Original Article

Comparative Study of 35% Glycolic Acid, 20% Salicylic–10% Mandelic Acid, and Phytic Acid Combination Peels in the Treatment of Active Acne and Postacne Pigmentation

Rashmi Sarkar, Sneha Ghunawat[1], Vijay Kumar Garg

Department of Dermatology, STD and Leprosy, Maulana Azad Medical College, New Delhi, India, [1]Department of Dermatology, Venereology and Leprology, Columbia Asia Hospital, Gurugram, Haryana

Abstract

Background: Acne is a commonly encountered disorder in the dermatological practice. Chemical peeling is one of the treatment modalities in acne and postacne pigmentation. Although various peeling agents are available, studies comparing their efficacy are lacking. Moreover, there is a paucity of studies comparing the efficacy of combination peels in Asian population. **Materials and Methods:** Forty-five patients with mild to moderate acne were divided into three groups of fifteen each. Groups A, B, and C underwent peeling sessions biweekly with 35% glycolic acid, 20% salicylic–10% mandelic acid, and phytic acid peels, respectively, for a total of six sessions. All other anti-acne treatments were stopped. Lesion count was carried out at baseline and at each follow-up visit. Acne scoring and postacne hyperpigmentation index were noted at each visit. Photographic record was maintained. **Results:** Significant reduction in inflammatory and noninflammatory lesion count was noted at 12 weeks in all the three study groups. Reduction in acne score at the end of 12 weeks in the three study groups was 70.55%, 74.14%, and 69.7%, respectively. A significant decline was observed in the postacne hyperpigmentation index in all the three study groups at the end of 12 weeks (P = 0.034). **Conclusion:** All three chemical peels are effective in the treatment of mild to moderate acne in Asian population. No significant adverse effects were noted.

Keywords: Acne, glycolic acid peels, phytic acid combination peels, postacne hyperpigmentation, salicylic mandelic peels

Introduction

Acne vulgaris is a commonly encountered disorder at dermatology clinics. In 2002, an Asian community–based survey found the prevalence of self-reported acne to be 91.3% in the age group of 15–25 years.[1] It has a significant negative psychological impact. Acne frequently resolves to leave behind sequela in the form of scarring/pigmentation. The risk of pigmentation is more so in darker skin types and in individuals exposed to high-intensity ultraviolet radiations. Chemical peeling has shown to be an effective therapeutic option in the treatment of active acne lesions and postacne hyperpigmentation.

There is a paucity of studies on the comparative efficacy of the combination peels in the Asian population. Hence, this study was undertaken to evaluate the efficacy of 35% glycolic acid, 20% salicylic–10% mandelic acid, and phytic acid in the treatment of active acne and postacne pigmentation.

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Materials and Methods

Forty-five patients with active acne (grade 1 and 2) and postacne pigmentation participated in the study (Fitzpatrick skin types, IV–VI). They were divided into three groups of 15 each, based on a random number table. Detailed history and cutaneous examination was noted on a predesigned pro forma. The age of onset of lesion, sites of distribution, type of skin lesions present, and percentage of postacne pigmentation were noted. The three groups underwent peeling sessions biweekly for 12 weeks (total six sessions). Photographic record was made at baseline and at each follow-up visit.

Address for correspondence: Dr. Rashmi Sarkar, Department of Dermatology, STD and Leprosy, Maulana Azad Medical College, New Delhi 110002, India. E-mail: rashmisarkar@gmail.com

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The study was approved by the institutional ethics committee.

Group A underwent peeling with 35% glycolic acid, Group B with 20% salicylic acid–10% mandelic acid, and Group C with phytic acid. No other topical or systemic anti-acne treatment was given during the study period.

Inclusion criteria included the following:

1. Patients with acne (grade 1 and 2) with postacne hyperpigmentation
2. Patients with age >12 years

Exclusion criteria included the following:

1. Patients with active/recurrent herpes infection
2. Patients with a history of hypertrophic scarring/keloid
3. Patients with hypersensitivity to aspirin
4. Patients with oral isotretinoin intake in the past 6 months
5. Pregnant and lactating women
6. Patients refusing consent

Evaluation of active acne

Active acne was evaluated using Michaëlsson and colleagues grading system[2] [Table 1]. Each lesion type was multiplied by the severity index and the total sum was the final score. Scoring was carried out at baseline and at each follow-up visit for 12 weeks.

Evaluation of postacne pigmentation

The postacne pigmentation was evaluated using postacne hyperpigmentation index[3] as shown in Table 2. The size of the lesion, pigment intensity, and the number of lesions were scored. The total score was reached by adding the individual scores. Assessment was carried out at baseline, 2, 4, 6, 8, 10, and 12 weeks.

The extent of postacne hyperpigmentation was also assessed by calculating the approximate surface area involved. The right and left cheeks and the forehead constituted 30% each, and the chin accounted for 10%.

Procedure

The study was approved by the institutional ethics committee. Each session of chemical peeling was performed by a trained dermatologist. Informed consent was obtained from all participants. The participants were not on any other anti-acne therapy at the time of enrollment in the study. All previous treatments were stopped 4 weeks before beginning the chemical peeling. Patients were made to lie down in reclining position. Their face was degreased with alcohol swab. Surgical cap was used to pull back the hair and cover the ears. Single coat of peeling agent was applied with cotton tipped applicator on their full face and left for 3 min. Then, their face was washed with running water. The corners of the eyes and nasal crease were protected with petrolatum jelly. After procedure, sun protection was advised. This procedure was repeated biweekly for a total of six sessions. Patients were advised to report immediately in case they experienced any side effects. Assessment was carried out at each session, and the findings were compared. Photographic records were maintained.

Table 1: Michaëlsson and colleagues grading for active acne

Lesion	Severity index	Definition
Comedo	0.5	Horny follicular plug and pinhead-sized follicular papules
Papule	1.0	Infiltrated papules (2–8 mm)
Pustule	2.0	Pustules (42 mm) with surrounding inflammation
Infiltrate	3.0	Nodules and infiltrates (48 mm) and coalescent papules where individual papules cannot be distinguished
Cyst	4.0	Lesions where infiltrate has broken down to form discharging cyst

Table 2: Postacne hyperpigmentation index

Weighted score (*S*)	Median lesion size
2	<3 mm
4	3–6 mm
6	7–10 mm
8	>10 mm

Weighted score (*I*)	Median lesion intensity
3	Slightly darker than surrounding skin
6	Moderately darker than surrounding skin
9	Significantly darker than surrounding skin

Weighted score (*N*)	Number of lesions
1	1–15
2	16–30
3	31–45
4	46–60
5	>60

Total postacne hyperpigmentation index = $S + I + N$; score range, 6–22.

Statistical Analysis

A P value of <0.05 was considered to indicate statistical significance. The normality of quantitative data was checked by measures of Kolmogorov–Smirnov tests of normality. For normally distributed data (age, duration, and age of onset), mean values of three groups were compared using one-way analysis of variance (ANOVA) followed by *post hoc* multiple comparison test. For skewed data or scores, Kruskal–Wallis test followed by Mann–Whitney test for two groups was applied. Proportions were compared using chi-square or Fisher's exact test, depending on their applicability. For time-related variables of skewed data, Wilcoxon signed-rank test was applied; for normally distributed data (time-related variables), ANOVA was carried out. Analysis was conducted using IBM Statistical Package for the Social Sciences (SPSS; IBM Corp, Armonk, NY) Statistics software (version 22.0).

Results

Demographic profile

The mean age of the patients in Groups A, B, and C was 23, 21.9, and 24.6 years, respectively. The minimum age was 16 years, whereas the maximum was 38 years. The difference in the ages was not statically significant ($P = 0.324$) among the three study groups.

Females outnumbered males in the study. A total of 30 (66.6%) female patients and 15 (33.3%) male patients participated in the study. Of the total participants, 12 (26.6%) were married, whereas 33 (73.3%) were unmarried.

Age of onset

The minimum age of onset of lesions was 13 years, whereas the maximum was 34 years. The mean age of onset in the three groups was 19.2, 18.1, and 20.4 years, respectively [Table 3].

Duration of lesions

The duration of active acne lesions in the three groups was 2.68, 4.05, and 2.83 years respectively, given in Table 3 ($P = 0.398$). The duration of postacne hyperpigmentation in the three groups was 1.97, 1.66, and 1.87 years, respectively as in Table 3 ($P = 0.895$).

Sites of involvement of active acne and Post inflammatory hyperpigmentation

The sites of involvement of active acne and postacne hyperpigmentation are shown in Tables 4 and 5.

Comedones

The percentage improvement in comedones in Group A was 56.32% at the end of 12 weeks compared to that of baseline, whereas in Group B and Group C, it was 62.4% and 44.9%, respectively. Statistically significant improvement was noted in Group A and Group C at 6 weeks, whereas in Group B, significant improvement was noted 4 weeks onward ($P = 0.030$).

Table 3: Demographic characteristics taken into consideration

Characteristic	Group A	Group B	Group C	*P* value
Mean age of patients (years)	23	21.9	24.6	0.324
Age of onset of acne (years)	19.2	18.1	20.4	0.0352
Duration of active acne (years)	2.68	4.05	2.83	0.398
Duration of PIH (years)	1.97	1.66	1.87	0.895

PIH = postinflammatory hyperpigmentation

Table 4: Sites involved with active acne lesions in the three groups

Sites	Group A	Group B	Group C	*P* = 0.171
Cheeks, chin	2 (13.3%)	0	1 (6.7%)	
Cheeks, forehead	2 (13.3%)	5 (33.3%)	1 (6.7%)	
Cheeks	4 (26.7%)	1 (6.7%)	6 (40%)	
Full face	7 (46.7%)	9 (60%)	7 (46.7%)	

Papule

At the end of 12 weeks, 69.88% improvement was noted in Group A compared to that of baseline, whereas improvement was 70.09% and 67% in Group B and Group C, respectively. Statistically significant improvement was noted in Group A at 4 weeks ($P = 0.003$), whereas in Groups B and C, it was noted at 6 weeks ($P = 0.032$ and 0.014, respectively).

Pustule

At the end of 12 weeks, the percentage improvement in pustular lesions was 72.5% in Group A, whereas it was 95.84% and 68.33% in Groups B and C, respectively. Significant improvement was noted at 4 weeks in Groups A and C ($P = 0.039$ and 0.001, respectively), whereas significant reduction in the lesions was noted after single peel session at 2 weeks in Group B ($P = 0.003$).

Acne score

Percentage reduction in acne score at the end of 12 weeks was 70.55% in glycolic acid group, whereas it was 74.14% and 69.7% in the salicylic–mandelic and phytic acid groups, respectively [Figures 1–3]. Statistically significant improvement was noted in the score at 2 weeks onward in the glycolic and salicylic–mandelic acid groups ($P = 0.031$ and 0.001, respectively), whereas improvement was significant at 4 weeks onward in the phytic acid group ($P = 0.028$).

Postacne pigmentation

The percentage of postacne hyperpigmentation at baseline was 21.53%, 17.16%, and 16.8% in Groups A, B, and C, respectively ($P = 0.916$). At the end of 12 weeks, the percentage of pigmentation was 8.8%, 3.1%, and 7.1% in the three groups, respectively ($P = 0.090$).

Postacne hyperpigmentation index

The objective assessment of the postacne hyperpigmentation index was compared at baseline and at each follow-up visit till 12 weeks. The baseline score in Groups A, B, and C was 10.87, 10.13, and 9.67%, respectively ($P = 0.210$). All the three groups recorded decline in the score at each follow-up visit [Figure 4]. At the end of 12 weeks, the score was 6.2, 2.8, and 5.47 in Groups A, B, and C, respectively ($P = 0.034$).

Table 5: Sites with postinflammatory hyperpigmentation

Sites	Group A	Group B	Group C	*P* = 0.377
Forehead	2 (13.3%)	0	0	
Cheeks	6 (40%)	8 (53.3%)	11 (73.3%)	
Cheeks, chin	1 (6.7%)	0	0	
Cheeks, forehead	2 (13.3%)	0	0	
Full face	4 (26.7%)	4 (26.7%)	2 (13.3%)	

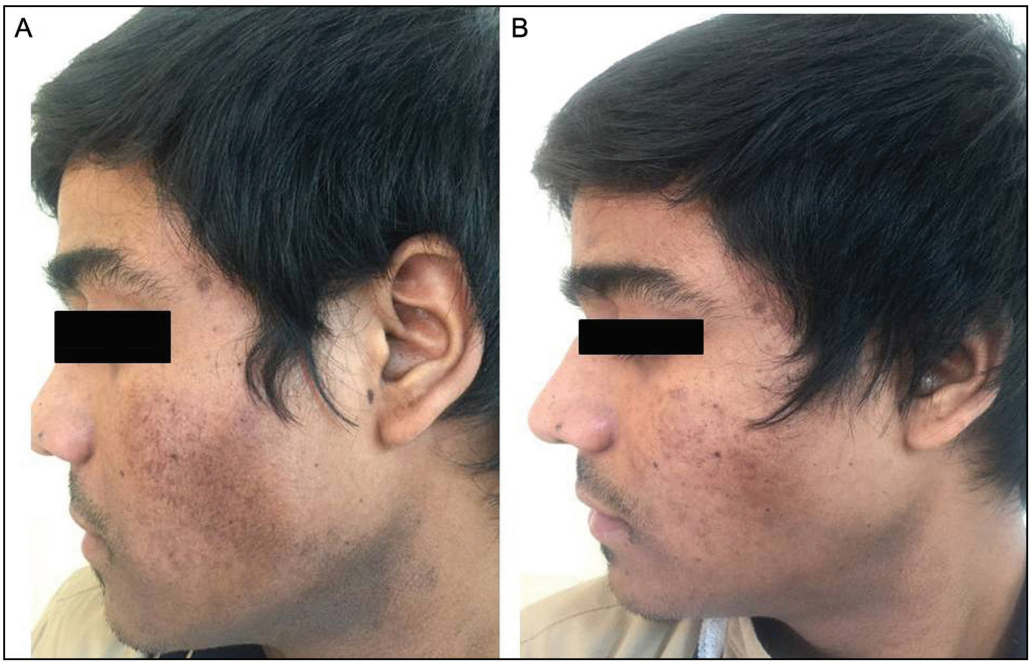

Figure 1: Images (A) and (B) show the baseline and 12-week results with 35% glycolic acid

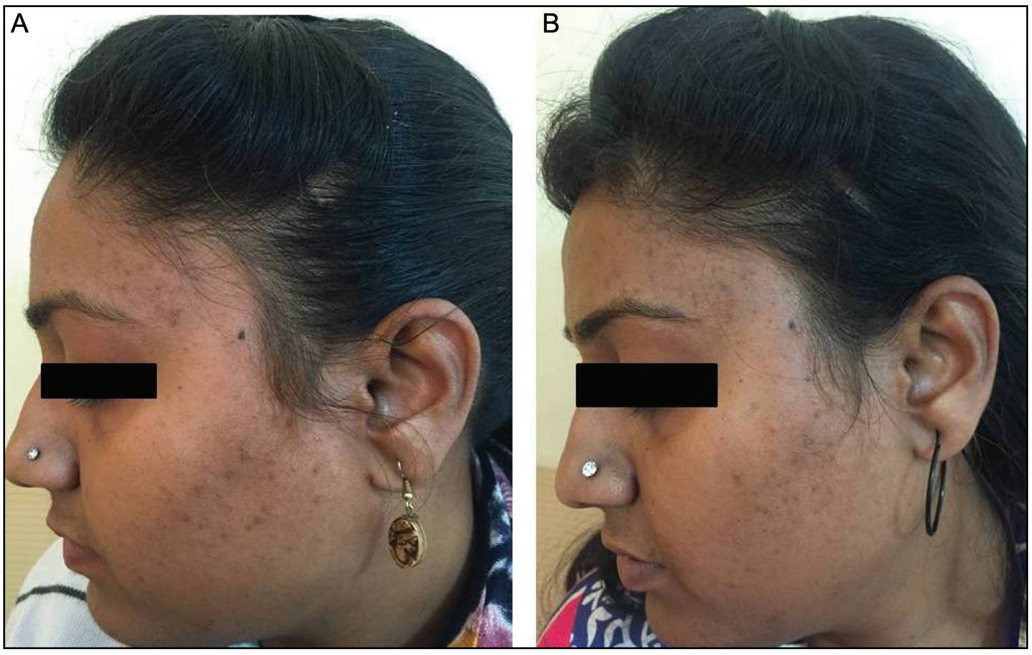

Figure2: Images (A) and (B) show the baseline and 12-week results with 20% salicylic–10% mandelic acid peel combination

Side effects

None of the patients discontinued because of the side effects. Overall, two patients (13.3%) in the glycolic acid and salicylic acid groups, respectively, reported burning, whereas none in the phytic acid group reported any burning sensation. One patient (6.7%) in the salicylic acid group reported postprocedural erythema that subsided within 2 days after prescribing a moisturizer. All peels were well tolerated.

Discussion

Many studies have evaluated the beneficial effects of glycolic acid and salicylic acid peel in the treatment of active acne in Asian population.[4] However, only a single study has evaluated the efficacy of salicylic–mandelic acid combination in active acne,[5] whereas none has studied the efficacy of phytic acid peel in the active acne. Alpha hydroxy acid peels have been the most extensively studied in the treatment of acne.[6,7] Low concentration

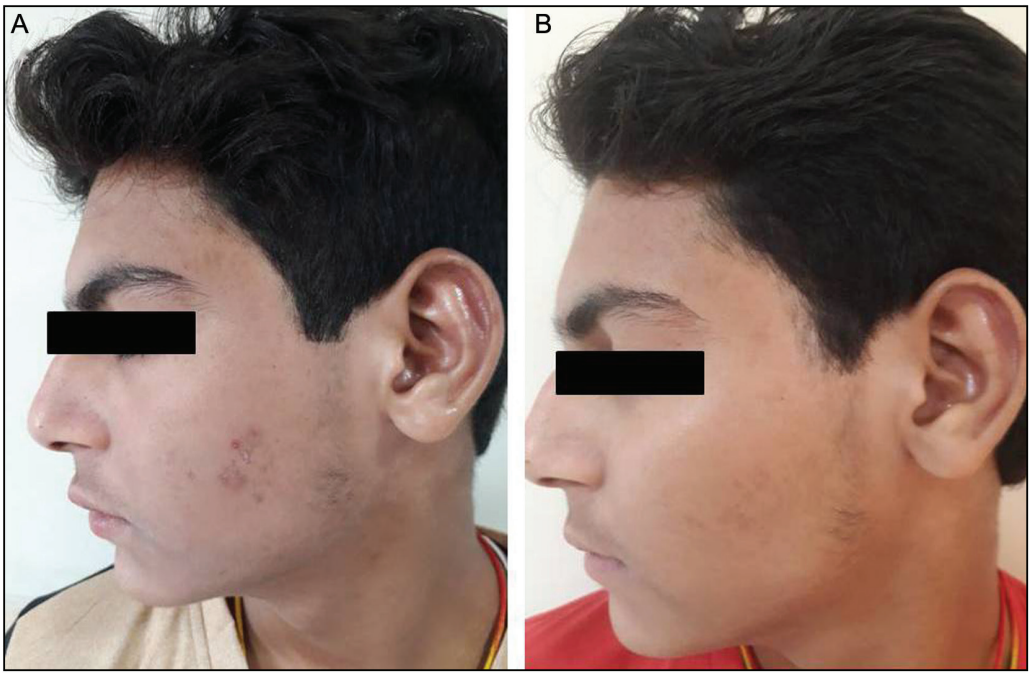

Figure 3: Images (A) and (B) show the baseline and 12-week results with phytic acid peel combination

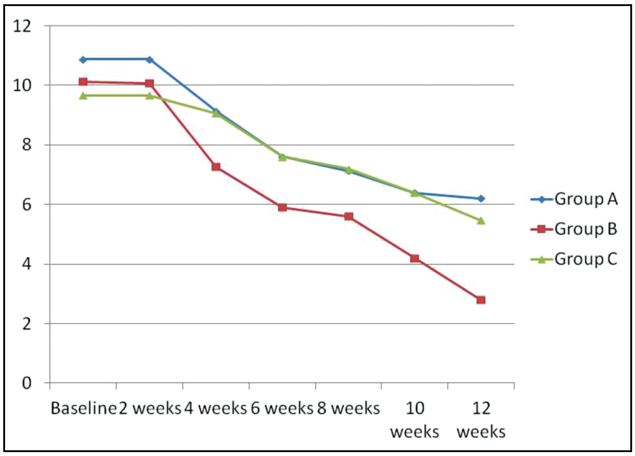

Figure 4: Line diagram shows the postacne hyperpigmentation index score among the three study groups

of alpha hydroxy peels decreases corneocyte cohesion and epidermal thickness. Higher concentration causes epidermal separation and stimulation of dermal collagen.[8] The concentration and exposure time are varied depending on the indication for which the chemical peel is to be used. Mechanism of action of glycolic acid peel in the treatment of acne is multipronged. It corrects the abnormal keratinization in acne and causes the loosening of keratinocytes extending into the sebaceous glands.[9,10] Higher concentration causes stimulation of dermal collagen. Repeated application of the peeling agent causes dermal thickening and improvement in acne scars.[11] This study with glycolic acid showed significant improvement in both inflammatory and noninflammatory acne lesions at the end of 12 weeks.

Glycolic acid peel also has beneficial effects in the treatment of postacne pigmentation. In a previous study, excellent response was noted with glycolic acid peel in cases of postinflammatory hyperpigmentation at the end of 16 weeks.[12] In another study by Burns *et al.*,[13] patients with dark skin undergoing chemical peeling with glycolic acid showed rapid and greater improvement compared to that of control group. The underlying mechanism is epidermolysis of pigmented cells followed by reepithelialization with less pigmented cells. It has also shown to improve skin texture and pores.[14] In this study, significant improvement was noted after six peeling sessions in the postacne hyperpigmentation score.

Mandelic acid is one of the largest alpha hydroxy acid peels and penetrates the skin slowly and uniformly, making it an ideal peeling agent of choice in sensitive skin. Mandelic acid along with salicylic acid have been used in previous studies and have shown significant reduction in the acne score.[5]

Salicylic acid is a beta hydroxy acid peel. It has a comedolytic effect owing to its lipophilic action. It dissolves intercellular cement, reducing corneocyte adhesion.[15] Because of its lipophilic nature, it can penetrate the sebaceous glands, thus affecting follicular keratinization. It also decreases inflammatory lesion count by acting on arachidonic acid cascade. In this study, salicylic–mandelic acid peel group showed significant improvement in inflammatory acne lesions compared to the other two groups.

Self-precipitation of the peeling agent accounts for little penetration and a good safety profile, thus reducing the risk of postpeel hyperpigmentation, especially in the darker skin types.[16] These features have made salicylic

acid peel superior to glycolic acid peel in comparative studies conducted earlier in dark-skinned individuals. Studies have also shown beneficial effect of salicylic acid peel in postinflammatory pigmentation in dark-skinned individuals.[16,17] Similar effect on postinflammatory hyperpigmentation was noted in this study. Salicylic acid decreases postacne hyperpigmentation by its anti-inflammatory effects. Ahn and Kim[18] found salicylic acid to have a whitening effect on the skin as well. Mandelic acid also has a beneficial effect in improving skin pigmentation.

Phytic acid is a proprietary combination peel containing glycolic, lactic, mandelic, and phytic acid. It is a self-neutralizing, slow-release peel, thus eliminating any risk of overtreatment and need of external neutralization. To the best of our knowledge, the effect of this peel has not been evaluated in the treatment of active acne and postacne pigmentation in the Asian population. This study shows comparable response with glycolic and salicylic–mandelic acid peels.

Conclusion

All the three peeling agents showed significant efficacy in improving both inflammatory and noninflammatory acne lesions and postacne pigmentation at the end of 12 weeks. The inflammatory lesions responded better to salicylic–mandelic acid peel. No significant side effects were noted, and all the three peels were found to be safe in the Asian population.

Limitations

The sample size selected was small, keeping in mind the possibility of high dropout rates because of the multiple peeling sessions required in the study. Subjective scoring was used to evaluate the postinflammatory hyperpigmentation scores. Objective scoring would have helped to eliminate evaluator's bias if any.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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