BROWN
DERMATOLOGY

Phenol-croton oil peeling

STANDARD OPERATING PROCEDURE V1.1 MAY 7, 2023

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Standard Operating Procedure – Phenol-croton oil peeling

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ACRONYMS

ACLS	Advanced Cardiac Life Support
AED	Automated External Defibrillator
BLS	Basic Life Support
CME	Continuing Medical Education
COPD	Chronic Obstructive Pulmonary Disease
ECG	Electrocardiogram
NiBP	Non-invasive Blood Pressure
HR	Heart Rate
IPS	International Peeling Society
pOx	Pulse oximetry
PPE	Personal Protective Equipment
QTc	Rate-corrected Q-T interval
SOP	Standard Operating Procedure
TdP	Torsades de Pointes

1. Introduction

Phenol-croton oil peels, also known as advanced chemical peels, or deep chemical peels[1] are chemical peels that promote deep facial skin renewal.[1] Chemical peels involve injury and detachment of skin layers, with the intention to remove aged and photodamaged skin layers. Chemical peels are classified into superficial, medium-depth, and deep peels depending on the nature and concentration of active chemical ingredients.[2] Due to the nature of the active chemicals used to provide the planned depth-of-injury, adequate training is required to ensure maximum patient, employee, and environmental safety.

The post-peel repair process of phenol-croton oil peels results in a new collagen band, new elastin, and a new epidermis. The skin becomes renewed, with a more youthful appearance.[1] Extensive peer-reviewed literature is available in the main journals of Dermatology, such as the Journal of the Academy of Dermatology, official journal of the American Academy of Dermatology,[1,3–5] and Plastic Surgery, such as the Plastic and Reconstructive Surgery, the official journal of the American Academy of Plastic Surgery,[6–8] supporting the safety and efficacy of phenol-croton oil chemical peels. Due to the intrinsic risks of this surgical facial procedure with a long learning curve, phenol-croton oil peels are routinely performed by physicians with high level of dedication and expertise, and structured hands-on training requisites must be met for safe operations.

2. Purpose

This standard operational protocol (SOP) has been developed to provide guidance and oversight for the procedural safety of phenol-croton oil chemical peels in Brown Dermatology, Inc.

3. Scope

The SOP applies to the dermatologists and their medical assistants involved in Phenol-croton oil chemical peeling procedures and the supervising Advisory Committee.

4. Responsibilities

Dermatologists:

- Develop and update the SOP
- Verify that the safety practices are followed rigorously
- Select patients and provide informed consent
- Formulation, Application and Post-operative support

Medical Assistant:

- Follow the SOP strictly and provide feedback for updates
- Assist the dermatologist in photographs, informed consent, and documentation
- Assist the dermatologist in the execution of Phenol-croton oil peels and the necessary post-operative care

Advisory Committee:

- Support and provide oversight for the practice and training of dermatologists in phenol-croton oil peels
- Approve and suggest reviews to the SOP
- Supervise the quality of care of phenol-croton oil peels
- Supervise and provide basic operational safety standards for phenol-croton oil peels
- Investigate all incidents or accidents focusing on improving safety and quality of care
- Composition of the advisory committee:
  1) Director of Quality and Safety;
  2) Clinical Operations Manager;
  3) Vice-Chair of Clinical Operations;
  4) Director of the Center for Laser and Aesthetics;
  5) Practice Manager;
  6) Nurse Medical Assistant involved in the execution of chemical peels.

5. Definitions

Applicator: instrument used for application (topical delivery) of chemicals.
Endpoint: appearance of the skin that relates to the level of injury planned, and no more application is necessary.
Formulas: extemporaneous mixture of chemicals compounded in-office by the dermatologist.
Hands-on training: supervised medical training in which taught skills observed during practical surgery, not only by observation. Hands-on training may be obtained during medical residency or by dedicated continuous medical education (CME) courses provided by recognized senior experts of the International Peeling Society (IPS).
Monitor: a multiparameter patient monitor, an electronic device that displays current vital signs, such as heart rate (HR), non-invasive blood pressure (NiBP), pulse-oximetry (pOx) and electrocardiogram (ECG) continuous readings.
Volatile organic compounds: potentially hazardous chemical compounds present in the air.

6. Training

Training Documentation

All documentation of training will be reviewed and must be approved by the Advisory Committee and will be maintained in the Dermatologist's credentials file and in the phenol-croton oil continuity/training/safety folder.

Formulation and application skills

To ensure prudent and safe formulation and application of formulas, the dermatologist must have previously undergone hands-on training procedures under the supervision of an IPS senior expert in phenol-croton oil peels either during residency training or in CME training sessions.

Post-operative support

When CME courses are performed outside residency, to ensure adequate patient care during the post-operative period, including management and recognition of side-effects, infections, and psychological support, a 7-day minimum duration of hands-on training course is required. This 7-day minimum ensures the training provided the minimum period to see the full recovery of a patient post-procedure. Examples of such comprehensive courses are provided by the following instructors: Dr Carlos G. Wambier (RI/CT), Dr Peter P. Rullan (CA), Dr Richard Bensimon (OR), Dr Luitgard Wiest (Germany), Dr Marina Landau (Israel), Dr Gustavo Nogueira (Brazil), Dr Felipe Ribeiro (Brazil), Dr Oliver Kreyden (Switzerland).

Safety

Life Support

The dermatologist must be Advanced Cardiac Life Support (ACLS) provider and the and medical assistant must be Basic Life Support (BLS) provider, with up-to-date training provided by an American Heart Association instructor, every 2 years.

Chemical Safety

The dermatologist and medical assistant must complete standard training modules on **1)** Fundamental Concepts of Laboratory Chemical Safety; and **2)** Hazardous Chemical Waste Management provided by an educational institution such as CITI training modules, provided by Brown University, Lifespan, or similar educational institutions, with a refresher every 5 years.

For more information and courses can be found at:

https://about.citiprogram.org/course/laboratory-chemical-safety/

https://www.brown.edu/health-safety/topics/environmental-compliance/hazardous-waste-management

7. Safety Guidelines

Environmental Safety

Biomedical waste disposal

- All material contaminated with chemicals: gloves, gauzes, cotton tipped applicators, absorbing paper used to clean spills and residue of chemicals of vials, cups, bottles, are disposed in identified biomedical/biohazard bins within the **Chemical Peel Procedure Room**, which contains an identified red bag for daily collection.
- Needles and syringes are placed in the "Sharps collector".

Chemical waste disposal

- The **Chemical Peel Procedure Room** must have a specific **Satellite Accumulation Area** for chemical waste disposal: A **locked lower cabinet** contains identified glass containers. An amber glass gallon labeled "Phenol-croton oil - hazardous waste". The label specifies the dates of the accumulation period.
- Residue of phenol-croton oil mixtures: of vials, expired bottles are safely disposed into the respective identified container within the **Satellite Accumulation Area**.
- If spills over 20mL occur on the **Chemical Peel Procedure Room**, absorbing paper towels used to dry the spills are also disposed inside the respective accumulation bottle.
- If the accumulation bottle reaches 3700mL level, the bottle is sealed from future collection and the end of accumulation period is written on the label, which is signed and dated in the label, and a new accumulation bottle is set.
- Accumulation bottles are collected by a contracted authorized hazardous chemical waste company licensed by the state of Rhode Island. A maximum of 5 bottles each bottle containing up to 1 gallon [3750mL] of chemical waste can be collected per request.

Handling Safety

Storage of hazardous chemicals

- No storage above four feet.
- Storage must be in drawers with a fixed base that can support multiple bottle sizes.
- Chemicals storage drawers are kept locked.
- Inventory is kept by a designated Nurse, with track of expiration dates on a checklist kept on the storage containers.
- The Dermatologist must verify the expiration dates before each use.
- Expired products are disposed immediately in the **Satellite Accumulation Area**.
- Avoid transport of chemicals between rooms when possible.

Contact personal protective equipment

- Neoprene gloves or double layer of nitrile gloves are effective personal protective equipment (PPE).[1]
- Protective eyewear is recommended.
- Surgeon and medical assistant must wear gloves for handling chemicals and during chemosurgery.
- Gloves are changed immediately upon exposure to chemicals to avoid contamination of surfaces and clothes.
- Standard scrubs or Laboratory coats are permitted to be used.
- If the laboratory coat has long and lose sleeves, it is advisable to keep the end of the sleeves under the gloves to avoid accidents such as inadvertently spreading surface chemicals over patients face or eyes.

Air Safety

Air circulation and exhaustion

- The **Chemical Peel Procedure Room** must be equipped with an exhaustion fan and windows.
- Smoke evacuators are generally not acceptable as they contain only particulate filters such as N95 masks. **If the smoke evacuator contains a chemical filter they can be used, however, a window is still needed in the eventual equipment or fan malfunction of in situations where increased air circulation is necessary.**
- Fans must be turned on during the procedures.
- A handheld fan or a cooler is used to blow the volatile chemicals away from the patient's airways, **Fig.1**. A cooler is advisable since it reduces pain, however some patients don't tolerate cold air on the face.

Figure 1 - Use of cooler to blow volatile chemicals away from the airways of the patient during the chemosurgery.

Respiratory personal protective equipment

- **N95 Masks with activated carbon layer** or **Gas Masks with chemical filter cartridges** are adequate personal protective equipment for advanced chemosurgeries.[9]
- Surgeon and staff standing close to the chemical application area must wear air safety PPE, **Fig.2**.

Dermatologic Surgery

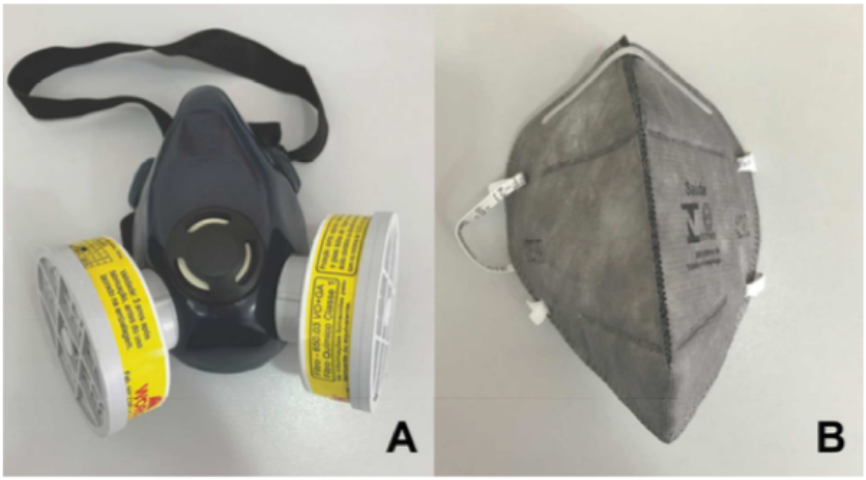

Figure 2. Personal protective equipment (PPE) recommended for phenol fumes. Both contain activated carbon. Reusable acid gases and organic vapors mask (A) or disposable organic vapors mask (B).

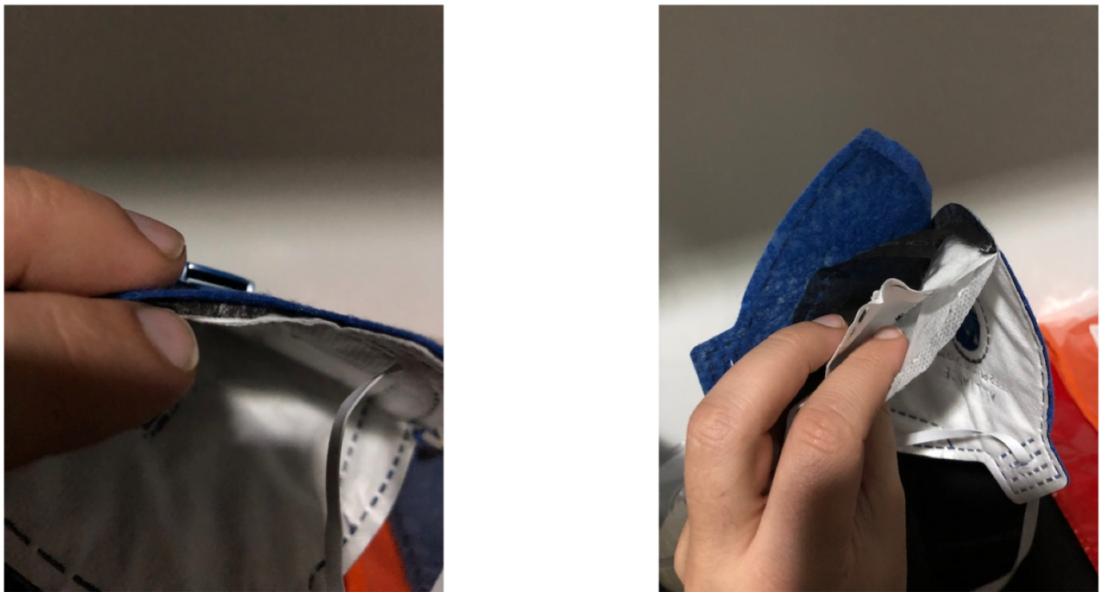

Figure 2 - Example of an N95 mask with an activated carbon layer to adsorb volatile chemicals during the chemosurgery.

Patient Safety

Maximum body surface area

The maximum surface to be peeled in the same day is 5% body surface area (BSA), which approximately corresponds to the Face and Anterior Neck on the average size adult.[10]

Small-area procedure (<1% BSA)

Restricting the skin surface to be peeled in the same day is the safest approach due to reduced systemic absorption and post-operative pain tolerance and facilitated wound care.

- Such procedures **do not require** ECG monitoring or IV access in patients without cardiac conditions or patients that are not in use of medications that prolong QTc.[10] However, ECG monitoring may be used in those patients to increase safety even in patients without any known risk factors for arrhythmia. [10]

Measurement of BSA

BSA is estimated by the placing a palm (without fingers) = 0.5% BSA, **Fig.3.**
Each 15 juxtaposed thumb prints (thumbs pressed on the skin surface) correspond to a palm without fingers of 0.5% of BSA.[11,12]
Estimation of BSAs: **Figs 3, 4, 5, and 6.**

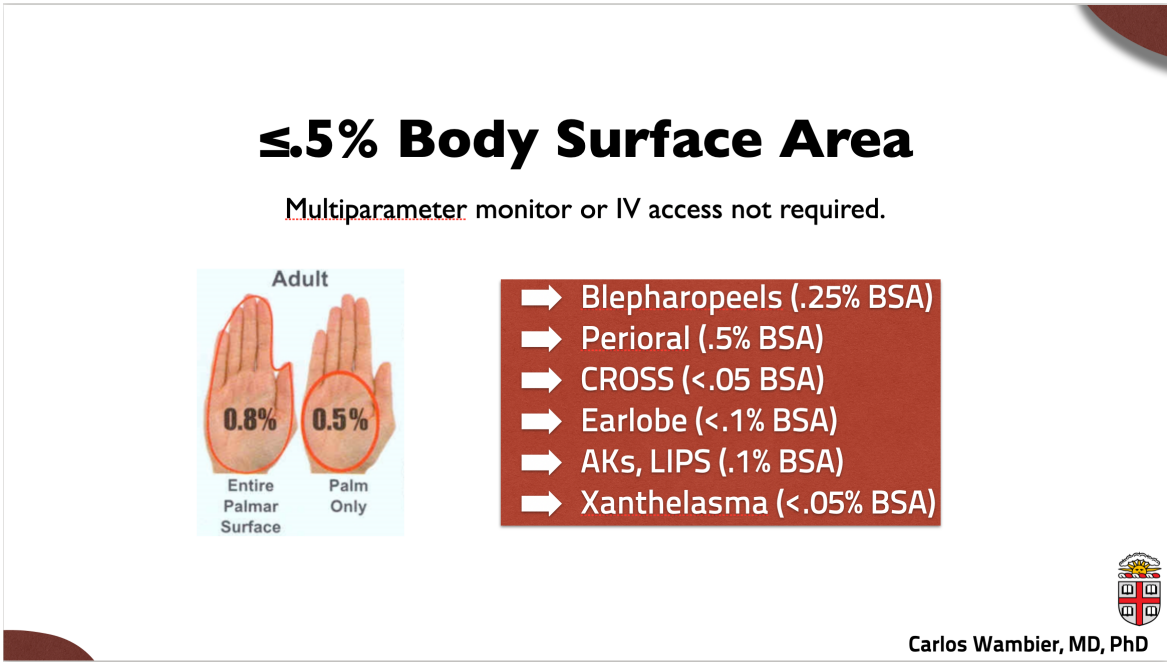

Figure 3 - Estimation of body surface area for minimal area procedures. CROSS: Chemical reconstruction of scars; AK: Actinic keratoses. Entire palmar surfaces vary from 0.8% to 1% based on ethnicity and effort for approximating all fingers for the face.

Safety Pauses

- Safety pauses of at least 10 minutes are the standard-of-care and are given after each 0.5% body surface area (BSA) or cosmetic unit is completed.
- Such safety pauses are important to allow urinary elimination of chemicals and to allow the QTc interval prolongation caused by phorbol esters to return to baseline.[13]
- Using a single safety pause in peels of up to 1% BSA make such segmental peels extremely safe,[3] **Fig.2**. Thus, the use of a multiparameter monitor is not a requirement, but may be used in selected patients per clinical decision based on age, and use of medications.[10]

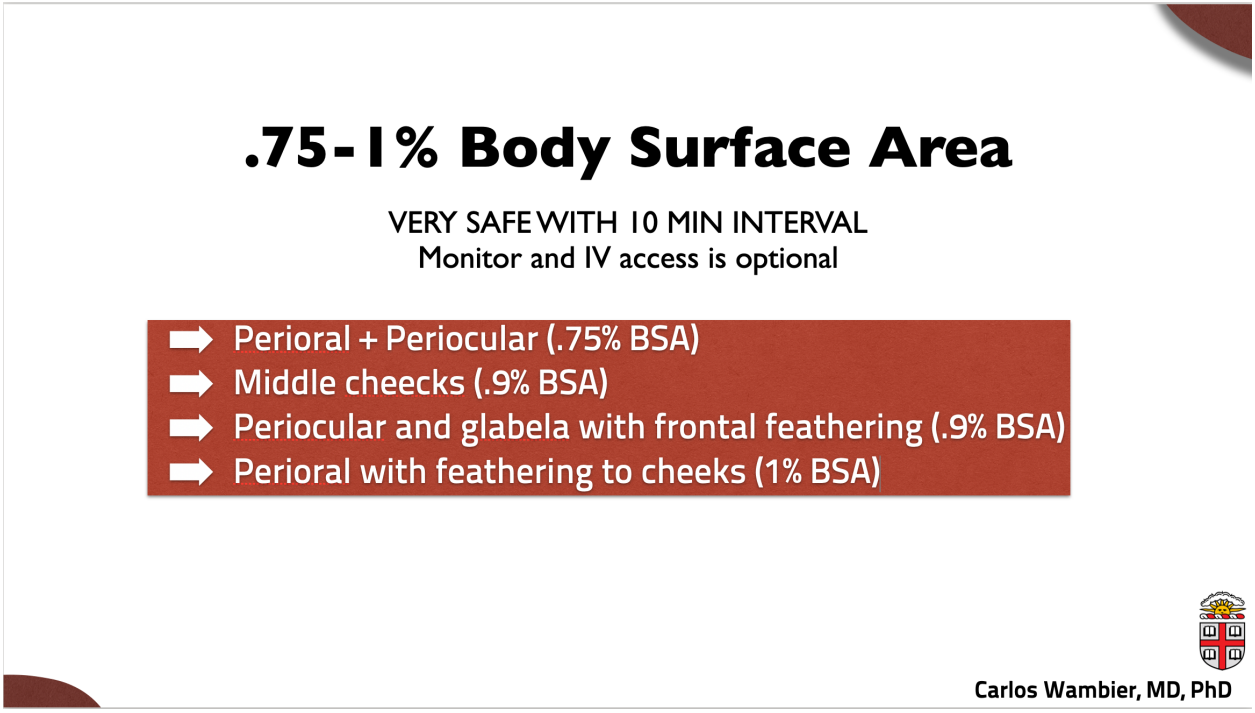

Figure 4 - Estimated areas for procedures of 0.75-1% body surface area (BSA)

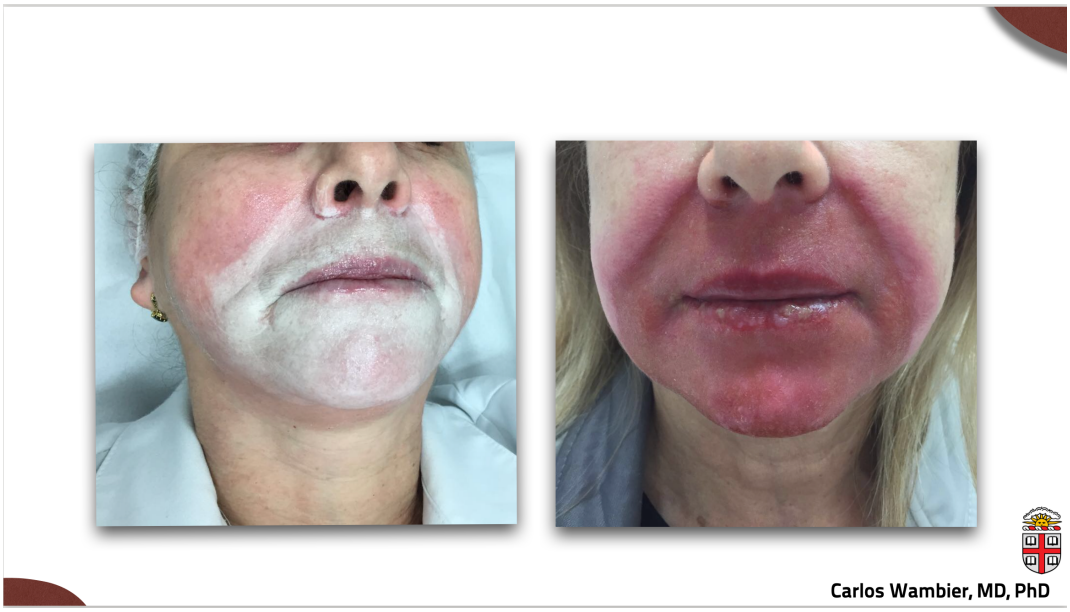

Figure 5 - Example of a procedure of 1% BSA (perioral with feathering to the cheeks).

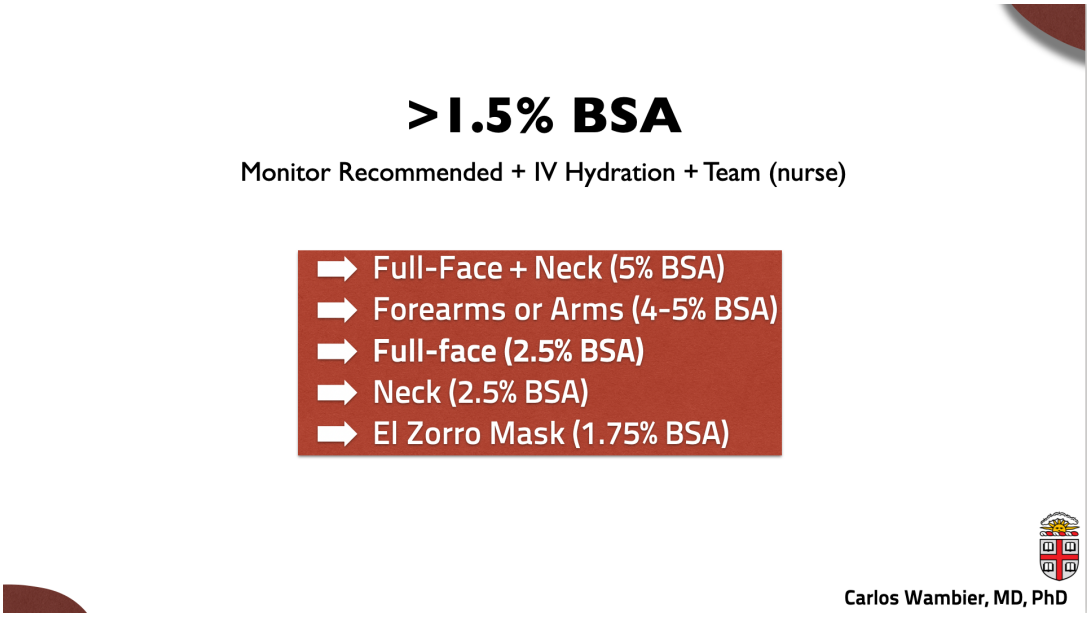

Figure 6 - Estimated areas procedures over 1.5% body surface area (BSA). El Zorro Mask refers to full forehead with perioccular area and temples, feathered to mid-cheek and nose tip.

Patient selection

Psychological, nutritional, cardiorespiratory is the basic screening for selection. The patient's medication list is checked for potential of QTc prolongation and risk of torsades de pointes (TdP) in the registry of QTc medications classified by risk, the only available reference to date is a free smartphone app and website called CredibleMeds®. A history of respiratory diseases such as asthma, COPD, previous known cardiac, renal, or hepatic dysfunction is carefully taken. Other important aspects of screening include previous evidence of effective wound healing, inflammatory or autoimmune history, financial situation, family support, personal hygiene is evaluated carefully. If patient is not an ideal candidate, minimal area procedures are considered by case-by-case evaluation. **Pre-op clearance by cardiology or the patient's primary care clinician will be obtained on a case-by-case basis.** However, if a patient needs a pre-op clearance, they likely have contraindication to the procedure and will be screened out in the pre-op evaluation. One example of a situation that might require cardiologic evaluation and clearance: a patient that has frequent Premature ventricular contractions (PVCs), which might be chronic, which preserved heart function and capacity, a cardiologist can evaluate the case before a decision is made by the surgeon. In cases where there are questions about the safety, it is prudent to select other procedures that don't impose cardiac risks. Such as microneedling or laser.

Absolute contraindications: [10]

Active infection; severe psychological conditions: suicidal ideations, non-controlled depression, recent history of legal or illegal substance abuse or dependance (drugs, alcohol, benzodiazepines, opioid, tobacco), psychosis, dementia; recent episode of dyspnea or decompensated cardiovascular disease, hypertension, chronic obstructive pulmonary disease (COPD), or diabetes; uncontrolled cardiac arrhythmia or QTc>475ms; improper wound healing (keloids or recent unexplained dehiscence), use of immunosuppressor, acquired immune deficiency syndrome (AIDS), severe autoimmune disease such as lupus erythematosus, pemphigus, scleroderma, dermatomyositis, Behçet's disease, pyoderma gangrenosum, sarcoidosis, recent surgery (less than 6 months: cataracts, facial plastic surgery, cardiac surgery, etc.); malnutrition.

Relative contraindications: [10]

Thick or phymatous skin, thin or fragile skin, Fitzpatrick skin type 5 or 6, active skin neoplasia (melanoma or non-melanoma skin cancer), frontal fibrosing alopecia (controversial), active lichen planus, recent bariatric surgery, pain intolerance, dependent of others for personal care, personality disorders, in use of isotretinoin (controversial) mild tobacco use, controlled cardiac arrhythmia, controlled asthma or COPD, diabetes, hypertension. Herpes simplex of frequent recurrence, any disease under current investigation or uncertain diagnosis, QTc between 450 and 475ms.

Baseline screening for all procedures > 1% BSA

- Baseline ECG: reporting QTcF <475ms, no detectable arrhythmia.
- CBC, ALT, AST, and a Basic Metabolic Panel within normal limits.

Procedure day screening

A screening is performed before the chemosurgery for respiratory, gastrointestinal or cutaneous infections.

Hydration

Adequate hydration is fundamental in all procedures for adequate urinary elimination of the chemicals and fast recovery from possible phenol intoxication. Oral isotonic fluids, water and normal diet is recommended (with no restrictions).

- Intravenous fluids are mandatory for procedures over 1.5% BSA (over half of the face).[10]
- Intravenous fluids may also be used for patients that have nausea, such as triggered by anxiety or medications.
- Intravenous hydration is performed with Ringer's Lactate. For every 1.5% BSA 500mL of IV fluids is administered.

    - -500mL is used for 1.5% BSA (over 30 min of procedure time);
    - -1000mL for 2.5-3% BSA (full face, over 1h of procedure time);
    - -1500mL is used for up to 5% BSA (over 2.5h of procedure time).

Urination: Due to IV volume, after 500mL or when the patient feels the bladder full, during the next 10 min safety pause (also see above section on Safety Pauses) the patient is allowed to open their eyes after placed in a sitting position and having tears dried with cotton-tipped applicators or gauze. The patient is then allowed to stand-up with assistance if needed, and is guided to the nearest restroom for a urination pause. No urinary catheter is used during the procedure and patients are fully awake and non-sedated to walk and have their privacy respected while they are in the restroom. The area previously peeled is pat dried with a gauze and is covered with Vaseline.

Patient Monitoring

- All patients are monitored for signs or symptoms of phenol intoxication: changes in speech and alertness, and changes in vital signs.
- Minimal-area procedures (<0.5% BSA): visual monitoring and conversation with the patient is performed for extremely small surface areas: such as lips, upper lip, touch-ups, chemical reconstruction of acne scars or earlobes, blepharopeeling.[10]
- For a full segment or cosmetic unit: BSA 0.5%-0.75%: such as perioral or periocular + glabella + nose peels, the required monitoring includes: blood pressure every 10 min, heart rate and rhythm (the procedure takes approximately 15 minutes). If a multiparameter monitor is available it might be used to facilitate automatic monitoring, at the discretion of the surgeon.

- BSA 0.75-1% the use of a pulse oximeter is recommended. Continued ECG monitoring is optional.
- BSA 1-1.5% the use of a pulse oximeter is mandatory. Continuous ECG monitoring is recommended.
- BSA ≥1.5%, continuous multiparameter (including ECG) monitoring is required.[10]

Continuous ECG monitoring

Patients at increased risk for arrhythmic events include those that take numerous medications and are of older age. Also, procedures that take over 30 minutes of duration or over 1.5% BSA place patients at increased risk for arrhythmic events. For these scenarios, continuous monitoring provides instant awareness of the rhythm, and ensures:

- Verification of baseline sinus rhythm. An example of Atrial Flutter found in the pre-op period that resulted in canceling the procedure is given in **Fig.7**.
- Early Identification of asymptomatic conduction changes, such as: increased frequency of PVCs.

Additionally, the following should also be performed for increased risk patients/procedures:

- Extension of safety pauses in case minimal ECG changes are detected.
- Increased hydration may also be considered, such as .[10]
- ECG, BP, HR and pOx are monitored until 10 minutes post-op.

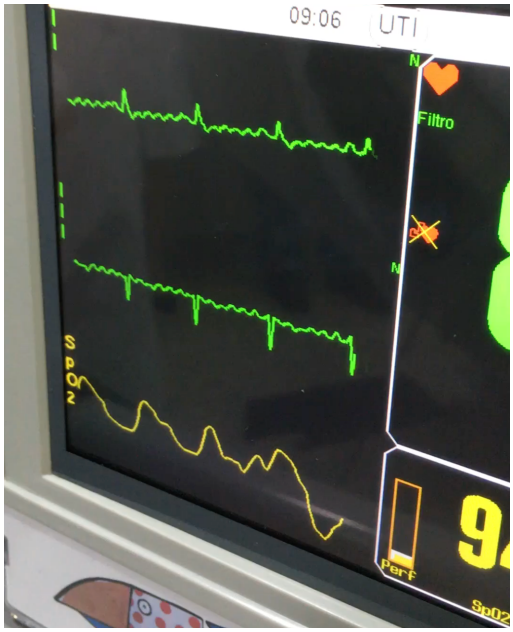

Figure 7 - Asymptomatic left atrial flutter with pulse/ventricular rate of ~80bpm heart. This was detected as the baseline rhythm before initiating the chemosurgery. The surgery was cancelled and the patient was referred for urgent cardiology evaluation.

Medications

Herpes prophylaxis

- HSV/VZV prophylaxis is initiated with Valacyclovir 500mg TID until complete healing occurs, independent of previous herpes history. For patients with history of frequent eruptions it might be initiated 2 days prior the surgery. For patients with low risk, it might be initiated immediately after the procedure.

Pain control

- 2 tablets of Naproxen 220mg 2 hours before the procedure, followed by 1 tablet every 8 hours during the first day only. Acetaminophen 500mg every 6 hours (max of 2gm per day) may be used as needed.
- The use of a fan for the first 6-8 hours is recommended and cold compresses may be used. Topical lidocaine 2% may be used, limited to 2 fingertip units (1 gram of the ointment containing 20mg of lidocaine) every 4 hours during the first 24 hours.
- For selected patients, intravenous analgesia may be used. 10mg of **morphine sulfate** is reconstituted to a total of 10mL with 0.9% NaCl in a 10mL syringe. 1mg (1mL) in one minute may be used in the beginning of the procedure and may be repeated if necessary. Usually, 2mg are used in a full face and neck procedure to achieve adequate analgesia.
- When adopting morphine, each bolus can be injected in at least 30 seconds. receive one bolus in approximately 30-60 seconds. With a pause of at least 5 minutes between each 1mg bolus. Alternatively, 1-2mg of morphine may be added in every 500mL of Ringer Lactate for a very slow infusion. The use of morphine is to be limited to a maximum of 5mg total dose to avoid post-operative nausea and vomiting.

Nausea or vomiting

- Ondansetron 4mg sublingual is prescribed if needed at home and instructed to be used only in case of nausea or vomiting for peels that exceed 1% body surface area.
- If patients present nausea and have an IV access, ondansetron 2-4mg may be used IV over 15 minutes, while monitoring the continuous ECG.

Sleep aid and procedural anxiety

- Melatonin 10mg is prescribed for the 5 nights after procedure and may be used 2 hours before the chemical peel for pre-procedural anxiety. Melatonin is preferred over conscious sedation with benzodiazepines due to reduced risk of motor impairment.

Arrhythmia prophylaxis

- No routine drug prophylaxis for arrhythmic events is currently advised.
- The prophylaxis of arrhythmia is performed by proper patient screening, selection of proper medications to be used in the intraoperative period. Avoidance of concomitant use of drugs that prolong QTc, comply with standard safety pauses, adequate technique and training of the surgeon.[1]

Anesthesia or sedation

- General anesthesia or sedation are **not recommended** due to difficulties in monitoring early signs of phenol intoxication, such as speech / motor impairment.
- Sedation and general anesthesia are avoided due to impairment of natural protective reflexes (tearing reflex, cough), which are useful to detect unwanted exposure to chemicals in the conjunctiva or airways.
- Sedation interferes with the ability of the patient to follow important safety commands given by the surgeon such as: "Keep eyes closed during the procedure. Please tell me if you want to open your eyes so I can prepare the skin around the eyes." Or: "Do not lick your lips. Keep your tongue in a fixed position (roof of the mouth). I will apply the formula over your lips".
- In exceptional cases of patient known anxiety or intolerance for pain, accommodations may be placed for exceptional anesthesia or sedation in an outpatient surgery center, which may include overnight stay for management of pain, sedation, and supervised feeding during the first post-operative day, such accommodations are billed separately from the peeling procedure, since they are negotiated with third party (hospital or outpatient surgical center).

Life Support Requirements

- **<1.5% BSA:** BLS training of the surgeon and staff is mandatory, as well as a crash cart equipped with basic BLS requirements for office that administer injectable medications (such as Botox, Biologics): automated external defibrillator (AED), oxygen, epinephrin, anti-histamines, and other equipment for basic life support, such as adult resuscitator with bag.

- **≥1.5% BSA:** ACLS training of the surgeon and staff is mandatory, as well as a crash cart equipped with a defibrillator and medications, such as magnesium sulfate, lidocaine, amiodarone, atropine, among others.

NOTE: serious cardiac events with phenol-croton peels are very rare when the appropriate safety protocols are in place. In the rare episode that a cardiac event does occur, the BLS or ACLS protocol will be activated, and depending on the severity of the event or the need for emergency cardiologic evaluation, the patient will be transferred by an ACLS-equipped ambulance to the closest available Emergency Department, through calling 911.

Defibrillators are to be utilized at the clinic as soon as a cardiac arrest is detected, through AED or Manual Defibrillator equipped with ECG monitor, following ACLS guidelines.

Acute stable conditions may be managed locally.

In case a stable condition does not resolve following the ACLS guidelines or spontaneously, the patient is to be transferred by an ambulance to the closest Emergency Room.

8. Procedure

Formulation

The standard formulas used are composed of mixtures of distilled water, phenol, Croton tiglium oil, and an emulsifier agent (Novisol).[4,5,14,15] The mixtures containing 35% phenol and 0.1 to 1.6% croton oil are known as Hetter's standardized formulas (**Table 1**).[1] The formula is prepared immediately before application by the dermatologist, and the formula is used for a single patient. Novisol is the preferred emulsifier agent due to emulsion stability and better homogenization of the formula,[5] which provides more uniform results and control by the surgeon.[14] Emulsifier agents that provide unstable emulsions are not recommended.[16]

Hetter's formulas were derived from the classical Baker-Gordon's formula and provide strength titration based on the concentration of croton oil.[17] Hetter's formulas have been adopted as the standard since 2000 due to improved safety and more natural results,[8] which are achieved by using reduced amounts of active chemicals.[1] Other commercial formulas are also used outside the United States, however, they have not been studied as broadly. [18] The standardized formulas adopt a 4% Croton oil in phenol stock (Hetter's stock) to avoid measurements inconsistencies that may occur by using a dropper to count drops of croton oil, as previously described in Baker-Gordon's formulas and Hetter's 1996 formulas.[1] The phorbol esters present in Croton oil cause the post-operative neutrophilic inflammation that is associated with the future development of the thick neocollagenesis band, while phenol is responsible for the epidermal and superficial dermis coagulation.[19]

Table 1. Hetter's phenol-Croton oil standardized formulas containing 35% phenol in 10mL.

	Very heavy	Heavy	Medium	Light	Very Light
Croton oil concentration	1.6%	1.2%	0.8%	0.4%	0.1%
Hetter's stock*	4 mL	3 mL	2 mL	1 mL	0.25 mL
Liquified Phenol	0 mL	1 mL	2 mL	3 mL	3.75 mL
Distilled Water	5.5 mL	5.5 mL	5.5 mL	5.5 mL	5.5 mL
Novisol	0.5 mL	0.5 mL	0.5 mL	0.5 mL	0.5 mL

*Hetter's stock: 1 mL of *croton* oil mixed with 24 mL of liquified phenol (at least 89% phenol in water). 4% *Croton* oil in phenol. Each mL of Hetter's stock contains 0.04 mL of *Croton* oil, resulting in 0.4% increments in *croton* oil concentration in formulas containing a total of 10mL**.**

Application

Before initiating the procedure, the targeted area is cleaned with a make-up remover wipe or by washing the face with running water and a mild liquid soap or cleanser. The clean skin undergoes topical anesthesia with a easy-to-remove 4% lidocaine cream for 30 minutes to maximize patient comfort. After removing the topical anesthetic with make-up remover wipes or by washing the face with running water and soap, the skin is fully degreased with isopropanol in acetone solution, such as "Delasco Peel Prep".

The application of phenol-croton oil formulas is performed with cotton-tipped applicators that contain a handle, such as the Wambier-Simão blade,[14] over facial segments, named cosmetic units: Cheeks (2 units), Periocular (1 unit), Forehead (1 unit), Perioral (1 unit). The nose is not considered a distinct cosmetic unit, and the cartilaginous tip is included in the perioral unit and the bony nasal area is included along with the glabella in the periocular unit. Each cosmetic unit usually takes approximately 10-15 minutes to be peeled. Upon the application the skin proteins coagulate throughout the epidermis, superficial and mid dermis. The skin becomes bright white, this appearance is caused by reflection of light by coagulated proteins is termed "Frosting". The level and duration of the frosting corresponds to the depth of injury achieved by the chemicals and is proportional to the concentration, volume, friction, and number of passes. The applicator's saturation, shape of applicator and the pressure applied modify the penetration of the formulas, and achieved the desired endpoint.

Monitoring requirements

<1.5% Body surface area (BSA): For each 1% BSA or 2 cosmetic units, the procedure takes about 30 minutes. Intravenous access and multiparameter monitoring are optional due to well-known systemic safety.[3,14] Such procedures can be performed safely with oral hydration and monitoring vital signs.

≥ 1.5% BSA: For larger procedures, such as full-face procedures or procedures over 1.5% of the body surface area, multiparameter monitoring and intravenous hydration is required. The estimated duration time of a full-face phenol-croton oil peel is approximately 90 minutes, because the procedure is performed at each facial unit (10 minutes), with safety pauses of 10 minutes between them (10-15 min X 5 units) + (10 min X 4 pauses) = 90 to 115 min.

Operating Procedures

≥1.5 BSA procedure (full-face)

Duration: This procedure takes approximately 2 hours.
Execution: Dermatologist with the assistance of a medical assistant (surgical technologists or RN).
Materials:

- Crash cart
- Electrocardiograph
- 70% Isopropanol
- Acetone
- Sterile gauze pads
- Cotton tipped applicators
- Disposable surgical caps
- Disposable electrodes
- Material for intravenous insertion of vascular access devices
- PPE (gloves, mask and scrubs).

Procedure:

- Room the patient and explain the procedure.
- Receive a signed consent, previously given to the patient at a pre-peel consult.
- Check if patient took and has prescribed medications:
  - Valacyclovir
  - Pain medication
    - Has anti-nausea medication at home
    - Has sleep aids at home
- Perform a 12-lead ECG print-out reporting QTcF (according to SOP). Proceed if ECG shows sinus rhythm, normal heart rate, and a QTcF<475ms (physician checks):
- Place disposable surgical cap (all hair in). Ask if patient wants to use restroom;
- Remove jewelry, makeup, sunscreen with hypoallergenic make-up remover.
- Take standardized photography: Frontal, Left and Right Profiles;
- Apply topical anesthetic (4% lidocaine cream), leave on from 15-60 minutes;
- Sit patient in the procedure chair, recline, verify if patient position is comfortable;
- Initiate monitoring with ECG electrodes, pOx, NiBP every 10 minutes.
- Make baseline note of measurements.
- Secure intravenous access (according to SOP) and initiate IV hydration with Ringer's Lactate, 1L per hour;
- Assist the physician, monitor vital signs, and ensure IV access is maintained;
- 10 minutes after the end of the peel, make after procedure note of vital signs and pOx. If all vital signs are stable, remove monitor and perform the second (post-procedure) 12-lead ECG (according to SOP).

- After authorization of the physician, remove the IV access (according to SOP).
- Give written instructions of post-op care with the cell phone of the physician.
- Ensure the next visit is scheduled, take patient to the restroom, and to the exit to the companion friend or family member who will drive back home or to hotel.
- Dispose the materials in respective recipients, and clean-up the room;
- Wash vials with PPE, perform hand hygiene;
- Upload the 2 ECGs (pre and post-procedure ECGs) with the physician signature and consent form to EMR.

<1.5% BSA procedure (1-2 cosmetic units)

Duration: This procedure takes approximately 1 hour.
Execution: Dermatologist with the assistance of a medical assistant.
Materials:

- 70% Isopropanol or 70% Ethanol
- Acetone
- Sterile gauze pads
- Cotton tipped applicators
- Disposable surgical caps
- PPE (gloves, mask and scrubs).

Procedure:

- Room the patient and explain the procedure.
- Receive a signed consent, previously given to the patient at a pre-peel consult.
- Check if patient took and has prescribed medications:
  - Valacyclovir
  - Pain medication
    - Has anti-nausea medication at home
    - Has sleep aids at home
- Place disposable surgical cap (all hair in). Ask if patient wants to use restroom;
- Remove jewelry, makeup, sunscreen with hypoallergenic make-up remover.
- Take standardized photography: Frontal, Left and Right Profiles;
- Advise the patient to drink 1 cup of isotonic fluid or water;
- Apply topical anesthetic (4-5% lidocaine cream), leave on for 15-30 minutes;
- Sit patient in the procedure chair, recline, verify if patient position is comfortable;
- Initiate monitoring of HR and rhythm, pOx, NiBP every 10 minutes.
- Make baseline note of measurements.
- Assist the physician, monitor vital signs;
- After the end of the peel, revise the post-operative routine with the patient;
- Make after procedure note of vital signs and pOx. If all vital signs are stable, remove pulse oximeter and cuff.
- Give written instructions of post-op care with the cell phone of the physician.
- Ensure the next visit is scheduled, take patient to the restroom, and to the exit to the companion friend or family member who will drive back home or to hotel.
- Dispose the materials in respective recipients, and clean-up the room;
- Wash vials with PPE, perform hand hygiene;
- Upload consent form to EMR.

Post-operative period

Pain and edema are expected in the first 12 hours after the procedure, followed by exudation and crusts over the week after the procedure.

During the first week of follow-up of patients who have undergone previous procedures, teledermatology follow-up may be appropriate in certain situations, however the dermatologist direct evaluation of the healing period, at least in two days during the first week of healing is recommended. For procedures of minimal areas with minimal risk of infection, such as lip peels, or focal actinic keratoses chemabrasion, no follow-up is required in the first 7 days, and the patient is instructed to call if intercurrences, questions or concerns arise.

Standard first week of wound care and follow-up

Before the peel, patients are instructed to acquire a kit of post-operative skin care. The standardized method is intended to provide safety regarding potential irritants and allergens present in over-the-counter “healing ointments”.

Patients are evaluated specifically for signs of improper wound healing, prolonged healing, signs of infection, proper use of medications. For wound care, petrolatum or poloxamer-188 gel base mask with low concentration lidocaine hydrochloride with or without bismuth subgallate applications, as needed are recommended, a non-absorbing antimicrobial method may also include the use of micronized silver in ointments such as petrolatum or squalane. The use of products containing lanolin is avoided.

After 12h of the peel, the patient is allowed to perform soaks with mildly acidic solutions, such as a solution containing boric acid, sodium hyaluronate and 0.9% benzyl alcohol (standard method). Alternatives include using Bacteriostatic Water for injections (0.9% benzyl alcohol, Hospira) for the soaks or diluting apple cider vinegar (2 teaspoons [10mL]) in 8oz [240mL] of fresh water, or 0.02% hypochlorite solution. Followed by the occlusive mask for wound care.

After 24h of the peel, the patient is allowed to wash the face with the 0.006% sodium hypochlorite foam, a standardized method, or hypoallergenic cleansers (alternative). The hair may be washed with Baby Shampoo or a mild, hypoallergenic shampoo.

Standard management of adverse events:

If the skin has signs of infection, systemic antibiotics are used: preferably Cefaclor (2nd generation cephalosporin), or for those allergic to cephalosporins or penicillin's, Sulfamethoxazole-trimethoprim. Recommended antibiotics have gram-positive (*Staphylococcus aureus*) and gram-negative (*Pseudomonas aeruginosa*) antibacterial activity. If delayed healing is noticed, topical super potent corticosteroids are used, such as clobetasol. After epithelization, symptomatic erythema is noticed, it is managed with Pulsed-dye laser. If indurated areas are noticed, resistant to clobetasol, the areas are injected with Kenalog 5-10mg/mL. If scars are noted, the areas may be injected with Kenalog at higher concentrations, or associated with injectable Fluorouracil or Bleomycin, and patients are followed closely. Therapy of scars is to be initiated as soon as they are noted.

After the epithelization period, the skin becomes red or pink for approximately 2-5 months. Blotchy brown discoloration may occur at 1-month post-peel, and usually fades spontaneously or with the recommended regimens and dermatologist follow-up of 3-6 months.

The use of tinted sunscreen is recommended for red or brown areas, for the next 6 months, or until the skin returns to a natural color. During this period, monthly in-person visits are recommended for patients within reasonable travel distance. Otherwise, tele-dermatology follow-up may be used.

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