Review Article

# Treating Vitiligo at the Angle of Lips: A Narrative Review

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## Abstract

Vitiligo is a common autoimmune depigmentary disorder seen among Indian patients. It has a significant impact on the self-esteem of the patient. Specific sites including acral areas, joints, and lips are usually resistant to medical therapy and thus transfer of melanocytes is mandatory for the treatment. Vitiligo at the angle of lips is distinct from the vitiligo on other sites, with respect to response to therapy, lack of hair follicles, and high mobility of the area. Our aim was to review the various therapeutic modalities available for the treatment of vitiligo at this site. In our narrative review, we searched databases including PubMed, Google Scholar, and EBSCO with a full strategic search with keywords "Vitiligo," "leucoderma," "mucosal vitiligo," "lips," "labial," "angle of lips," "Minipunch grafting," "Suction Blister epidermal Grafting," "SBEG," "Micropigmentation," "tattooing," and "Excision" from 2005 to 2021. The relevant articles were extracted and included in the review. Various modalities including suction blister grafting, miniature punch grafting, split-thickness grafting, and micropigmentation have been reviewed with their advantages and disadvantages. Various potential modalities of therapy have also been proposed in the review.

**Keywords:** Angle of lips, excimer laser, micropigmentation, minipunch grafting, SBEG, split-thickness grafting, vitiligo

## Introduction

In his 1936 correspondence, dermatologist Dr. Douglass Montgomery said, "Vitiligo, except for the disfigurement it causes, is an uninteresting disease, as it is easily diagnosed, is an indication of no other known trouble and is in most instances absolutely refractory to treatment." Approximately 85 years later, we disagree since present-day options for surgical treatment of vitiligo have made it more interesting than ever before.[1]

Vitiligo is a depigmentary disorder with a complex pathogenesis due to the autoimmune destruction of melanocytes in the skin, eyes, and mucosa. It has a high psychological and social impact on the life of the patient. Especially when it affects cosmetically concerning areas such as lips and hands. The disease affects approximately 0.5%–1% of the world's population, of which 16.39% of cases show lip involvement.[2,3]

Lip vitiligo has a peak age of onset in the second decade of life with a mean duration of illness of 21.46 months. It may manifest as acrofacial, periorificial, lip-tip, focal, and lateral lip vitiligo.[4]

Vitiligo over the mucosal regions is difficult to treat due to the paucity of melanocyte reservoirs. Pharmacological treatment has commonly been tried with topical and systemic corticosteroids, immunomodulators such as calcineurin inhibitors (tacrolimus and pimecrolimus), phototherapy, and psoralens, but medical therapy is usually ineffective due to dearth of melanocyte reservoir.[5] Comparatively, other areas are more responsive to treatment with the presence of melanocytes in the lower part of hair follicle and over the outer sheath, which are spared in the primary disease.[6] This aspect of vitiligo emphasizes the need for surgical treatment over mucosal areas including angle of lips making it the first line of treatment as recommended by Njoo *et al.*[7]

For our narrative review, a search on PubMed, Google Scholar, and EBSCO databases, with a full strategic search was done with the following keywords "Vitiligo," "leucoderma," "mucosal vitiligo," "lips," "labial," "angle

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of lips," "Minipunch grafting," "Suction Blister epidermal Grafting," "SBEG," "Micropigmentation," "tattooing," and "Excision" from 2005 to 2021. Two reviewing authors analyzed the extracted searches and included the relevant articles for consideration.

## Discussion

Vitiligo on lips may occur as a focal variant or may be associated with other types of vitiligo.[8]

The aim of treatment in an angle of lip vitiligo is to restore uniform repigmentation with cosmetically acceptable results considering that the primary need for treatment is the patient's appearance and the burden of social stigma.[9]

The various theories explaining pathogenesis of vitiligo include autoimmune destruction, cytotoxic mechanism, intrinsic defects of melanocytes, and antioxidant mechanisms. Another possible mechanism is melanocytorrhagy, when the melanocytes are predisposed to mechanical, chemical, and oxidative stress whereby depigmentation occurs due to chronic detachment of these melanocytes.[10]

Pure mucosal vitiligo accounts for 2.3% of total vitiligo cases and angle of lip accounts for approximately 12%–17% of total mucosal vitiligo cases.[3,11]

Anatomically, lips are lined externally by skin and internally by mucosa. The vermillion area has melanocytes and vessels, but is deficit in hair, sweat glands, and salivary glands.[8] Any surgery at the angle of lips is aimed at maintaining the oral seal while preserving the sphincter function. Minor disruption of vermillion border, lip notching, or other malalignments pose a significant aesthetic concern among patients especially over angle of lips, so a cautious planning of the surgical procedure is mandatory to avoid any distortion of margins. The incisions should be limited to a single cosmetic unit in order to achieve a minimal appearance. The incision lines should be either oriented within the natural vermillion border or angled radially along relaxed skin tension lines.[12]

Another challenge faced while treating the labial commissures is the inability to achieve immobility. The fibers from the inferior and superior parts of orbicularis oris muscle interweave and intersect with other extrinsic muscles (buccinator, zygomaticus, risorius, and depressor labii inferioris) and get inserted into modiolus, which is a complex cone-shaped structure present at the angle of mouth. Thereofore, postoperative instructions regarding the minimal talking and facial movements for 72 h are mandatory to achieve better results. In addition, avoidance of use of straws for 7 days postoperatively and antibiotics to prevent local infection is foremost to achieve better cosmetic results.[13]

As vitiligo on lips is usually resistant to medical therapy due to absence of hair follicles and melanocytes reservoir. The first-line therapy in lip vitiligo is autologous melanocyte transplantation or micropigmentation.[14,15]

Surgical treatment options for lip vitiligo include:

- Techniques involving melanocyte transfer:
  - Minipunch grafting
  - Split-skin thickness grafting
  - Suction blister epidermal grafting
  - Ultrathin split-thickness skin graft
  - Hair follicle grafting.
- Techniques not involving melanocyte transfer:
  - Micropigmentation
  - Excision and closure
  - Dermabrasion
  - Lasers (excimer laser)
  - Therapeutic wounding (chemical cauterization)

Of all the tissue grafting methods, suction blister epidermal grafting (SBEG) and ultrathin split-thickness skin graft carry only the epidermis and hence are suitable for sensitive areas like angle of lips.[16]

Various therapeutic modalities, their reported use, and their advantages and disadvantages have been summarized in Tables 1 and 2.

### Suction blister epidermal grafting

SBEG is an established and successful modality of vitiligo surgery. It was first described by Dr. Rafael Falabella in 1971, with successful repigmentation at various sites.[17]

It involves the transfer of active melanocytes to the depigmented region through blister induction and separation of epidermis.[18]

The advantage of using blister grafts is that these thin blister grafts can easily adapt the characteristics of the recipient site as compared to split thickness grafts where the grafts do not adapt to the recipient site, and cause scarring and contraction instead.[19]

Blister grafting in vitiligo is a simple procedure and does not require any extensive setup.[19] It is a multistep technique that requires precise handling of the graft. A blister is formed from the donor site using a suction apparatus and is then removed and transferred to the dermabraded recipient site.[20]

SBEG is safe for use in sensitive areas like angles of the lips. In a report to assess the prognostic factors for graft success, Darlene Gou concluded that younger patients show better pigment spread with more robust release of cytokines and growth factors that stimulate melanocyte activation.[2]

Kar *et al.* in their experience of 112 cases, reported SBEG as an efficacious, easy, cost-effective method for the treatment of vitiligo at angles of lips with complete repigmentation in majority of the patients at 6 months follow-up.[11] Most common side effects of the procedure was pain during the infiltration of local anesthesia and hyperpigmentation of the donor site.[2] Other reported

**Table 1: Advantages and disadvantages of various surgical procedures on angle of vitiligo**

| | Advantages | Disadvantages or limitation | Author comments |
|---|---|---|---|
| Suction blister epidermal grafting (SBEG) | Excellent cosmetic results, easy and safe procedure with less side-effects. | Time consuming procedure, ecchymosis, post-inflammatory hyperpigmentation. | Best cosmetic results. |
| Minipunch grafting (MPG) | Economical, fastest and easiest procedure. | Cobble stoning, graft rejection, polka dot appearance, depigmented junctional zone and scarring. | Can be used for smaller areas. |
| Micropigmentation (Tattooing) | Simple day-care procedure, Not time consuming.<br>Rapid results. | Colour mismatch, Leaching and colourfades with time. Requires instrument | Best results in darker skin types.<br>Suitable for Small, localised lesions. |
| Split-skin thickness grafting | Instant coverage of large areas over short period.<br>Inexpensive procedure.<br>No cobble stoning | Prolonged hyperpigmentation in darkly pigmented individuals and achromic fissures between the grafts.<br>Surgical skills required for grafting. | High success rates amongst all the grafting procedures for vitiligo. |
| 308 Excimer laser | Effective as monotherapy. | Latency period for positive results may be delayed. Costly procedure. | |
| Surgical excision and closure. | Effective with results in a single sitting. | Needs expertise for the suturing. | Better for thin depigmented patches covering less than 1/3rd of the lip. |
| Therapeutic wounding (chemical cauterisation with 88% phenol or 50% TCA, liquid nitrogen cryosurgery, laser ablation.) | Easy procedure, minimal expertise or instruments required. | Post inflammatory pigmentation, scarring. | Suitable for treatment of darker lips. |

side effects include perigraft halo, wrinkling of the graft and displacement of graft.[16]

Over the last few years, with increasing frequency of SBEG use in daily practice, several innovations have been developed that allow shorter procedural time with better results. Singh *et al.* showed the use of a 2ml disposable syringe for easier graft transfer to the recipient site, doing away with the need of a glass slide for graft transfer. The advantage of this method are that the graft does not curl while transferring and there is no confusion about the dermal side.[21] Arora *et al.* showed the use of a hair dryer in decreasing the time taken for blister formation. The authors heated the donor area to 44 degrees Celsius and observed a decrease in mean time from 121 ± 6.2 min to 69.9 ± 5.4 min. The heat causes protein denaturation and facilitates separation at the dermo-epidermal junction.[20]

Various authors have shown different techniques for formation of epidermal grafts including use of "Hijama" cups and suction pumps.[22,23] Other alternatives used in the past include double-syringe device connected to three-way cannula, modified conventional respiratory or gastric suction pump, increasing the suction pressure to 100 mm Hg on appearance of small vesicle.[24,25]

Various modalities have been used to obtain a better-dermabraded recipient site, including application of liquid nitrogen, PUVA 2 days prior to the procedure and ultrasonic abrasion.[26]

Lee *et al.* showed a 1.5–2 times higher number of melanocytes and better results with PUVA-treated donor site as compared to the normal skin.[27]

Hanafusa *et al.* used intradermal injection of normal saline or local anesthetic agent to decrease the time taken for blister formation.[28]

Ashique *et al.* have shown the use of half regular size slide (1.5 × 1 inch) for placement of grafts. They reported that the cut slide has an advantage of easy maneuvering over the areas like angle of lips.[29]

The use of butter paper for splitting the graft and better usage of graft has been reported by Ashique *et al.* However, this technique requires expertise.[30]

Subramaniyam *et al.* showed use of aerosol spray as an easy and convenient way of retaining grafts in place after SBEG. In their report of four patients, the authors used aerosol spray containing polyvinyl polymer, cetrimide, and benzocaine at a distance of 4½ to 5 inches over the graft till it formed a thin film for fixation of graft.[31]

Laxmisha *et al.* addressed the issue of graft displacement over the treatment of mobile areas like lips and labia, which might cause hindrance in graft uptake. The authors used a surgical tape to cover the blister graft. It is hypoallergenic and porous thus extrudes any discharge. The authors used 3 strips parallelly with a slight gap between them to allow oozing and bleeding and covered these with 2 strips placed in a criss-cross pattern. The dressing and strips were removed after 7 days. The authors used this technique in 3 cases and concluded that it supports wound closure and also acts as a dressing material.[32]

Gupta *et al.* used recipient site blister as a biological dressing and sealed the margins of the graft with cyanoacrylate gel

**Table 2: Various studies on non-medical treatment of lip vitiligo**

| S. no. | Treatment modality | Mechanism. | Authors | Type of study | Results | Remarks |
|---|---|---|---|---|---|---|
| 1 | Suction blister epidermal grafting | Formation of an Epidermal graft using suction device and Transfer of the grafts which adopts the characteristics of the recipient site. | Kar *et al.*[11] | Prospective study. (112 cases) | Efficacious, easy and cost effective therapeutic option for angle of lip vitiligo. Complete repigmentation at 6 months follow-up. | Suitable and effective for paucifollicular sites. |
| 2 | Minipunch grafting | Formation of pits/wells at the recipient site and transfer of similar circular grafts from the donor site. These wells act as melanocyte reservoir and cause repigmentation. | Babu *et al.*[8] | Comparative study. (30 patients) | Satisfactory and better results with MPG as compared to SBEG comparing the colour matching and *postoperative* complications. | Smaller grafts reduce the chance of cobblestoning. MPG is suitable for smaller patches. |
| | | | Lahiri *et al.*[38] | Case series (5 patients) | Combined regrafting with PUVA/ PUVASOL therapy in cases who had failed MPG previously. | Regrafting with PUVA is effective for the cases where MPG has failed initially. |
| 3 | Micropigmentation | Pigment granules are placed intradermally either manually or via electrically driven needles. | Francis *et al.* [15] | Letter (30 patients) | Immediate satisfactory results post treatment. Sustained response in patients at 1 year follow-up. Only 2 patients required touch-up repigmentation at 3 weeks of follow-up. | Used Black and brown pigment (1:4 ratio) Manual needling used. |
| | | | Singh *et al.* [6] | Case series (15 cases) | Immediate results which no pigment fading at 2 years follow-up in 13 patients. 2 patients had minimal fading at 18 months and 2 years of follow-up. | Used Brown, white and yellow colors for micropigemtation. Electric 26 gauge cluster needles used. |
| 4 | 308-nm excimer laser. | High intensity targeted radiation to the therapeutic site, causing stimulation of melanocytes in outer root sheath. | Deshpande *et al.* [5] | Case report. (3 cases) | Near-total repigmentation in short time (average 18 weeks) with no recurrence at 1 year follow-up. | Excellent results in a few months. |
| 5 | Radiofrequency and 5-fluorouracil | 5-FU initiates pigmentation by producing melanocyte localization to dermabraded vitiliginous skin in by migration of epidermal and follicular melanocytes. | Hassanandani and Kar. [43] | Letter to Editor (1 case) | Complete repigmentation at end of 4 weeks. | Best results with a single session of radiofrequency. |

to achieve immobility of graft, hemostasis and enhance re-epithelization.[33] Babu *et al.* in their report, suggested peeling of graft after 1 week to get better cosmetic results and reduce chances of hyperpigmentation.[8]

## Minipunch grafting

Minipunch grafting is a commonly done procedure for stable vitiligo of lips and has a high success rate (91% graft uptake).[34,35]

It is a procedure in which multiple circular punches of size ranging from 1 to 1.5 mm, 3–4 mm apart are first taken from the donor site under local anesthesia, after assessing the amount of punches required for the recipient site. Punches of similar of 0.25–0.5 mm smaller size are made at the recipient site and the grafts are put in the recipient wells and fixed. A pressure bandage is put over the recipient area to achieve immobilization. These small punches act as a reservoir of melanocytes which subsequently migrate and cause repigmentation.[8,36]

The term "minipuch" is used when the size of punches is less than 1.2 mm. For all the sizes more than 1.2 mm, "punchgrafting" is the term used. The grafts are taken

from a normally pigmented donor site with a similar thickness to recipient site.[36] Preferred donor site for lips is the retroauricular area.[14] Various reported side-effects of the procedure include polka-dot appearance, cobble-stoning, perigraft halo, keloids, and variegated appearance.[16]

Cobble-stoning can be prevented by making the recipient punches 0.5 mm smaller or 1 mm deeper than the grafts.[24] Various corrective options available for cobble stoning include electrofulguration and silicon sheet compression.[37] Babu *et al.* placed the grafts in the lower 3/4$^{th}$ of the wells to avoid cobblestoning.[8]

Over highly mobile areas like angles of lips, postoperative immobilization of the grafts is challenging. Ghorpade *et al.* in their report of 10 patients including 2 patients with lip vitiligo, used tissue glue (Cyanoacrylate surgical adhesive) between the graft edges and recipient wells to achieve immobilization. The authors concluded that the glue is effective in achieving immobilization with no change in the postoperative prognosis and no complication at 2 years of follow-up.[34]

Babu *et al.* in their comparative study comparing outcomes of MPG versus SBEG included 18 patients with stable vitiligo of 1-year duration. The authors concluded that punch skin grafting showed better results with respect to color matching and *postoperative* complications. The authors recommended use of small punches to reduce the chances of cobblestoning in the smaller patches and SBEG in the larger patches.[8]

Lahiri *et al.* in their case series of five patients used PUVA/PUVASOL with regrafting in patients who had failed MPG earlier. UV Phototherapy (311 nm) was used at minimal erythematous dose, starting at 1000 mj/cm$^2$, gradually increasing by 10–20% per treatment session for 10 weeks (total 20 sessions). After that the rate of increment was decreased to 2%–5% to a maximum 2270 mj/cm$^2$.UVB phototherapy promotes the destruction of the perilesional and circulating melanocyte-specific cytotoxic CD8 T cells. The authors concluded that use of phototherapy (311 nm) with regrafting is efficacious in cases where MPG has failed initially.[38]

## Micropigmentation

Micropigmentation (Tattooing) involves implantation of minute (6 µm), inert, non-toxic, non-allergenic, and tissue and light stable insoluble pigment granules into the dermis uniformly either manually or by using motorized electrically driven needles.[14,39]

The needles used are of 25 gauge, 36 mm length, and 0.36 mm diameter. They are used at a speed of 1500–9500 strokes/min. The pigment granules are injected intradermally, between the superficial and the mid-papillary dermis, which is approximately 1–2 mm from the surface of skin, where the granules are fixed permanently into the dermal mononuclear cells and collagen fibers. The superficial deposition of the pigment causes the "Pigment Extrusion," that is the pushout of the pigment, whereas deeper deposition of granules causes "Pigment Migration," which is taken away by the macrophages.[39]

The pigment granules, which are initially taken up by mononuclear cells (Intracellular), gradually with time become extracellular. These extracellularly placed granules can cause foreign body granuloma formation in a few cases.[39]

Micropigmentation is an easy procedure that provides permanent camouflage without any significant side effects. It is an effective treatment option over the difficult sites including distal digits, hands, wrists, perianal area, lips, and over joints. Commonly used pigment is Iron oxide which gives black color.[39] Factors affecting the outcome of micropigmentation include depth of pigment deposition, consistency of pigment paste used, number of needles, depth of needles, and characteristics of recipient site.[39]

Various advantages of micropigmentation over other treatment modalities are that it is safe, does not require any hospitalization, has no donor site morbidity, and provides permanent and immediate results with no post-treatment hypoesthesia or any other serious side-effects.[6]

Various immediate adverse effects of this procedure include edema, crusting, ecchymosis, and contact allergy to the pigment.[39]

Long-term adverse effects include washed-off appearance, leaching, color mismatch, foreign body granuloma formation, crusting, reactivation of herpes, secondary bacterial infection and hypertrophy at the mucocutaneous junction.[6,16]

A limitation of microneedling is an exact color match which is usually achieved at lateral side of lips due to physiological darker appearance of the lateral side of the lips.[15]

In their letter, Francis *et al.* included 30 patients who had undergone micropigmentation with brown and black pigment. They reported no immediate side effects of the procedure with only two patients experiencing loss of pigment which was treated with touch-up micro-pigmentation. Rest of the patients showed pigment retention at 1 year of follow-up with no side-effects. The authors concluded that micropigmentation is a safe, cosmetically acceptable option for lateral lip vitiligo with immediate and long-lasting results.[15]

Singh *et al.* in their case series of 15 patients, used electric tattoo machine with 26 gauge cluster needles for tattooing. They also found micropigmentation as a safe and effective alternative for lip vitiligo in dark-complexioned patients. They used brown (Iron oxide), white (titanium oxide) and yellow (cadmium yellow) shades to achieve accurate camouflage. The authors introduced the needles at

45 degrees to the skin to increase the potential visibility of pigment on needle entry.

In their report, only 2 patients had minimal fading of pigment at 18 months and 2 years follow-up. Rest of the patients had no pigment fading. The authors commented that micropigmentation shows the best results when used on soft and thin skin areas like the lips.[6]

### Split-thickness skin grafting

Split skin thickness has been successfully used by various authors. After infiltration of the depigmented patch under local anesthesia, a split-thickness graft is removed from the vitiliginous area using a sterile razor blade over a Kocher's forceps, a hand dermatome, Humby's knife or a Silver's knife.[40] Similar graft from the donor site (medial aspect of forearm) and is placed and attached to recipient site. Following the graft placement, the biological changes that take place include graft adherence (72h post-grafting), revascularization, and graft contracture.[40,41] Promising results with the use of split-thickness skin grafting have been reported by Njoo *et al.*[42]

### 308-nm Excimer laser

Evidence shows that inactive melanocytes are present in the outer root sheath of hair follicles, which are spared in vitiligo. Excimer laser delivers high-intensity radiation to the vitiliginous area. It causes a halt in the disease progression and also induces repigmentation by stimulation of maturation and migration of melanocytes in outer root sheath of hair follicles causing their ascent and thus causing repigmentation.

Deshpande *et al.* in their case series of 3 patients of lip vitiligo, who were not responding to systemic and topical therapy, used Excimer laser and found near-total repigmentation in short time of 18 weeks in all 3 patients with no recurrence at 1 year follow-up. They concluded that Excimer laser is effective as monotherapy in the treatment of vitiligo in paucifollicular areas like lips.[5]

### Radiofrequency and 5-fluorouracil

Hassanandani and Kar in their letter used Radiofrequency cautery for dermabrasion of the depigmented patch on angle of lips, followed by topical application of a mixture of 5-Fluorouracil (5-FU) and antibiotic cream. 5-FU causes repigmentation by stimulating and initiating migration of melanocytes from the perilesional epidermis. The authors reported complete repigmentation at 4 weeks of daily application of the mixture of creams. They concluded that combination therapy of Radiofrequency with 5-FU is a cheap and easy alternative for angle of lip vitiligo with less downtime and good pigmentary outcome in a single session.[43]

## Future Perspective: Other modalities

### Surgical excision and closure

This is a simple procedure that involves excision of the depigmented patch and subsequent closure of the wound. This procedure is cost-effective and requires only basic surgical knowledge in a minimal setup. It also eliminates the uncertainty of the outcomes with quick results.[18]The use of silk suture is recommended while surgical closure of vermillion as it tends to absorb the fluid and softens. Also, since the scars over lips tend to depress, the edges of the wound should be everted to ensure flat laying of the scar after healing.[12]

This method was first used by Sachidanand *et al.* and authenticated by Kanathur *et al.*

Sachidanand *et al.* in their report of patient with vitiligo over lips showed the surgical excision of the depigmented patch using a 15 number blade, followed by undermining and closure with 5-0 plain catgut suture. They stated that this treatment option cannot be used in cases where the depigmented patch is large as it may alter the shape of the lips. The authors concluded that this method is an easy alternative for patients not responding to medical therapy, and it is effective and gives immediate results with no side effects.[44]

Kanathur *et al.* included patients with vitiligo involving less than the upper one-third of total height of the lower lip. The patches were excised under local anesthesia and wound edges were approximated using 3-0 chromic catgut suture. In their report of 30 patients, there was only one patient who showed recurrence at 6 months follow-up.[18]

Daruwalla *et al.* in their report of 25 cases evaluated the efficacy of primary excision and closure and found no recurrence at 24 months of follow-up. The authors performed the procedure under intraoral mental nerve block. They also assessed the surgical site morbidity score for postoperative evaluation of pain, healing time, and complications. The authors reported complete normal lip contour at 7–10 days with no recurrence at 24 months of follow-up.[16] All these procedural modifications are feasible only for small depigmented lesions and there is no evidence regarding their efficacy at the angle of the lips. However, if the area of the vitiligo at the angles is very small this procedure can be tried without inducing deformity in the lip.

### Mucosal advancement flap

The primary aim of an advancement flap is the transition of tension that would result from traditional closure.[13] Reddy *et al.* showed mucosal advancement flap from within the oral cavity after the excision of the depigmented patches and the formation of a flap in the submucosal plane. The flap was advanced forward to cover the defect and sutured using a vicryl 5-0 interrupted sutures.

The authors concluded that the mucosal advancement flap gives satisfactory results in cases of lip vitiligo.[9] Though the procedure is promising for the lip it has not been tried in vitiligo involving the angle of the lip.

### Chemical cauterization

This a simple office procedure where a chemical agent is applied over the depigmented patch. This subsequently

causes wound formation and elicits an inflammatory response which stimulates melanogenesis and transfer of melanin granules to keratinocytes. Puri *et al.* in their comparative study of 30 patients, used chemical cauterization with 100% trichloroacetic acid and 88% phenol. The authors combined PUVA/PUVASOL with chemical cauterization in their report. The authors concluded that chemical cauterization with medium-depth peeling agents is an effective alternative for the treatment of vitiligo.[45]

## Conclusion

After reviewing a number of case reports and articles regarding the treatment of vitiligo at an angle of lips, we conclude that multiple surgical treatment modalities are effective for the treatment with their own advantages and disadvantages. The therapeutic option needs to be evaluated individually according to the extent of the disease after proper counseling.

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### Conflicts of interest

There are no conflicts of interest.

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