dermatologic surgery skills. The major limitations of the pig foot model is that it is best for teaching basic procedural skills and is potentially less useful for training of more-sophisticated dermatologic techniques such as flaps, grafts, and curettage. Preference data should continue to be collected to fully assess the Il Duomo mannequin and other more-complex synthetic lesion simulator platforms, although we found that the tried-and-true pig foot platform is still a preferred platform for

teaching basic dermatology surgical skills to medical students [64].

### **Banana: A New Simulation Model to Teach Surgical Techniques for Treating Ingrown Toenails:**

**Toenails:** Ingrown toenails, when recurrent and painful, are often treated surgically. Surgical treatment has traditionally been performed as matricectomy involving sharp excision of the matrix; another option is chemical eradication of the matrix with phenol, which has become more popular and is more effective at preventing symptomatic recurrence. There are no animal models on which to teach and practice these techniques. Surgical models can be used to improve depth perception and surgical skills. The authors sought to develop an economical simulation model to teach the different phases and surgical techniques used to treat ingrown toenails to dermatology residents. The authors selected large, ripe bananas without imperfections on the peel to simulate toes. The banana peel was incised to create a nail bed. They used flexible acetate plates to create the nail plate and matrix. The plates were fixed into the banana's core, slightly oblique to the peel, and were adequate for delicate manipulation. The plate must be cut larger than the nail bed so that it is inserted and fixed. No glue or external fixation was used. The acetate plate remains fixed during the peel incision, but because there are no ligaments created with the bed, it is necessary to hold this plate using the contralateral hand. They used conventional surgical materials to demonstrate and practice the techniques. Acetate plates are commonly used as document covers. The banana and acetate plate were adequate to create a model for the composition of the nail unit. This model allows good representation of the proportions and anatomic structures involved in surgery for ingrown toenails. Each banana model was used only once for each technique. They demonstrated to undergraduate students and residents the main techniques for surgical treatment of ingrown toenails, such as digital block anesthesia, tourniquet or rubber band around the toe, classic matricectomy, avulsion of the nail plate. Afterward, the residents may practice these procedures. No major difficulties were faced in the process of teaching these techniques for surgical treatment of ingrown toenails using this model. Simulation is increasingly recognized as an effective means of team training, the acquisi-

tion and maintenance of technical and professional skills, and reliable performance assessment. In addition, a simulated surgical model encourages active participation and can enhance the retention and transfer of learning. Surgical models using fruit have been previously reported: tomatoes for shave biopsies, burned oranges for necrotic ulcer debridement, cantaloupes for sigmoidoscopy techniques, and bananas as a training model to refine blade control for Mohs layer removal and skin incisions. In the case of partial avulsion of the nail plate with chemical matrixectomy, it is possible to discuss the different protocols. There are protocols using 80% to 88% phenol applied directly to the nail matrix, including two cycles of 1 minute and three cycles of 1 minute, as well as protocols using 10% sodium hydroxide for 1 minute and 100% trichloroacetic acid. The pros and cons of each protocol can also be discussed. This simulation model for teaching techniques to treat ingrown toenails is easy to use and allows performance and visualization of all surgical phases. This model also allows development of new surgical techniques for treating nail problems [65].

**Pillowcase Baby: A Laser Teaching Tool for Dermatology Residents:** Pigs' feet are widely used as a teaching tool for suturing and biopsying and have served as a traditional method to help dermatology residents become acquainted with these procedures before performing them on live patients, but there has not been an equivalently effective teaching modality for lasers. Because dermatologists perform more laser procedures than any other specialists, it is important that dermatology residents receive proper training in laser surgery during their residency, for patient safety and for upholding high standards of care as experts of procedural dermatology. It has been reported that the resident role in laser procedures varies greatly, raising concerns about adequate training during residency. Practicing the proper use of a laser device before performing the procedure on a patient is especially important in pediatric dermatology, where patients may be less cooperative than their adult counterparts, adding to the technical complexity of the procedure. To introduce dermatology residents to lasers, the authors used a pillowcase on which a drawing of a target is made using a red permanent marker. The drawing serves as an

imaginary patient with a red vascular lesion on which residents can learn firsthand how to properly hold the laser, activate appropriate buttons, and aim at the target. With this technique, residents are also readily able to see the effect of the pulsed dye laser (PDL) on the target. The drawn and colored in target serves well as an imaginary vascular target that allows learners to immediately visualize the outcome of their PDL treatment. PDL, in particular, is an ideal device for application of this teaching tool since it is the laser that dermatology residents use most frequently. Pillowcase Baby can be adapted in various ways to practice the use of other lasers on different types of targets. For example, we drew and colored in a black circular target that could be used as a model for a nevus of Ota, tattoo, or other pigmented lesion for practicing quality-switched alexandrite (and other Q-switched) lasers. Again, the marker target allows for good visualization of the target, guide light, and treatment effect. It is important to note that this teaching technique is safe and clean. To minimize the risk of fire or injury to the underlying pillow or examining table, the pillowcase was placed on a folded sheet moistened with saline before starting the training session. The marker pigments do not penetrate through the pillowcase even after numerous passes of the different lasers that residents practice with. As with actual laser treatment sessions, residents should be instructed to check their surroundings and ensure that there is nothing flammable around before treating their Pillowcase Babies. Other variables that increase the risk of fire include an oxygen-rich environment, which is especially relevant in real-life cases in which inhalation anesthesia is used or when the laser procedure is performed in the oxygen-enriched atmosphere of the operating room. Certain types of lasers such as carbon dioxide laser and certain types of materials such as polyester also increase the risk of fire, and care must be taken to minimize the risk of fire in accordance with the safety protocol of the individual institution. In summary, Pillowcase Baby can serve as an effective teaching tool for dermatology residents during laser procedure training. The teaching session also incorporates other aspects of laser surgery, such as wearing proper protective goggles and setting laser parameters, which further helps learners become familiar with the overall process of laser treatments. Performing laser the-

rapy on a Pillowcase Baby as their first laser case is not only safe, but it is also a fun method for introducing dermatology residents to the exciting field of cutaneous laser surgery [66].

**Short-contact topical tretinoin therapy to stimulate granulation tissue in chronic wounds:**

The use of retinoids in wound healing is increasing. It has been shown that retinoic acid reverses the inhibitory effects of glucocorticoids on wound healing and accelerates the formation of healthy granulation tissue. Pretreatment with tretinoin before epidermal injury such as chemical peeling and dermabrasion has shown accelerated wound healing. Enhanced healing of full-thickness skin wounds has also been demonstrated in early wound healing studies. However, tretinoin therapy can be quite irritating. The authors observed the clinical and histologic effects of topical tretinoin solution 0.05% applied directly to the wound beds of chronic leg ulcerations. All were treated with topical tretinoin solution 0.05% applied directly to the wound bed. The tretinoin solution was left in contact with the ulcer bed for a maximum of 10 minutes daily and then rinsed with normal saline. Punch biopsy specimens were obtained from the wound beds at baseline and mid therapy. Standard wound care was continued throughout the study. They founded that as early as 1 week after treatment with topical tretinoin solution 0.05%, there was increased granulation tissue first noted at the wound's edge. After 4 weeks of therapy with tretinoin, there was further stimulation of granulation tissue, new vascular tissue, and new collagen formation. Short-contact tretinoin therapy can be a novel modality in which to treat chronic ulcers and stimulate the formation of granulation tissue [67].

**A simple means of disarming the "locked and loaded" needle:**

Surgery, in any setting, has several inherent risks not only to the patient, but the physician and his assistants as well. Safe handling and management of the sharps to prevent inoculation injuries is one of these risks, in particular: 1) instrument hand-off of the needle and needle driver between the physician and his assistants; 2) retrieval of instruments from the surgical tray. The authors' review a simple means of disarming the needle loaded in the needle driver to reduce sharps injury. Before the needle and needle driver are either handed off to the as-

sistant or returned to the surgical tray, pivot the needle 90 degrees toward the instrument joint. The needle's point should be directed toward and touching the needle driver, and thereby, disarming the needle. To avoid dulling the needle, the point should not be grasped by the needle driver. Disarming the loaded needle may reduce the chance of sharps injury during instrument hand off and retrieving instruments from the surgical tray. Ninety-nine percent of surgical residents incur at least one needlestick injury during their training. The Center for Disease Control and Prevention estimates that there are over 1000 needlestick injuries per day. Percutaneous injuries represent both an infection and contamination risk, as well as a major cost: follow-up after a single needlestick injury can cost up to \$3000 even when no infection occurs. Needlestick injuries can occur many times during surgery. The following method addresses sharps exposure during instrument hand-off between the physician and assistant, and during the retrieval of from the surgical tray [68].

**Simple method for controlling surgical sharps:**

During surgical procedures, control of sharps is important for both infection control and for minimizing contamination. In fact, there has recently been a push to increase the awareness of the risks of sharp injuries and development of new devices to minimize said risks. In dermatologic surgery, the main culprits for sharp injuries are scalpels, hooks, and needles. Attempts to minimize sharps injuries include the use of "neutral zones" for hands-free transfer of sharps, and placement of potentially injurious devices under drapes and into dental rolls. Although the number of sharp injuries among health care workers has declined, the number is still not zero. As a result, any device or technique that can help to decrease this hazard to health care workers is invaluable. As curved needle injury is the most common type of sharp injury, and the most commonly used needle in dermatologic surgery, our focus is on decreasing the risk of injury from this type of instrument. The authors described a simple device for eliminating the risk of suture needle injury. During packing of our surgical trays, they include a thin small section of a refrigerator magnet, similar to those found on, for instance, many notepads and advertisements for pharmaceuticals. The

magnet is sterilized along with the entire surgical pack before the first use. During the surgical procedure, the needle can be placed on the magnet, which is kept in a corner of the surgical tray. During placement of the needle, the magnet will attract the needle to it, further aiding in placement in the desired location. Furthermore, the magnet will serve to hold the needle in place, and allows for easy retrieval with the needle driver when suturing is initiated. During breaks in suturing, the needle is simply replaced onto the magnet, thus, safely isolating it from the rest of the tray and, thereby, minimizing the risk for accidental injury. Although this technique does not prevent injury during suturing, it is a simple and novel approach to minimizing the risk in the surgical tray area. It also serves to declutter the surgical tray when multiple needles are used. This is done without the potentially dangerous method of placing the needle into a dental roll, which on occasion can lead to needle-stick injury. These magnets are generally easy to find at little to no cost. At the end of the procedure, these magnets can be sterilized along with the other surgical instruments in the tray. As a result of this simple device, needle-stick injuries can be reduced with no cost to provider and patient [69].

**Rapid treatment of subungual onychomycosis using controlled micro nail penetration and terbinafine solution:** Onychomycosis continues to be a common and intractable problem in adults, often responding poorly to drug treatment. Toenails are most frequently affected by the infection, particularly the hallux.<sup>1</sup> Studies suggest its prevalence to be around 29% across Europe, showing an increase in prevalence with age and in countries with longer winters. The causative agents are typically the dermatophyte species of fungi which spread from plantar skin over many months to invade the nails through a distal and lateral subungual route producing the characteristic discolouration of the nail plate.<sup>4</sup> Over many months, complete invasion of the nail may lead to total dystrophy. Onychomycosis is often trivialised as a cosmetic condition but studies have confirmed its effect on the patient's wellbeing and quality of life. Moreover, the presence of fungus on the foot is a risk factor for the development of lower limb cellulitis – a particular risk for patients with peripheral vascular disease and diabetes who

have an increased propensity for the disease. Management of the condition to date has proved challenging. Oral systemic agents such as terbinafine and itraconazole have shown good mycological cure rates when taken over a number of months. However, potential side effects, drug interactions and reluctance from some patients to oral medications remains a limitation. Exploring new techniques, the use of lasers has been suggested and reported as a less invasive and safer technology to destroy the subungual infection by rapid heating of the infected area. However, results have suggested that it has little evidence to date to support their widespread use in onychomycosis. Topical treatments, applied directly to the nail plate, have also been used widely but consistently have been shown to be less effective than the systemic drug regimes. The nail plate is naturally a barrier to drug penetration, effectively shielding the subungual area so the underlying infection remains protected. In addition, patients are expected to apply the medicament to the nail for many months. Studies of topical medicament usage have shown that compliance decreases the longer the treatment continues, which may result in a treatment failure. Measures designed to enhance topical drug delivery have been trialled with some success. Chemical penetration enhancers have been developed and incorporated into many topical drugs to boost delivery of the active ingredient through the nail. Combination therapy has also been shown to improve overall cure rates. Topically, nail reduction by mechanical thinning of the nail has shown to modestly improve the clinical response to antifungal agents. Recently, researchers have employed the use of fractional lasers to penetrate the full thickness of nail plate to create a porous structure, thus allowing the easier passage of any applied antifungal. Fractional lasers concentrate power to a very small area, thus reducing the risks of thermal damage to peripheral tissue. This work is ongoing, with potential promise, but the expense of such systems is still prohibitive for general podiatric use. In addition, as with most “hot” lasers, pain appears to be a commonly reported side effect of the treatment with a risk of damage to the delicate subungual tissues. For the last few years there have been few significant advances in the ongoing struggle to treat onychomycosis more quickly and effectively. As reported by Podi-

Today in November of 2007, the novel idea of drug delivery to the nail using trephination or “mesosclissioning” was first introduced using Pathformer, a handheld device, that uses a microscopic cutter to penetrate the nail plate but not the nail bed. The principal of this device is based on electrical impedance, effectively decreasing the inherent electrical potential of the epidermis, a known insulator. This idea allows drugs to enter the “stratum corneum-free” nailbed painlessly. A Phase 1 study conducted at Brigham and Women’s Hospital found the procedure to be painless, offering both depth control and a mycological cure in a diverse patient population. Of interest, a terbinafine 1% cream was applied to the nails, in direct contrast to today’s standard of care with low molecular weight, hydrophilic solutions widely preferred. A recent study from Shemer and Gupta AK, in Israel presents a noteworthy exception. The work reveals an open comparative study of nail drilling by trephine, as an adjunctive treatment for toenail onychomycosis. Presented as a parallel three-arm trial the study investigates the effects, outcome and safety of treatment using trephine technology. The study concludes that both groups managed concurrently with trephined holes in the nails had a significantly higher percentage of clear nail compared with topical terbinafine alone. Interestingly, the addition of oral terbinafine provided no significant advantage with comparable outcomes. Treatment of fungal nails with holes plus topical terbinafine produces greater improvement in the appearance of the toenail and a higher, and significantly earlier, mycological cure rate. For nail trephination, the Israeli study used an ingenious apparatus, an automatic device manufactured by Ex-It Medical Devices Ltd. This is used to drill two horizontal lines of holes just proximal to the border between the diseased and healthy segment of the nail. Holes are of a 1.8 mm diameter, spaced 2mm apart. Grossly, the nail plate consists of a superficially dry compartment and a deeper humid department. This trephine technology is designed to detect when the drill has reached the more humid department. When a pre-defined humid level is reached the drill aborts, to protect against pain and nail bed injury. Nail trephination is required one time only. After this work, data analysis confirms that no case of bleeding or pain was reported. It was also reported further treatment success in 3 case

studies of onychomycosis, using controlled micro-nail penetration delivered by a U.K. device known as Clearanail. The authors further hypothesize that a “subungual mass of dermatophyte hyphae which are not attached to the nail bed or nail plate remain shielded by the overlying nail plate.” This presence of a dermatophytoma slows the passage of low-tension anti-fungal solution without the adjunct of micro-drilling. It is a safe and painless, turbo-charged drug-delivery system to the affected nail and nail bed, via ‘micropores’. Trephination as a concept, it seems, would certainly provide a podiatrist with a very useful and welcome addition to the toolbox [70].

**Knot Technique: A New Treatment of Ingrown Nails:** Ingrown nails are a painful problem that affects all ages, particularly the young, and it may become chronic if not treated. A new technique was used to treat patients with Stages 2 and 3 ingrown nails in whom conservative and surgical methods were attempted. A total of 30 patients presenting with Stages 2 and 3 ingrown nails to the clinic between 2010 and 2012 were included. A wedge excision of the upper and lower soft tissues of the nail was performed. The wound margins were simply sutured with 2/0 polypropylene. Approximately 8 to 10 knots were tied without cutting the stitches under the nail. These knots were used to push the soft tissue down and to raise the nail. This was achieved by placing a knot under the nail after the needle had been passed inside the nail, without cutting the suture before another knot was tied above the nail. Therefore, the ingrown part of the nail was raised. Patients were followed up for 20 months (range, 10–24 months). Relapse was observed in only 1 patient. No infection was observed, and none of the patients required additional surgery. Stages 2 and 3 ingrown nails can also be safely treated with this technique. This study demonstrated that ingrown nails can be successfully treated using a simple surgical technique with low rates of recurrence [71].

**Treatment of ingrown nail with a special device composed of shape-memory alloy:** Ingrown nail is a common nail problem resulting in pain and disability in daily life. Recently, a new treatment modality for an ingrown nail was reported that used a device composed of shape-memory alloy, K-D. The aim of the present study was to determine the

efficacy, recurrence rate and complications of K-D. The majority of patients were very satisfied. There were no side-effects in most patients except loss of nail in one patient. K-D has some advantages such as simple application steps, no deformity after the procedure, high patient satisfaction and obvious effect compared to other non-invasive and invasive methods [72].

**A Simple, Pain-Free Treatment for Ingrown Toenails Complicated with Granulation Tissue:** Gulru decided to apply a small apparatus made of 0.4 mm-thick stainless dental wire with two hook-like pieces attached to each side of the nail, which were connected by a dental string in the middle. The granulation tissue was cauterized by silver nitrate, and they were advised to have foot baths with one tablet of 250 mg potassium permanganate diluted in 2 L of warm water twice daily, for 10 minutes each time. Patients were called back 1 and 6 months after the cessation of the treatment, and none had any complaint with their toenails. Applying a special nail apparatus together with silver nitrate and potassium permanganate foot baths may be an inexpensive, easy, and patient-friendly treatment alternative to surgical interventions for ingrown toenails complicated with granulation tissue [73].

**The Effectiveness of Matrix Cauterization With Bichloroacetic Acid in the Treatment of Ingrown Toenails:** Partial nail avulsion followed by BCA matricectomy is a safe, simple, and effective method with low rates of postoperative morbidity and high rates of success. Therefore, partial nail avulsion and BCA matricectomy can be used as an alternative treatment method for the treatment of ingrown toenails. This is the first study to use BCA for the treatment of ingrown toenail. In our study, side effects such as postoperative pain and drainage were at a minimal level in the majority of the patients. None of the patients had postoperative infection. The success rate of treatment was found to be 96.6%. One patient who underwent matricectomy had recurrence at the 12th month of the follow-up. In this study, 90% BCA matricectomy shows treatment success comparable with those of phenol, TCA and sodium hydroxide matricectomy. Partial nail avulsion followed by BCA matricectomy is a safe, simple, and effective method with low rates of postoperative mor-

bidity and high rates of success. Therefore, partial nail avulsion and BCA matricectomy can be used as an alternative treatment method for the treatment of ingrown toenails. Bichloroacetic acid is a viable alternative to other modalities in the management of unguis incarnatus. Advantages include simplicity, cost-effectiveness, speed, safety, and efficacy [74].

**The effectiveness of matrix cauterization with trichloroacetic acid in the treatment of ingrown toenails:** Ingrown toenail is an often painful clinical condition that usually affects the big toe. Chemical matricectomy with phenol has a low recurrence rate and good cosmetic results. However, it produces extensive tissue destruction that can result in drainage and delayed healing. Alternatives such as sodium hydroxide and trichloroacetic acid (TCA) have therefore come into vogue. A total of 39 patients with 56 ingrown toenail edges underwent chemical matricectomy with 90% TCA after partial nail avulsion. In most of the patients, adverse effects such as postoperative pain and drainage were minimal. One patient who underwent matricectomy had recurrence in a single nail edge (1.8%) at 12 months follow-up. No recurrence was observed among 38 patients during the mean follow-up period. This was considered to be statistically significant ( $P < 0.001$ ). Partial nail avulsion followed by TCA matricectomy is a safe, simple, and effective method with low rates of postoperative morbidity and high rates of success [75].

**Resin splint as a new conservative treatment for ingrown toenails:** Several conservative as well as surgical methods are used for the treatment of ingrown toenails until date. The conservative methods are either based on nail splinting or on orthonychia, but no methods employing both principles have been reported thus far. Moreover, surgical methods usually involve postoperative pain, prolonged wound healing and restricted activities of daily living. Therefore, considering the need of a simplified, non-invasive method, in this study, we applied a novel splint to treat patients with ingrown toenails and estimated the clinical efficacy as well as rate of recurrence following treatment. The splint is a plate made of resin that is attached to the lateral edge of the nail using a bandage. The authors studied 61 patients with an average

application duration of 9.3 months and an average follow-up period of 10 months in all patients. All patients experienced pain relief within a week of splint application and a decrease in the degree of nail deformity. Moreover, follow-up revealed a recurrence rate of 8.2%. Therefore, the authors believe that this new device is an excellent conservative treatment method for patients with ingrown toenails [76].

**Nail-splinting method with flexible plastic tubes for ingrown toenails:** Ingrown toenail is a common disorder in the great toe. Many treatments have been described for ingrown nails. But they have many disadvantages, such as a prolonged wound-healing period, the production of an unsightly nail, or the restriction of normal activities. The authors performed a modified method of lateral nail manipulation with placement of splints on 6 patients who gained instant relief from pain and resumed normal activities immediately. Most patients experienced no recurrence 20 months after the treatment [77]. Nazari also encountered 32 cases ingrown toenails in this clinical trial. All of the patients were treated using the plastic nail tube insertion technique for 7 to 15 days. Patients were examined daily for the first 3 days of treatment and were evaluated 3 and 6 months after treatment. All patients were followed up by a single observer. Recurrence was seen in only two patients after 6 months of treatment. The low recurrence rate using the nail splinting technique in the treatment of ingrown toenail, as well as its simple application, shows that this treatment constitutes an effective, non-invasive method. It appears that this technique can substitute other more invasive surgical methods, particularly in the early stages of this disease [77].

**A Conservative Method to Gutter Splint Ingrown Toenails:** In conservative approaches for treating ingrown toenails, lifting the nail plate out of the ulcer bed using the gutter technique improves wound healing. There is no need to free the side of the nail plate all the way to the proximal nail fold or matrix. Pushing a plastic gutter between the nail edge and the ulcer bed is all that is necessary and usually does not require anesthesia. Cyanoacrylate glue offers more security and stability than suturing or other methods for attaching the gutter. This approach is more effective, easy to perform, more acceptable to patients,

and less traumatic than classical gutter technique. It can be considered an initial treatment for most patients with mild ingrown toenail. However, this conservative method may not be the first choice for cases with soft-tissue overgrowth or extensive granulation tissue. Acrylic treatment with gutter splint and sculptured nail was found to be vastly superior to the other methods described, especially in the ability to firmly affix the gutter splint and sculptured nail for the extended period required for treatment. The treatment leads to a complete remission with almost instant alleviation of pain, with no disfigurement, while allowing for the resumption of daily activities. Conservative methods utilizing formable acrylics are highly beneficial in the treatment of an ingrowing nail and should be viewed as the first treatment option [78].

**A New Economic Method for Preparing Platelet-rich Plasma:** Although platelet-rich plasma (PRP) is nowadays a common method in various medical fields, including cosmetic surgery or dermatology, the expensiveness of the kit for processing is still a hurdle. A new unique economic method for preparing PRP was reported. The method consists in a simple modification of a disposable 5-mL syringe that allows insertion into a common centrifuge and positioning of the syringe on the centrifuge so the PRP separates next to the tip of the syringe. Platelet-derived growth factor BB in PRP was measured under anticoagulant dextrose solution A (ACD-A) or heparin as anticoagulant and with or without prostaglandin E1 (PGE1) as a platelet aggregation suppressant. The new method successfully created PRP with high platelet-derived growth factor BB in all conditions, and the highest value was obtained by using ACD-A and PGE1. The new method is useful, and the use of ACD-A and PGE1 is the most recommended. The whole blood of 60 mL was taken from each healthy volunteer. Thirty milliliters was under existence of ACD-A solution, and the rest 30 mL was under heparin. The mixing rate was 9:1 in volume. Sixteen pieces of disposable 5-mL syringes were prepared for the first centrifugation with their finger-holders cut by scissors. Four milliliters of the whole blood was put into each syringe and centrifuged as it stands. The rotation speed and time was 3000 rpm × 3 minutes, which was the minimum for separating red blood cells (RBCs) from plasma empirically by KOKUSAN H-19a

centrifuge with RF-109 rotor and MA-109K buckets. The centrifugal force was calculated with the corrected real radius to be 704g. The syringes were then taken out from the centrifuge and arranged on a special handmade holder. A 3-way cock and an extension tube (both are common medical disposables) were connected, and the other end of the extension tube was attached to the syringe after centrifugation. Eight syringes for the second centrifugation were prepared as the same way as the syringes used for the first centrifugation. One microgram of PGE1 diluted in 0.05 mL of saline was added to each of 4 syringes beforehand. The syringe was connected to the 3-way cock and the plasma was aspirated. The second centrifugation was performed at 4000 rpm (1252g) for 15 minutes, which is the fastest speed of the machine and considered to be the realistic time as a daily practice. The supernatant was discarded leaving 0.65 mL in each group (namely, ACD-A PGE1+, ACD-A PGE1-, Heparin PGE1+, and Heparin PGE1-), and the sediment was mixed with it using a vortex mixer (Vortex V-1 plus, BIOSAN). Finally, 0.65 mL of PRP solution was prepared from 16 mL of the whole blood in each group. PRP in each group was divided into 3 pieces of 0.2 mL. Twenty microliters of 0.5% Triton X in saline was added to 1 of the 3 and 20  $\mu$ L of 8.5% calcium glucuronate to another. Triton-X is a kind of detergent that destroys cell membrane and let  $\alpha$ -granules discharge nonspecifically. Calcium glucuronate neutralizes the anticoagulant effect of ACD-A while it has no effect to heparin. Platelet count of the 4 groups was performed by using disposable counting chambers. The PRP solutions were stored at 22–29°C4 overnight for the delivery to a laboratory. PDGF-BB was measured there using Human PDGF-BB immunoassay microplate (R&D systems). Ten microliters of the specimen was taken from each whole blood or PRP solution after mingling, diluted to 190  $\mu$ L buffer and measured. The rest 190  $\mu$ L of the samples were centrifuged at 10,000 rpm for 10 minutes, and the supernatants were also measured. This new method is useful and ethical in clinical practice. The use of ACD-A and PGE1 is recommended for preparing PRP with dense PDGF-BB [79].

**A single injection technique for midface rejuvenation:** The correction of volume loss has become an important part of facial reju-

venation treatments, particularly in the midface region. Techniques to date have largely relied on multiple injections, fanning techniques and deep placement of product under muscle or on periosteum. A new technique to enhance volume in the midface using a single injection of cross-linked hyaluronic acid at the subdermal level and above the muscle has been described. The technique approaches midface rejuvenation with reference to both the bony skeleton and the medial malar fat compartment. After appropriately marking the skin, the filler is placed using a blunt cannula. The treatment achieves satisfactory volume correction, enhancing the sharp cheek bones and malar fullness typical of an attractive adult face. The approach is simple, quick, and well tolerated by the patient and may result in less bruising than deeper techniques. The attractive adult midface has clean, sharp cheekbones accentuated by a shadow beneath them formed by a concavity in the cheek and a smooth transition between different areas of the face. With aging, there is a loss of projection in the midface as fullness and volume reduces. In particular, reduction in fat over the upper maxilla flattens the malar area. Malar fat has been shown to consist of three separate compartments; medial, middle, and lateral temporal cheek fat. A change of volume in the medial compartment in particular, lateral to the nasolabial fold, has been suggested as the main cause of the loss of midface projection, exaggeration of the nasolabial fat compartment and, therefore, loss of the smooth transition typical of the youthful face. Restoration of facial shape by sculptural manipulation of facial soft tissues has been deemed the highest priority in midface rejuvenation. Volumetric replacement at the midface region can restore a more youthful and fuller facial appearance and may also soften the nasolabial folds by elevating loose skin above the folds. This technique approaches midface rejuvenation with reference to both the bony skeleton and the medial malar fat compartment. Fullness of the malar region conveys a youthful appearance and prominent malar eminences are typically considered aesthetic. The area posterior and superior to the crossing of Hinderer's lines is used to indicate the location of the most prominent part of the malar eminence. Newer hyaluronic acid fillers provide an effective option for volume enhancement in the midface region. To

date, these have typically been applied using either multiple “bolus” injections or a fanning technique to place product deeply either in the muscle layer or just above the periosteum. This method achieves adequate volume correction but can result in plump, “baby face” cheeks with little shape. The single injection technique described enhances the sharp cheek bones and malar fullness typical of the attractive adult face. Reference to the bony skeleton in injection placement assists in achieving this. The limited resistance to movement of the cannula assists to establish that the cannula is in the subdermal level and above the muscle. By contrast, vigorous backward and forward cannula motion would be needed to penetrate the muscle. Using the degree of resistance against the cannula to establish cannula position in the midface is described by Berros and Taieb. Additionally, the overlying tissue can be tented with the cannula tip to ensure the correct injection depth as recommended by Wu et al. Because the cannula is confined to the subdermal level and remains above the muscle, the single injection technique reduces the bruising and swelling often associated with deeper injections and reduces the potential for nerve damage. The latter can mean that the technique is more feasible for less experienced injectors, for whom deeper cannula techniques are not advisable. The injector may draw back the plunger after advancing the cannula to confirm the cannula is not positioned in a blood vessel. Effective rejuvenation of the midface can be achieved using this safe and simple technique. The use of a single injection on each side of the face yields highly satisfying results with reduced patient discomfort compared to currently favored, deeper injection techniques [80].

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