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STRATEGIES AND TECHNIQUES FOR MINIMIZING SURGICAL SCARS FOLLOWING DERMATOLOGIC PROCEDURES AND EXCISIONS

Introduction

Dermatologists perform more in-office cutaneous surgery than any other specialty. Given the regularity of surgical procedures and excisions, strategies around minimizing surgical scars may prove useful for both patient satisfaction and overall procedural outcomes. Whether doing a simple linear closure or complex flaps, fundamental principles remain consistent with regard to the minimization of scars.

This article aims to provide practical pearls that can be incorporated into every dermatologist's toolbox to optimize surgical scars following in-office surgeries and excisions.

Setting the Stage

Prior to the surgical procedure itself, it is critically important to set realistic patient expectations. The importance of taking the time to counsel patients so that they know what to expect cannot be emphasized enough. The following are some important aspects to touch upon when counseling patients prior to surgery:

Time for Healing: It may seem obvious to clinicians, but it can be surprising how many patients need to be reminded that surgical healing *will* take time. Patients should be reminded that the final outcome of the scar is at 1 year (or beyond) after the scar has had a proper chance to mature and re-model.

Prolonged Erythema/Hyperpigmentation: It is common for patients with Fitzpatrick Phototype (FP) I-III to heal with pink to red scars, and FP IV-VI to heal with hyperpigmented/brown scars, in the immediate post-operative period. These manifestations associated with healing will typically fade to skin color/white over 1 year (although FP IV-VI may take longer). This should be explained to patients so they understand the progression of the color of their scar and know what to expect. Of course, FP IV-VI also have a higher chance of hypertrophic and keloid scarring, especially on the trunk.[1]

Unpredictability: Patients should be reminded that human skin is a living organ and that despite the use of meticulous surgical techniques, each patient's biology and wound healing is heterogeneous and therefore unpredictable.

Limitations on Activity: It may be helpful to provide pre-operative instructions for patients if it is a pre-planned or scheduled procedure/surgery in

order to help them understand activity restrictions. Otherwise, if consultation and surgery is done on the same day, then it is important to discuss these issues during the informed consent process. It is usually most helpful to instruct patients exactly on which activities they cannot undertake (depending on the area of their surgery). As a general rule, any activity that will significantly stretch on the area of surgery in the first 2 weeks may significantly jeopardize healing. However, patients should also be advised that any activity that significantly pulls on the surgical site (or surrounding skin) within the first 2 months can stretch/widen the scar and result in a sub-optimal aesthetic outcome (as scars are very weak early in the post-operative course and do not reach their maximum strength until 2 months).[2] This is especially important for high tension areas (such as the shoulders, back, shin, etc.).

Planning the Incision

Aligning the closure along relaxed tension lines is a fundamental tenet of basic surgical principle. However, additional aspects that can be considered are cosmetic subunits[3] and natural borders of the skin. For example, aligning a closure along the alar groove or the melolabial fold will result in a much more discreet and aesthetically pleasing result than away from these pre-existing boundaries (**Figure 1 & 2**).

Making the Incision

To facilitate ease of closure, increase wound edge eversion, as well as to maximize likelihood of removal of the desired lesion/tumour, clinicians should ensure the incision is made with either a straight down (90°) edge,[4,5] or an anti-beveled edge (**Figure 3**).[5] If an incision is made using a beveled edge, it can result in difficulty approximating the wound edges, or potentially result in a more collapsed/inverted scar

Figure 1: *Removal of benign spindle cell neoplasm. Note the incision is made along the melolabial fold (rather than overtop of the lesion) as it is a natural border between cosmetic subunits; photos courtesy of Noelle Wong, MD*

Figure 2: *Removal of a benign intradermal nevus. Note the incision is made along the melolabial fold as it is a natural border between cosmetic subunits; photos courtesy of Noelle Wong, MD*

line. It also increases the likelihood of inadvertently cutting towards or into the lesion/tumour that is being removed, increasing the potential for a positive margin.

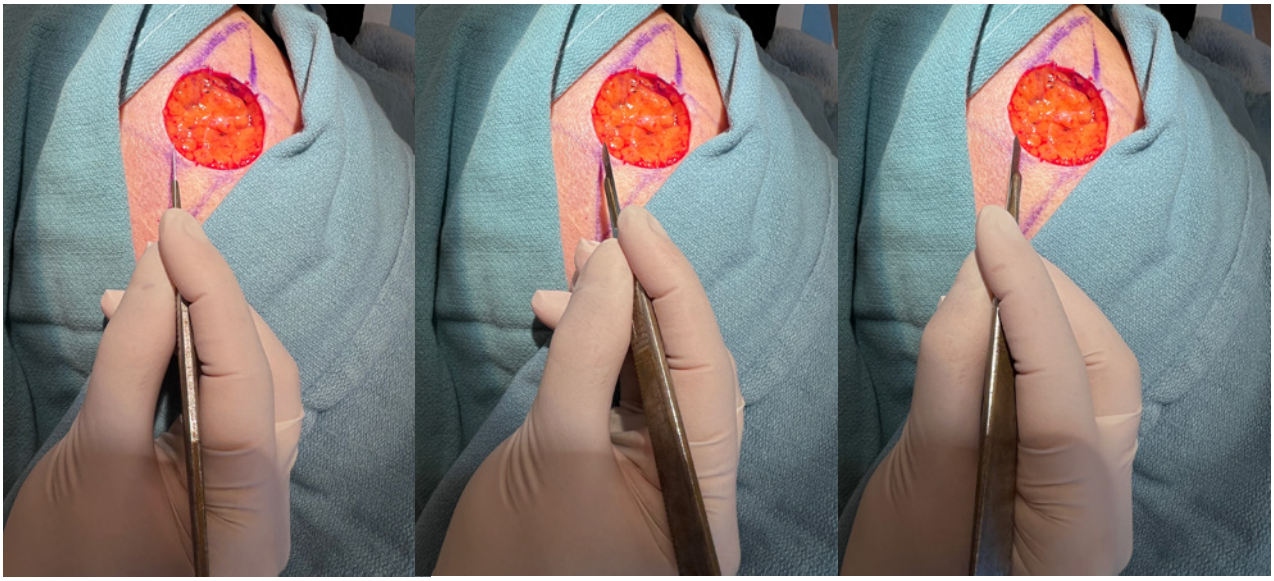
Suture Selection

Always select stronger sutures for deep sutures, and finer sutures for top/epidermal approximating sutures. The deep sutures provide support while the dermis/scar is still weak and healing.[6] Erring on the side of choosing stronger sutures, especially for areas of high tension (for example using no weaker than 2-0 Vicryl on the back, heavy breast tissue, lower legs) will pay off during the healing process, with less chance of a widened/stretched scar. Top sutures are for epidermal approximation only and should not be relied upon for relieving any kind of tension.

Suturing Techniques

Running Subcuticular Sutures on the Body: Facial skin versus skin on the body heals remarkably differently, and anything not on the face may result in a higher likelihood of forming permanent "train-track" or "puncture marks" from top sutures (from simple interrupted or running epidermal sutures) (**Figure 4**). Instead, the use of running monocryl subcuticular sutures whenever possible can aid in avoiding these "train track/puncture" marks resulting in a more improved/elegant aesthetic outcome.[7] Burying the knots or leaving the ends exposed on either end is left to the clinician's discretion, with the understanding that patients with exposed ends will need to return to have the ends clipped at the level of the skin.

Modifications to Running Epidermal Sutures: Running epidermal sutures, referred to as a "baseball" suture, is a very useful and efficient technique for epidermal approximation, especially on the face. However, if performing this suturing technique, clinicians should avoid cinching the sutures tightly; instead allowing them to simply rest across the skin surface (**Figure 5**). The aforementioned guidance is important because post-surgical edema will occur and cinched sutures can potentially cause wound edge strangulation and micro-ischemia resulting in less aesthetic outcomes and increased scarring.[6,8] This is especially true if using suture material with less inherent elasticity/plasticity such as fast absorbing gut or vicryl rapide (both of which are absorbable top sutures which have become even more commonly used during the COVID-19 pandemic) versus more traditional non-absorbable choices such as ethilon or prolene.



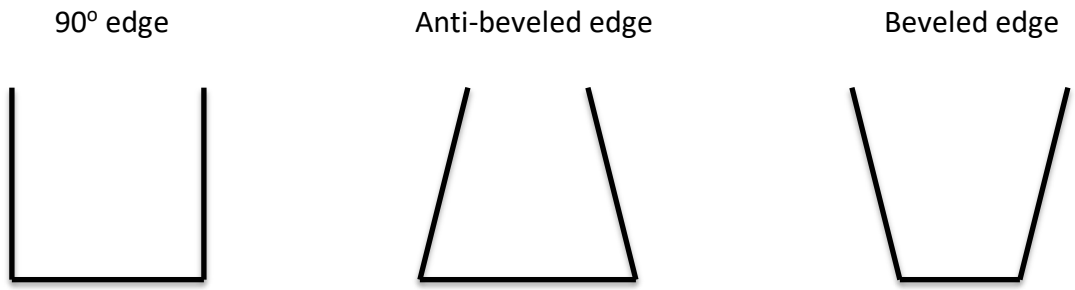


Figure 3: *Blade position to achieve a straight down (90º), anti-beveled, or beveled edge. For ease of closure and avoidance of inadvertently cutting towards or into the lesion/tumour being removed, a straight down (90º) or anti-beveled edge should be used and a beveled edge should be avoided (figure adapted from Nantel-Batista & Murray, 2015); photos courtesy of Noelle Wong, MD*

Epidermal approximation: Approximation of the epidermal edges is extremely important in the pursuit of an imperceptible scar. If one side of the closure sits higher or lower than the other, final aesthetic outcome will be impacted. During epidermal closure, the dermatologist should constantly be assessing whether there is slight discrepancy between the two edges.[6] Of course, the tissue should also be approximated as much as possible using the deep sutures, but often the natural contours of the face or body may contribute to some discrepancy. In these scenarios, micro-adjustments can be made by placing a shallower bite on the edge that is sitting higher, and a deeper bite on the edge that is sitting lower, resulting in a 'balancing out' of the two sides to sit at the same height.

Gentle Tissue Handling

The handling of tissue during surgery is very important for the optimization of healing. If the tissue is handled roughly or clamped too tightly with the forceps, the resulting tissue injury may lead to worsened swelling, inflammation, post-operative pain, and atrophic scarring. Heightened awareness of these sequalae and the use of appropriately sized Adson forceps specific for tissue type and surgical site can help alleviate these potential outcomes. Additionally, maximizing the use of skin hooks during hemostasis (and in the personal preference of some dermatologists, during suturing) can further avoid unnecessary compression of the wound edge.[6]

Post-operative Care

Proper post-operative care is a vital component of optimal healing and to ensure minimal scar formation. A pressure dressing should be applied for 24 hours in uncomplicated cases, with the dressing staying on for 48-72 hours in those cases where patients are actively receiving anticoagulation therapy. For closure involving top sutures above the skin (simple interrupted or running baseball sutures), having the patient apply ointment (Vaseline® or Fucidin®) twice-daily for 3 weeks once the pressure dressing has been removed is helpful in creating a moist wound healing environment. If the sutures dry out, the resulting scar may be sub-optimal.

For running subcuticular sutures, the use of Steri-strips over the incision can help offload any pulling/tension on the skin in the early stages of healing.[9]

Figure 4: *Example of "train track" or "puncture marks" left from top sutures on the trunk from remote spinal surgery (left) and example of scar using running subcuticular suture on lower leg, arrows indicate beginning and end of scar (right) ; photos courtesy of Noelle Wong, MD*

Figure 5: *Example of avoiding cinching sutures tightly when laying down epidermal sutures to achieve a subtle scar (fast absorbing gut sutures used here); photos courtesy of Noelle Wong, MD*

Using a skin adhesive such as Mastisol® Liquid Adhesive before applying the Steri-strips can help extend the longevity of the Steri-strips staying over the incision (the adhesive is not to aid in the closure of the wound but instead allows for the Steri-strips to remain adhered). Instructions can be given to patients to keep the Steri-strips on as long as possible (a minimum of 2 weeks or until they fall off on their own). The patient can shower with Steri-strips and pat them dry afterwards, but patients should be instructed that the surgical site is not to be submerged in a pool or a hot tub while the Steri-strips remain on (also important for avoiding risk of infection).

Finally, counseling patients around strict sun protection is highly recommended and critical as scars can turn more erythematous or hyperpigmented (based on skin type) due to direct sun exposure.

Providing the patient with written post-operative wound care instructions that are straightforward and easy to understand and reviewing these instructions with them verbally at the end of the surgery will help maximize success.

Adjunctive Therapies

Given the unpredictable nature and variability of healing in different patients, in rare situations despite meticulous surgical technique and patient adherence to proper care, adjunctive therapies may be needed to help further refine scars. These are beyond the scope of this article but may include intralesional kenalog,[10,11] 5-Flourouracil,[10,11] botulinum toxin,[12] laser therapy,[13] or dermabrasion.

Conclusion

Surgical procedures and excisions are a necessary part of most dermatology practices. There surely will never be one technique or approach that ubiquitously works best for all clinicians. This being said, there are fundamental aspects related to surgical procedures and excisions that can be adopted despite different personal preferences to supplement and enhance existing regimens and practices.

Patient data and photos used with permission; courtesy of Noelle Wong, MD

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