IJD ORIGINAL ARTICLE

A comparison of the efficacy of 50% trichloroacetic acid (TCA) application and dermabrasion in patients with idiopathic guttate hypomelanosis (IGH): a pilot study

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Background: Idiopathic guttate hypomelanosis (IGH) is characterized by discrete, multiple, round-to-oval hypopigmented macules of approximately 2-5 mm diameter, especially on the forearms and pretibial area,which increase in number with aging. Recent focus has been on therapeutic wounding, which stimulates melanocytes from the periphery and surrounding hair follicles to proliferate, migrate, and repigment the lesions. This study aimed to evaluate and compare the efficacy of trichloroacetic (TCA) 50% application and dermabrasion in IGH patients.

Methods: Twenty patients of IGH were enrolled after considering various inclusion and exclusion criteria. IGH lesions over the right side were treated with trichloroacetic acid (TCA) 50% with a cotton-tipped applicator. IGH lesions over the left side were treated with dermabrasion.

Results: Of the 153 macules in 20 patients, all 81 macules in the dermabrasion group showed some repigmentation, whereas 7 (9.7%) out of 72 macules treated with 50% TCA Touch™ showed no improvement. At the end of 3 months, repigmentation up to 25%, between 25–50%, and between 51–75% was seen in 18.5%, 66.7%, and 14.8% of lesions treated with dermabrasion, respectively. This is while TCA 50% touch-treated macules showed up to 25% and between 25–50% repigmentation in 48.6% and 41.7% of instances, respectively.

Conclusion: The analysis suggested that both dermabrasion and TCA 50% Touch are effective in the treatment of IGH. Dermabrasion proved to be more effective than TCA peel and can be tried before or with the medical line of therapy in the treatment of IGH.

Keywords: hypomelanosis, dermabrasion, wound, trichloroacetic acid

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INTRODUCTION

Idiopathic guttate hypomelanosis (IGH) is an acquired, benign leukoderma of unknown etiology [1]. Also known as solar leukoderma or actinic punctate leukoderma, IGH is characterized by discrete, round to oval porcelain-white macules of approximately 2-5 mm diameter. In IGH, multiple, small, pure white macules occur chiefly on sun-exposed areas of upper and lower extremities; it can sometimes become generalized. Other skin changes of photodamage and

chronological aging are usually seen in association with IGH. It usually affects individuals after the fourth decade and the likelihood of acquiring it increases with age [2-4].

Although the pathogenesis of IGH remains controversial. Factors that may play a role in the causation of IGH are senile degeneration of melanocytes, ultraviolet (UV) exposure, trauma, and genetic factors [2,5-7].

Although the disease runs a benign course, IGH patients may seek treatment due to esthetic concerns. Various studies have reported successful treatment with modalities like topical retinoids, 0.1% topical tacrolimus ointment, 88% phenol peelings, 5-fluorouracil infusion using a tattoo machine, cryotherapy, superficial dermabrasion, low fluence fractional carbon dioxide laser, nonablative fractional photothermolysis, a combination of nonablative fractional photothermolysis and 0.1% topical calcineurin inhibitors or topical tretinoin cream, and the excimer laser [5,8-18]. Currently,there is no standard treatment for IGH. However, both topical and surgical methods have been studied with variable results.

Trauma can cause hyperpigmentation by two mechanisms: first, it can lead to pigment incontinence due to damage of basal cells, thereby recruiting melanophages in the papillary dermis; secondly, it can cause enhanced melanin synthesis/ transfer to the surrounding keratinocytes. It also stimulates melanocytes from the periphery and surrounding hair follicles to proliferate, migrate, and repigment the lesion [19]. Therapeutic wounding uses this mechanism to repigment the depigmented macules of stable vitiligo by causing controlled trauma. Dermabrasion, local application of phenol or trichloroacetic acid, laser ablation, cryosurgery (liquid nitrogen spray), and needling all work on the principle of therapeutic wounding. We herein investigate and compare the efficacy of therapeutic dermabrasion and trichloroacetic acid (TCA) 50% Touch™ application in the treatment of IGH.

MATERIALS AND METHODS

This was a prospective, split-body, evaluator blinded trial, designed to measure the effect of dermabrasion and 50% TCA Touch on IGH. The institutional ethics committee's permission was taken. Written informed consent was obtained from all the patients for voluntary participation. Patients with age more than 30 years having IGH lesions distributed over the upper limbs, lower limbs, or trunk with a similar extent on both sides were included in the study. Patients with a history of treatment with topical retinoids, topical calcineurin inhibitors, chemical peel, cryotherapy, or lasers during the previous three months were excluded. Patients with a history of hypertrophic scars or keloids, active vitiligo, or active infection were also excluded.

Study procedure

After considering various inclusion and exclusion criteria, 20 IGH patients were enrolled. Under aseptic precautions, IGH lesions over the right side were treated with 50% trichloroacetic acid (TCA). With the help of cotton buds, TCA was applied over the macule and feathering of up to 1 mm of normal skin was done at the periphery of the lesion.All the patients were advised to apply topical 2% mupirocin cream twice daily for 7 to 10 days. IGH lesions over the left side were treated with dermabrasion after giving local anesthesia (2% lignocaine) with aseptic precautions. Dermabrasion was done after holding the skin tightly with the thumb and index fingers and applying mild pressure to control the depth until pinpoint bleeding was achieved. We used a Marathon micromotor machine with pear-shaped diamond fraises and speeds varying from 3000-4000 rpm. Patients were advised to apply 2% mupirocin cream twice daily for 7 to 10 days. Frosting was seen in lesions treated with TCA. Crust formation was seen over treated lesions, which fell off within 7-10 days.

Assessment

Serial photographs were taken of all treated patients before starting treatment and at monthly intervals till three months. The pretreatment photographs were compared with post-treatment photographs by three blinded dermatologists using a scale and results of subjective clinical improvement score were graded from G0 TO G4 (G0 = no improvement, G1 = up to 25% improvement, G2 = between 25–50% of improvement, G3 = between 51–75% of improvement, G4 = greater than 75% improvement). At the end of three months, the

feelings of each patient were asked and the patient's satisfaction score was recorded on a four-point scale for the TCA treated and dermabraded area (1 - very unsatisfied, 2 - somewhat unsatisfied, 3 - somewhat satisfied, 4 - very satisfied). At every visit, any adverse effects of TCA and dermabrasion were recorded.

Statistical analysis

Statistical analysis was done using descriptive and inferential statistics using the Chi-squared test. The software used in the analysis included SPSS 24.0 version and GraphPad Prism 7.0 version. P-values < 0.05 were considered significant.

Sample size calculation

$$N=\frac{x^2.N.P(1-P)}{C^2.(N-1)+x^2.P(1-P)}$$

Total patients = 21

x^2 = Chi-squared value for 1 d.f. at the same desired probability level. This is 3.84 at 5% level of significance.

P = 50% proportion

C = Confidence interval of one choice

= 95% CI = 0.05

$$N=\frac{3.84\times21\times0.5\times0.5}{0.05^2\times20+3.84\times0.5\times0.5}$$

N = 19.96

N = 20 Patients needed in the study.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent

Informed consent was obtained from all participants included in the study.

RESULTS

Out of the 20patients enrolled in the study, 11 (55%) were male and 9 (45%) were female, with male to female ratio of 1:1.2. Six out of 20 patients belonged to Fitzpatrick skin type IV and 14 patients were of Fitzpatrick type V. The patients had a total of 153 lesions. Seventy-two lesions were treated with 50% trichloroacetic acid (TCA) and 81 lesions were treated with dermabrasion. The mean age of the patients was 56.70 ± 12.92 years, ranging from 37 to 74 years. The highest number of cases, i.e., 10 patients, were of the elderly age group of 60 to 69 years, which constituted 50% of the total study population as shown in Table 1. In more than 15 (75%) patients, IGH lesions were present for more than 1 year. Lesions were distributed over the lower limb (49.6%, n = 76), forearms (28.1%, n = 43), trunk (17.6%, n = 27), and face (4.7%, n = 7). All patients completed the study.

Of the 153 lesions, all 81 lesions in the dermabrasion group showed some repigmentation, whereas 7 (9.7%) out of 72 lesions treated with 50% TCA Touch showed no improvement. Repigmentation up to 25%, between 25–50%, and between 51–75% was seen in 18.5%, 66.7%, and 14.8% of lesions in the dermabrasion-treated group. Whereas TCA 50% touch-treated macules showed up to 25% and between 25–50% repigmentation in 48.6% and 41.7% of lesions, respectively (Figure 1). The clinical improvement started earlier in the dermabrasion group as compared to the 50% TCA Touch group. At the end of three months, 14.8% of dermabraded lesions showed more than 50% repigmentation (Figures 2 and 3) whereas such improvement was not seen in TCA-treated patients. Thus, repigmentation was better in dermabrasion treated areas as compared to TCA-treated areas at the end of three months. The proportion of poor responders (less than 25% repigmentation) in the dermabrasion-treated group was 18.5% as compared to 58.3% in the TCA treated group, and the P-value was significant (0.0001), with a

Table 1. Demographic distribution of patients.

Age Group	No. of patients	Percentage
30-39 yrs	3	15
40-49 yrs	3	15
50-59 yrs	2	10
60-69 yrs	10	50
≥70 yrs	2	10
Total	20	100
Mean ± SD	56.70 ± 12.92 years	
Range	30-74 years	

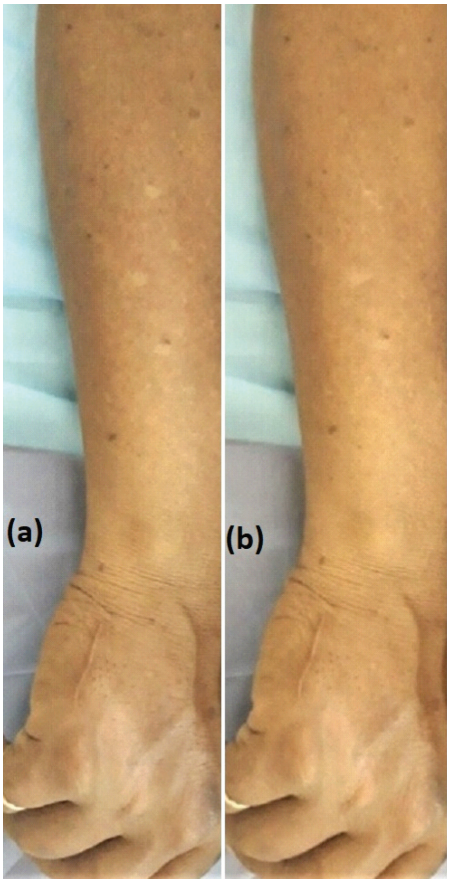

Figure 1. TCA 50% - site: upper limb. Three macules showing partial repigmentation at the end of three months: (a) pre-treatment; (b) post-treatment.

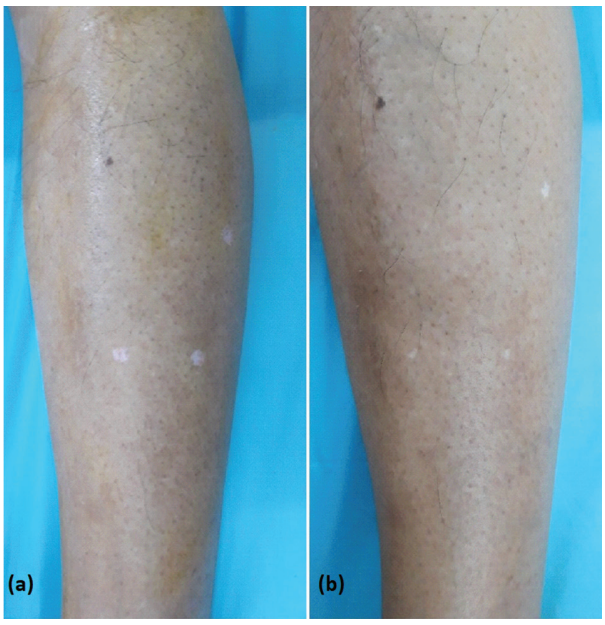

Figure 2. Dermabrasion – site: lower limb. All 3 macules showing less than 50% repigmentation at the end of three months: (a) pre-treatment; (b) post-treatment.

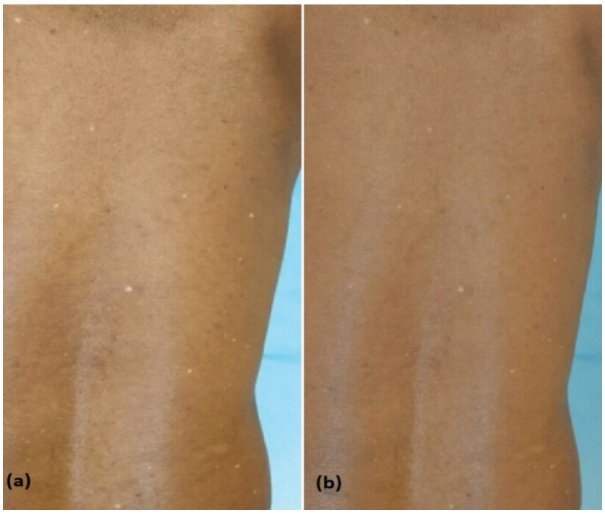

Figure 3. Dermabrasion – site: back. Showing less than 50% repigmentation at the end of three months: (a) pre-treatment; (b) post-treatment.

Chi-squared value of 33.44 (Table 2). When poor responders were compared with better responders, it was seen that repigmentation was better in lesions that were less than 5 mm in size.

As seen in Table 3, the patient satisfaction score was significantly better in the dermabrasion-treated side as compared to the TCA-treated side (P = 0.046) (Figure 4). Patient satisfaction scores correlated well with subjective clinical assessment scores.

Table 2. Clinical assessment score.

Clinical assessment score (n= number of lesions)		
Repigmentation (%)	**Dermabrasion Percentage of lesions (n)**	**50% TCA Touch Percentage of lesions (n)**
G0 - no improvement,	0 (0)	9.7 (7)
G1 - < 25% improvement	18.5 (15)	48.6 (35)
G2 - 25 –50% of improvement	66.7 (54)	41.7 (30)
G3 - 51–75% of improvement	14.8 (12)	0 (0)
G4 - > 75% improvement	0 (0)	0 (0)
		P = 0.0001

Table 3. Patient satisfaction score.

Scale	Dermabrasion	TCA Touch
0	0 (0%)	2 (10%)
1	4 (20%)	9 (45%)
2	13 (65%)	9 (45%)
3	3 (15%)	0 (0%)
4	0 (0%)	0 (0%)
Total	20 (100%)	20 (100%)
2κ-value	7.85, *P*=0.046	

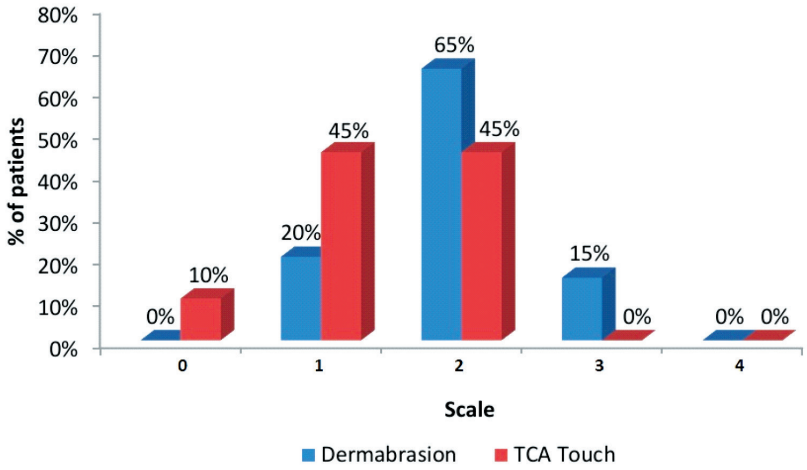

Figure 4. Comparison of patient satisfaction score between dermabrasion and TCA touch treatment.

Side effects were seen only on the 50% TCA-treated side, with dermabrasion leaving no side effects (Table 4). The most common side effect was a burning sensation, which was noticed in 3 (15%) patients although it was not severe and subsided spontaneously within a few days. Persistent scabbing that lasted for more than two weeks was seen in 1 (5%) patient (Figure 5). Other side effects like post-inflammatory hypopigmentation, secondary infection, and scar formation was not observed in any patient.

Table 4. Distribution of patients according to side effects.

Side effect	No. of patients	Percentage (%)
Burning sensation	3	15
Scabbing	1	5
No side effects	16	80
Total	20	100

DISCUSSION

Idiopathic guttate hypomelanosis (IGH), also known as ''symmetric progressive leukopathy of the extremities,'' was first described by Costa in 1951. IGH is an acquired leukoderma, which presents with porcelain-white macules of approximately 2-5 mm in diameter. The prevalence of IGH increases with age and is distributed on the sun-exposed surface of the forearms and the legs [20]. Previous studies have mentioned that there is a gradual decrease in the number of enzymatically active melanocytes by 10–20% every 10 years [3].

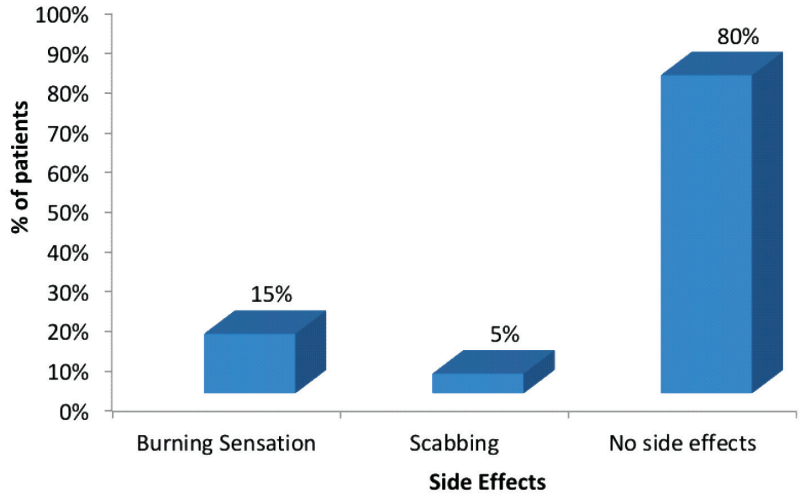

Figure 5. Distribution of patients according to side effects.

Skin biopsy from IGH lesions over non-exposed areas shows epidermal atrophy, rete ridge flattening, and reduced epidermal keratosis as signs of aging. These findings suggest the role of senile degeneration apart from chronic UV exposure in the causation of IGH, especially in sun-protected areas [21]. Depigmentation is caused by degenerative changes in melanocytes; initially, there is fragmentation or loss of dendrites in melanocytes, before the destruction of inactive melanocytes later on. Ultrastructural studies in IGH also reported a decrease in the number of melanosomes in melanocytes and keratinocytes over the involved area. However, assessments using the electron microscope have shown normal numbers of melanosomes and melanocytes. Moreover, the number of melanosomes in keratinocytes was reduced [2,18,22]. This may suggest that keratinocyte dysfunction and impairment in melanosome uptake play a role in the causation of IGH [23].

We took inspiration for this study based on the response of therapeutic wounding in the treatment of vitiligo. Therapeutic wounding of the lesion stimulates melanocytes from the periphery and surrounding hair follicles. After dermabrasion, during the re-epithelization of the epidermis, melanocytes migrate from the surrounding skin and basal layer of the hair follicles to the healing area [15].

Notably, 50% TCA Touch™ can cause inflammation and can induce melanogenesis and melanin transfer to adjacent keratinocytes. TCA peel-induced inflammation was reported to induce an increase in both melanogenesis and melanin transfer to adjacent keratinocytes [24]. We are not sure whether TCA causes true repigmentation or post-inflammatory hyperpigmentation (PIH). Clinically, it is very difficult to distinguish the two entities but PIH fades over 4-6 months. A skin biopsy can differentiate true repigmentation from post-inflammatory hyperpigmentation [14].

Former studies have demonstrated that therapeutic wounding with 88% phenol, dermabrasion, TCA 50-90%, CO_2 laser, and radioelectrosurgery can result in pigmentation. We conducted this study to assess whether the chemical (50%TCA) or mechanical method (dermabrasion) leads to better repigmentation in IGH. We assessed both clinical assessment scores and patient satisfaction.

Our study demonstrated that dermabrasion causes better repigmentation as compared to 50% TCA Touch with fewer side effects. The clinical assessment score by three experienced dermatologists showed better repigmentation over lesions on the dermabraded side as compared to the TCA side. At the end of three months, 81.5% of lesions showed more than 25% repigmentation in the dermabrasion side as compared to 41.7% lesions over the TCA (50%) Touch side. These results are in line with a previous study on IGH treatment using dermabrasion, which showed repigmentation in 80% of patients [15]. Regarding patient satisfaction scores, 15% of patients treated with dermabrasion were somewhat satisfied whereas none were satisfied with 50% TCA treatment.

Regarding side effects, only 15% of patients complained of a burning sensation, which was mild and resolved spontaneously, and 5% of patients complained of persistent scabbing that lasted more than 14 days. These side effects were seen only on the 50% TCA-treated side, whereas the dermabrasion-treated side showed no side effects. Post-inflammatory hypopigmentation, secondary infection, and scar formation were not seen in any patients.

Repigmentation started at the periphery of the lesions then spread towards the center but in some macules, there was diffuse repigmentation. Clinical improvement started one month after the procedure. In our study, 100% repigmentation was not seen after either dermabrasion or TCA treatment; the possible reason for this may be due to the inevitable total exhaustion of melanocytes or the total absence of melanocyte reservoirs in the affected lesions [25].

The limitation of our study is the small sample size and the short duration of follow-up. As follow-up was of short duration and in the absence of skin biopsy from repigmented macules, we were not able to differentiate between true hyperpigmentation and post-inflammatory hyperpigmentation. Further studies with a larger sample size and a longer duration of follow-up are needed to validate these findings.

Nonetheless, this study is the first to compare the efficacy of two different treatment modalities based on therapeutic wounding in IGH. Our study shows that dermabrasion can be an effective treatment with relatively fewer side effects than TCA

Touch. As a single sitting of dermabrasion leads to perceptible repigmentation thereby decreasing the number of follow-up visits to the hospital as compared to topical medication that needs longer follow-up, it becomes a cost-effective therapy.

Further studies with larger sample sizes and longer follow-ups are warranted to define ideal treatment protocols and to recognize the optimal number of sittings required for repigmentation. The combination of dermabrasion and TCA Touch should also be assessed in the treatment of IGH.

CONCLUSION

In conclusion, the analysis suggested that dermabrasion seems to be a safe and effective procedure with better results than TCA Touch™. Both dermabrasion and TCA Touch are simple office procedures. Where TCA Touch had few side effects like a burning sensation and persistent scabbing, dermabrasion had none. Therefore, dermabrasion could be a promising approach to the treatment of IGH, and TCA Touch can serve as an adjuvant that can be done before any approved therapy for IGH.

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Conflict of Interest: None declared.

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