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Featured in this issue:

Laser Resurfacing

Common Complications of Laser Resurfacing and Their Treatment

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Laser is an acronym for Light Amplification Stimulated by the Emission of Radiation, but with the wide spread popularity of laser resurfacing, some clinicians have tongue and cheek referred to it as Last Attempt to Secure Extreme Remuneration. For sure, more and more patients are having cutaneous laser procedures each year. Due to this, it stands to reason that clinicians will see complications from their own patients as well as those patients seeking treatment that have been treated elsewhere.

The learning curve for facial resurfacing can be steep and complications may occur along the slope. Even for the most seasoned practitioners, untoward outcomes may occur due to patient variation, skin types and patient compliance. Fortunately, most complications from laser resurfacing are transient and if recognized early, are treatable. Since many different specialties perform laser resurfacing, all doctors must be aware of the common complications and have immediate diagnostic and treatment modalities in their armamentarium.

Some complications occur in the early post-treatment phase and if not recognized may lead to drastic outcomes. Septic shock has occurred from post-laser cutaneous infection and rampant herpes infection may lead to permanent scarring.

There exists an adage that rings true with post-operative problems. A post-operative problem that was discussed before the surgery is a sequalla, whereas a post-operative problem that occurs and was not discussed is a complication. Failure to use proper and extensive informed consent may make a case undefendable.

Persistent Erythemia

All laser patients will experience erythemia and the resolution of this is usually complete in two to three months, however some patients may remain red or pink for six months or more.

When erythemia persists longer than usual, one must consider the possibility of underlying infection, allergic reaction or healing defects. The author makes it a practice to show all patients actual pictures of post-laser erythemia and the worst cases are shown as not to underplay this situation. If the patient is not as red as the pictures (as they are usually not) we look better, however if the patient is led to believe that the redness is minor, they will likely be disappointed.

Some practitioners use strong fluorinated topical steroids (Temovate) for prolonged erythemia. The manufacturer contraindicates the usage on the face in the product literature due to the propensity to thin the skin. Advocates state that a BID regimen of no longer than 14 days is safe.

For those clinicians that prefer a weaker topical steroid, one percent hydrocortisone is useful for a BID regimen.

Post-operative erythemia is usually self-limiting and frank and open pre-operative communication is the best tool.

Contact dermatitis is also a contributing factor to increased inflammation and prolonged erythema. Wool products (lanolin), sunscreens, vitamin E, topical Benadryl or lidocaine, perfumes, detergents and fabric softeners can cause contact dermatitis. The use of triple antibiotic creams or ointments post-laser is a well-known cause of contact dermatitis and should not be routinely used. Over-the-counter niacin or other supplements which cause vasodilatation or flushing should be avoided.

Herpes Infection

Herpes simplex infection is one of the most common early treatment complications and presents on a relatively frequent basis. Alster and Nanni reported a 7.4 percent HSV infection rate in 500 cutaneous laser resurfacing patients.

The standard of care from the inception of facial cutaneous laser surgery has been pre-operative and post-operative herpetic prophylaxis (See Figure 1).

Valacyclovir (Valtrex) is frequently used over acyclovir due to higher blood levels and the author has used this in more than 100 chemical peels or laser resurfacing cases with only a single herpetic outbreak. The usual dose used is 500 mg BID beginning 48 hours pre-op and continuing until

Figure 1 (herpes)

Figure 3 (scar)

Figure 5 (ectropian)

Figure 2 (yeast)

Figure 4 (acne flair)

Figure 6 (hypopigmentation)

re-epithelialization is complete. It is interesting that even small areas of laser treatment such as a single perioral lesion may induce significant herpes and scarring. For this reason, we prophylaxes all laser patients regardless of the size of the treatment area. The perioral area seems to be the most susceptible region to herpetic involvement. Patients with previous history of fever blisters should be carefully scrutinized in the initial post-laser period.

Herpetic diagnosis in the early post-operative phase may be difficult to diagnose due to the fact that the common sign of vesicle formation may not occur. Since the laser destroys the entire epithelial layer, there is no epithelium to vesiculate in the early post-operative period. The foremost sign of herpetic involvement is pain. Although laser resurfacing may be painful, it is rare to have severe pain after 48 hours, and its presence should tip of the astute surgeon to possible herpetic infection. If vesicles are present, they should be cultured for herpes or examined for a positive Tzanck smear.

The Tzanck smear is the quickest means of identifying a herpetic infection. The vesicle is disrupted and the base swabbed. The swab is then rubbed on a glass slide and fixed with cytologic fixative or hair spray. The lab can then perform specialized stains to identify the multinucleated giant cells indicative of herpes. These cells are often referred to as eggs in a basket. Intra-nuclear inclusion bodies are also seen in these smears. Although a Tzcank smear will identify herpes, it is not specific for subtypes.

Most hospital labs provide special herpetic cytologic culture kits. They contain a special viral culture medium, which is inoculated after wiping the broken vesicle or suspected site with a cotton swab. Viral cultures can differentiate herpetic subtypes and usually take at least 72 hours for growth and reading.

Again, early herpes involvement may not produce vesicles and require empirical treatment. The treatment for herpes outbreak requires switching from the prophylactic dose to the zoster dose of antivirals. For Valtrex, the zoster dose is 1 gram TID for seven days assuming normal renal function.

Bacterial Infection

Pustules may not form, listen to patients with fever or prolonged pain.

Bacterial and yeast infections are not common. Alster and Nanni, in the previously quoted study of 500 laser patients, found no bacterial infections and two yeast infections. However uncommon, a significant infection may be problematic in terms of discomfort or scarring. Toxic shock has been reported and this may obviously be life threatening.

Argument exists over using occlusive techniques with various types of membranes versus protecting the lased skin with ointment preparations. The proponents of a moist healing environment point out decreased post-operative discomfort and faster re-epithelializations with closed membrane techniques. The opponents point out increased bacterial and monilial infections. The author uses ointment type preparations such as melting petrolatum, bovine cartilage preparations, or Vaseline and has given up using occlusive membranes with no significant noticeable differences.

Prompt recognition of bacterial or yeast infection is paramount in the treatment and response (See Figure 2). Most clinicians use pre- and post-operative systemic antibiotics on laser resurfacing patients. The author utilizes a regimen of Keflex 500 mg 48 hours pre-operatively and until re-epithelialization is

complete. Azithromycin is also used by some clinicians and due to the easy dosing (500 mg 24 hours pre op and 250 mg for four days post op). Some practitioners feel that pseudomonas coverage is important and use ciprofloxin. Suspected bacterial infections should be cultures and empirical antibiotic treatment started. So commonly, the infection becomes controlled well in advance prior to the final culture reports arriving. Gram stain will also assist in the identification of bacterial infection.

Yeast infection also occurs and must be promptly diagnosed and treated. KOH staining can immediately differentiate bacterial and yeast infections by the presence of pseudohyphae and should be in the armamentarium of any doctor performing cutaneous laser resurfacing.

Patients with a history or active vaginal yeast infections or perleche (monilial infection of the oral commisures) or diabetes may indicate prophylactic coverage with diflucan.

"Infections not responding to first line antibiotics should be treated aggressively with infectious disease consult and intravenous antibiotics."

Since there may be no epithelium, pustules may not form making the diagnosis difficult. Again, fever and especially prolonged pain should be serious warning that infection may be present.

Infections not responding to first line antibiotics should be treated aggressively with infectious disease consult and intravenous antibiotics.

Milia Formation

Milia are lesions from the obstruction of pilosebaceous units and frequently appear after laser resurfacing procedures. In the authors opinion, extended use of petrolatum based products increase milia formation. Switching to less greasy preparations as soon as the serous phase of healing resides has seemed to keep milia to a minimum. The remaining milia regress spontaneously or respond to treatment with Retin A or topical glycolic acid applications. Persistent indurated milia require disruption by gently scooping the contents with an 18-gauge needle.

Informing the patient of milia formation pre-operatively will ally their fears if and when they appear.

Acne Flair

Cutaneous laser resurfacing may stimulate acne formation causing an otherwise happy patient and surgeon increased concern. Pre-treatment of acne is imperative and it is inappropriate to treat a patient with active acne. Patients with a history of acne should be placed on systemic antibiotics (See Figure 4).

Minor acne flare may resolve spontaneously. Significant acne flare is treated with topical antibiotics, retinoic acid, glycolic or azeleic acid preparations and light chemical peels.

Telangiectasia

The formation of telangiectasias after laser resurfacing has not been predictable in our series. Some patients, who exhibited substantial telangiectasias pre-laser, healed without them whereas other patients with little or no telangiectasias developed substantial formation post-CO_2 laser. In other words, we tell our patients that their telangiectasias may become better or worse after laser resurfacing. The policy of the author is to proceed with the CO_2 resurfacing and if telangiectasia formation is a problem, treat the patient with the pulsed dye laser six weeks later to ablate the telangiectasias. This is, of course, discussed pre-operatively with the patient.

Hyperpigmentation

This problem is probably seen in some form by every practitioner performing cutaneous laser resurfacing. Many practitioners pre-treat all laser patients with a pre-operative skin regimen, where other experts claim that pre-treatment is ineffective since the superficial layers of skin will be destroyed by the laser anyhow. Even those clinicians who do not believe in routine pre-treatment will probably agree that the standard of care with Fitzpatrick skin types III and higher is to pre-operatively treat patients with a regimen of Retin A and hydroquinone for four to six weeks pre-laser.

Hyperpigmentation is obviously more of a problem in darker skin types, thus Asians, Hispanics, Native Americans and African-American populations must be approached with caution.

Hyperpigmentation frequently manifests in about one month post-laser, but we have had patients develop significant hyperpigmentation four months post-CO_2 laser. Hyperpigmentation will usually spontaneously resolve but it can be a very disconcerting problem for some patients and can be hard to cover with even special make up.

The strict avoidance of actinic exposure in the post-operative phase cannot be overstressed. We have had patients swear that they have not been in the sun, but possess the telltale sign of left sided facial hyperpigmentation from driving and sun penetration (UVA rays) from the drivers window. Sunscreen is paramount after re-epithelialization and should be continued for life.

The author has had patients that exhibited sensitivity to PABA and the use of sunscreen actually made the hyperpigmentation worse due to contact dermatitis. For this reason, we routinely use PABA free preparations.

Our experience has been that treatment with a compounded mixture of paraben free hydrocortisone (Aristocort) 30 grams, hydroquinone 4 percent 15 grams, and retinoic acid 0.1 percent 20 grams applied bid will effectively treat hyperpigmentation. For hyperpigmentation resistant to creams, light glycolic or TCA peels may be effective

Fortunately, most hyperpigmentation will spontaneously resolve or resolution with minor treatment is common.

One potential screening aid for how a patient will respond in terms of hyperpigmentation is to inquire if scars from minor scratches, pimples, bites, etc. turn brown and how long it takes for them to fade.

Hypopigmentation

Hypopigmentation is far more of a serious problem than hyperpigmentation largely due to the fact that it may be permanent (See Figure 6). Hypopigmentation is most commonly a result of over treatment with damage or depletion of melanin producing cells. Being conservative with laser resurfacing enables more tissue removal in the future, but putting it back is impossible. Judicious attention to tissue thickness and laser depth is the forefront of prevention of hypopigmentation.

Hypopigmentation is usually a late complication, occurring months after laser treatment. Some so-called cases of hypopigmentation are actually a return to the skins normal color, which contrasts from aged or photodamaged skin. Comparing with non-exposed skin such as the

axilla will show the patient that this is in fact their normal skin color. This again is something that if discussed pre-operatively may prevent a disgruntled patient or lawsuit.

An additional caveat concerning hypopigmentation concerns treating patients with vitiligo. The Koebner phenomenon is the unmasking of vitilgo that can occur with laser treatment. Anyone with vitiligo or a family history should be treated with caution and warned of hypopigmentation.

No specific treatment exists for hypopigmentation and exposure to sun does not change the color and may actually make the areas appear more pronounced. The perioral areas and cheeks are frequent sites of hypopigmentation.

Hypertrophic Scarring

This is the most feared and serious of all laser resurfacing complications (see Figure 3). Hypertrophic scarring is usually a result of over treatment with damage to the deep dermal layers. The perioral and mandibular areas may be more prone to hypertrophic scarring with laser treatment.

Operator factors and patient factors contribute to scarring. Operator factors would most frequently include over treatment.

Patient factors include ancestry (African-American, Native American and Asian) patients are more prone to keloids and scarring, but hypertrophic scarring may occur in any population. Improper or poor wound care on the part of the patient as well as the inappropriate use of topical preparations can effect the healing and scarring, therefore compliance is paramount. Many clinicians fail to ask their patients about previous therapeutic radiation treatments for acne, cancer or eczema. Radiation can cause loss of the adenexa with a compromised ability to re-epithelialize and cause scarring. The use of Accutane within the previous 12-18 months can inhibit the pilosebaceous units and contribute to scarring. Collagen and elastin diseases (Ehlers-Danlos) have potential healing problems as well. High dose vitamin A may lead to sebaceous gland atrophy.

Treatment of post-laser hypertrophic scarring includes intralesional steroid injection. The author uses Kenalog in a concentration of 10 mg/ml, .1 to .3 ccs (1 to 3 mg) are injected from a tuberculin syringe into the scar on a monthly basis. The topical application of fluorinated steroid (Temovate 0.05 percent BID for two to three weeks), 5 fluorouracil or Verapamil 2.5 g/ml is also used by some clinicians. The application of silicon gel sheeting, and treatment with the 585 pulsed dye laser is also advocated in the treatment of hypertrophic scarring. Clinicians not experienced with treating this complication should refer these patients to more experienced practitioners as early as possible.

Ectropion

Lower lid ectropion is an unfortunate complication of periorbital laser skin resurfacing that frequently can be prevented by sound pre-operative screening (See Figure 5). Patients with previous skin-muscle lower lid blepharoplasties are at risk to ectropion and conservative treatment should used in these areas. In addition, elderly patients may have existing senile ectropion, which can be worsened by laser resurfacing.

Snap testing and other lid evaluation procedures should be routinely performed and documented pre-operatively.

Temporary ectropion may occur immediately after lid resurfacing and typically resolves in a few days or weeks. Eyelid massage and lower lid taping is appropriate if ectropion is severe. Occuloplastic consultation is also suggested.

Self-inflicted Dermal Abrasion

The author has experienced several cases where patients inadvertently abraded the unepithelialized or recently re-epithelialized skin by conscious daytime scratching or unconsciously while asleep. Post-operative pruritis can be very bothersome to patients and should be treated with antipruritics. Trimming the fingernails and having the patient wear cloth gloves on the hands while sleeping have controlled thes problem.

Corneal Injury

There should be no excuse for corneal injury with the laser beam. The standard of care for periorbital resurfacing demands metallic eye shields. A problem that most clinicians do not consider is the scratching of the shields that can lead to serious corneal abrasion. The eye shields should be frequently inspected and not thrown in with the other instruments. Defective shields can be sent to the manufacturer for polishing.

Enamel Injury

The teeth are the most resistant tissues to destruction in the body, but the CO2 laser beam will actually melt enamel. Even light beam contact will pit the enamel. A moist gauze should be placed over the teeth when treating the perioral area.

Treatment Overextension

Controversy exists over treating the neck with laser resurfacing. The author will treat the upper neck in males that exhibit hair bearing in that area. Otherwise, do not laser the neck. It is not uncommon for the author to perform a concomitant TCA peel of the neck to reduce the demarcation of laser treated skin.

The author, as most practitioners ends the laser treatment area in the mandibular shadow. This region is not normally visualized and conceals the treatment transition. It is important to mark this area preoperatively with the patient sitting up. Failure to pay attention to this can lead to a very noticeable transition. In addition, although never experienced by the author, some clinicians report permanent tattooing of tissues that have been marked with a surgical marker after the first laser pass. Due to this we never remark treated skin.

Conclusion

Cutaneous laser resurfacing is a predictable procedure and positive treatment results are well documented. The learning curve for this procedure may be steep and with the aggressive sales tactics by laser manufacturers, inexperienced people are performing these procedures.

A multitude of factors on the part of the doctor and the patient contribute to laser complications. Many of these problems may be avoided by through pre operative screening, enhanced patient/doctor communication, and conservative treatment techniques. ■

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