

Effect of intense pulsed light on the treatment of facial pigmentation caused by burn.

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Abstract

Objective: To observe and analyse the effect of intense pulsed light on facial pigmentation caused by burn.

Methods: From January 2015 to May 2017, 42 patients with facial pigmentation caused by burn enrolled in our hospital were collected. All of them received intense pulsed light therapy by the way of BEAUTYFLASH NP-LTSS produced by General Project Company and the efficacy of treatment was observed and analysed.

Results: All cases were followed up after receiving intense pulsed light treatment and the result showed that the effective ratio in the patients was 80.24% in one month, 88.10% in 3 months, and 95.24% in one year. During the treatment, 2 patients experienced erythema and pain in skin of treatment area with mild symptoms that resolve spontaneously without special handling; 1 patient of blister who was healed up by implement of debridement and wound dressing and constantly treated with intense pulse light after stability and it turned out to be no conditions like hyper pigmentation or scar formation.

Conclusion: For patients with post-burn facial hyperpigmentation, the intense pulse light treatment program is effective, safe and reliable in fading the facial pigmentation caused by burn.

Keywords: Intense pulsed light, Burn, Facial pigmentation, Effect.

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Introduction

In the case of degree II or above burns, hyperpigmentation would leave on the face after healing from burn wounds. Since pigmentation is exposed to the face, neck, limbs and other parts, it will not only influence the patients' life, but also cause pressure on their mind.

Traditional methods used to treat facial pigmentation after burn includes oral vitamin C or external use of silicone cream. However, both of those methods are either slow or ineffective [1-7].

With the development of science and technology, Intense Pulsed Light (IPL) has been widespread applied in cosmetic surgery. Especially, it has a better curative effect for pigment diseases like senile plaques and freckles. But the effect of IPL on pigmentation due to burn is unknown.

In our study, we investigated the effect of intense pulsed light on the facial pigmentation after burn and verified IPL as one of the good methods used to fade the pigmentation caused by burn.

Materials and Methods

Materials

From January 2015 to May 2017, 28 female and 14 male patients, aging from 18 to 66, with facial pigmentation caused by burn enrolled in Shanghai East Hospital were collected. Among all patients, 22 cases had skin lesion on the whole face, 8 had skin lesion on forehead, 5 had skin lesion on the lower face and 7 had skin lesion on the zygomatic. After the facial pigmentation appeared, the patients were hospitalized from 5 days to 6 months, with an average time of 1.2 ± 0.5 months.

Methods

All cases in this study received intense pulsed light therapy: before the formal treatment, regular thorough cleaning will be taken to patients' face or micro-crystalline grinding apparatus was used to work on the facial skin, both cleaned dust and grease on the face. The sterile tower was taken to protect the hair but the face ought to be fully exposed. Treatment handle of BEAUTYFLASH NP-LTSS produced by General Project Company of Italy was applied. There were two kinds of spot

areas namely the 35 mm × 25 mm and the 20 mm × 10 mm, and had a contact cooling system meanwhile. The temperature of probe and pulse-width were 5°C and 5 ms, and the energy density was 14 J/cm²-30 J/cm². In the operating steps, the relevant operators and patients must wear the special protective glasses strictly. During the treatment process, it was no need to carry out anesthesia or use the lidocaine cream. Every three weeks, the patients were given one treatment with five times as a course, the time of whole face treatment for doctor to master was ranged from 15 min to 20 min, each treatment was implemented twice, while the second was in a lower energy density than the first one. At the more sensitive position, such as mandible and eyelid or other parts, only one time treatment was enough. For the relatively narrow area, the spot area with 20 mm × 10 mm will be used. After the preparatory work has been completed, the treatment probe was placed at the area behind patients' ear or at the upper area of the mandibular with gradual compression, the reaction state of the skin was observed carefully through the launch of spot and at this basis energy parameter was reasonably adjusted to slight congestion of the skin and disappearance of slight pain [6-8]. With this parameter, the treatment was successively implemented and required to ensure uniform illumination during this period without omission. Under normal conditions, the number of treatments were about 6. After treatment, ion spray machine was used to take 15 min cold spray and moisturizing mask for external use. The patients were guided to carry out the scientific care after the treatment and they would be advised to have a reasonable diet with the photosensitive drugs prohibited. Common medicine has been taken orally, and the patients were told to take serious sunscreen in the case of going out.

Table 1. General information of patients before treatment.

| Number | Sex | | Depth of burn | | | The degrees of pigmentation before treatment | | |
|--------|------|--------|-----------------|----------|--------------------------|--|----------|--------|
| | Male | Female | Superficial II° | Deep II° | Superficial II°-deep II° | Mild | Moderate | Severe |
| 42 | 14 | 28 | 15 | 12 | 15 | 10 | 24 | 8 |

The effects of patients after being treated for 1 month and 3 months

As is shown in Table 2 below, after receiving intense pulsed light treatment and the result showed the effective ratio of the patients was 80.24% in one month, 88.10% in 3 months with good results.

Table 2. The effects of patients after being treated for 1 month and 3 months.

| Time | Healed | Marked effect | Efficient | Inefficient | Overall effective rate (%) |
|---------|--------|---------------|-----------|-------------|----------------------------|
| 1 month | 20 | 8 | 6 | 8 | 80.95 |

Observation index

To observe and analyse the treatment effect of patients in one month, three months, and the effective ratio of them in one year. The criteria for evaluation include healed completely, marked effect, efficient and inefficient. Among them, the evaluation criteria of the healed is that the original pigmentation completely disappeared in the diseased parts, and have no significant differences compared with the surrounding healthy skin; the evaluation criteria of the marked effect is that the pigmentation area of the affected area has a shrinkage over seventy percent, and the remaining pigment has a significant improvement and became shallow; the evaluation criteria of the efficient is that the original pigmentation area of the affected area has a shrinkage ranging from 30 percent to 70 percent, and the pigment appears to be lighter but the skin color is not to be normal; the evaluation criteria of the inefficient is that all above indicators have no change anymore.

Statistical analysis

SPSS21.0 software was used for data processing and analysis. The count data were expressed by (n, %), and tested by Chi-square, and the measurement data were described as mean ± SD and tested by t, only p<0.05 suggested the difference had statistical significance.

Results

General information of patients before treatment

The relevant data of patients before treatment was shown in Table 1 below:

| | | | | | |
|----------|----|---|---|---|-------|
| 3 months | 22 | 9 | 6 | 5 | 88.10 |
|----------|----|---|---|---|-------|

The overall effective ratio of patients followed up after one year

As is shown in Table 3 below, all cases were followed up after receiving treatment and the result showed the effective ratio of the patients was 95.24% in one year. During the treatment, there were 2 cases in which erythema and pain appeared in skin of treatment area with mild symptoms that resolve spontaneously without special handling; 1 case of blister who was healed up by implement of debridement and wound dressing and constantly treated with intense pulse light after

stability and it turned out to be no conditions like hyper pigmentation or scar formation.

Table 3. The overall effective ratio of patients followed up after one year.

| Case | Healed | Marked effect | Efficient | Inefficient | Overall rate | effective |
|------|--------|---------------|-----------|-------------|--------------|-----------|
| 42 | 24 | 10 | 6 | 2 | 95.24 | |

Discussion

After the face being burned, it is easy to have pigmentation problems, including pigmentation, scar hypertrophy, scar contracture deformity and other conditions. During this period, it is more likely to suffer pigmentation when compared to other problems. The conventional methods for the treatment mostly are invasive treatment, and the effect is not satisfactory [9-17]. For the mechanism of post-burn facial pigmentation, there is no uniform view about it, majority of people think that serious metabolic problems will be happened on the burned facial skin due to the inflammation, physical and chemical factors and skin nutrition imbalance, and the melanocytes release the melanosome at the same time, through the melanocytic cells in the process of phagocytosis, they are gathered in the burned area and make the skin color change [18]. At the same time, the circulation of the skin is blocked and the blood flow state is obstructed, blood stagnation and other factors, which are the component factors of the pigmentation.

With the continuous improvement of the medical technology, the strong pulse light (IPL) treatment was applied more in the treatment of facial pigmentation after burns [19,20]. The principle of this technology is that after the wavelength of light was selective absorbed by the skin, and then starts the photopyrolysis reaction, finally carry out and complete the treatment at the pigmentation skin without any pain or injury. The strong pulsed light can selectively destroy melanin and oxygenated hemoglobin, while help the fibrous cells to play its role on collagen formation, and then the melanin grains will be broken by patients' own phagocyte or be excreted by metabolism. In addition, strong pulse light can also effectively promote the microcirculation of skin tissue improved, and to eliminate the abnormal pigmentation. In this study, all 42 cases were followed up after receiving intense pulsed light treatment and the result showed the effective ratio of the patients was 80.24% in one month, 88.10% in 3 months, and 95.24% in one year; during the treatment, fewer adverse reactions had appeared. There were 2 cases in which erythema and pain appeared in skin of treatment area with mild symptoms that resolve spontaneously without special handling; 1 case of blister who was healed up by implement of debridement and wound dressing and constantly treated with intense pulse light after stability and it turned out to be no conditions like hyper pigmentation or scar formation. Therefore, the intense pulsed light therapy has a relatively ideal effect of the patients. During the treatment of the application of intense pulse light, we should pay attention to: The therapist should be well

experienced, for a certain technical content was required in this operation, and choosing relevant parameters featured a scientificity and flexibility. Secondary burn problems will be happened at the treated skin if set unsuitable parameters. Therefore, to avoid such condition, continuous cooling device should be in preparation. At the same time, in order to effectively avoid the problems such as eye burns and the beam of light directly to the eye, both therapists and patients should wear goggles during the operation. In addition, before the commencement of specific treatment, therapists should have a seriously understanding of contraindications of patients so that to ensure the safety of treatment.

Conclusion

In a summary, the therapy plan of the intense pulse light to post-burn facial pigmentation patients can get good results. This measure is convenient, safe and reliable, it also can reduce the incidence of complications, and help patients resume work and normal life as soon as possible. At the same time, this therapy plan has the best effect when used in early days with the wound healed. The application of intense pulse light treatment plan is worth being popularized and applied.

References

1. Bi S. 43 Observation cases on the treatment of pigmentation of burn wounds. *Med Beauty China* 2017; 12: 40-42.
2. Liang J, Wang Y. Clinical effect of treatment of facial acne erythema and pigmentation by combination of intense pulsed light with Chinese medicine face-coat. *Mod Trad Chinese Med* 2016; 23: 43-44.
3. Wang Q, Jin R, Mi J, Dong J. Evaluation of narrow-spectrum intense pulsed light for the treatment of burn scar. *J Tissue Eng Reconstruct Surg* 2015; 25: 196-198.
4. Duan L, Lei J, Zhang Z, Cheng J, Wei T, Chen Z, Ming Z, Guo W. 5 cases of P540 intense pulsed light combined with anti-scar black cream treatment of hypertrophic scar hypertrophic severe pain. *Chinese J Clin Rat Drug Use* 2014; 10: 28-30.
5. Yang W, Xia M, Zhang Y, Xu X, Fan K. Effect of intense pulsed light to prevent pigmentation caused by face burn. *Chinese J Laser Med Surg* 2013; 9: 35-37.
6. Yu YB, Xiong W, Cao YH. A conceptual model of supply chain risk mitigation: the role of supply chain integration and organizational risk propensity. *J Coast Res* 2015; 95-98.
7. Yang ZC, Lv YZ, Li H. Changes of soil organic carbon in soil aggregates under different stages of desertification in the Ordos sand land of Inner Mongolia. *J Coast Res* 2015; 420-425.
8. Duan P. P540 intense pulsed light combined with anti-scar black cream treatment of burn scar scarmic severe pain in 5 cases. *Chinese Medical Association Annual Academic Conference Essays Compilation of Chinese Medical Association Burns Surgery Branch*, 2012.

9. Chen X, Luo Z, Liu P, Liu H. To explore and evaluate the clinical effect of combination of traditional Chinese medicine and Western medicine in the treatment of burned skin hyperpigmentation at face. *Contemp Med* 2012; 10: 159-161.
10. Xu X, Yang W, Wang C, Yu X, Wang D, Xie L. Preventing scarring in the donor site of intermediate split-thickness skin with intense pulse light: clinical observation on curative effects. *Chinese J Laser Med Surg* 2012; 12: 96-99.
11. Hou X, Sha D, Li D, Liu H. Clinical effect of hypertrophic scar treated by intense pulsed light. *Clin Med Equip* 2012; 6: 68-70.
12. Yang X. Combining quantitation of remote sensing information of local structures- bearing oil/gas of marine and calculation of structural deformation and stress field. *J Coast Res* 2015; 448-452.
13. Liu Y, Shen Y. Influence of crack geometric properties on its propagation tendency of rail surface crack under rolling contact fatigue for the port machines. *J Coast Res* 2015; 188-192.
14. Cai Y, Zhang Y. Effect of intense pulsed light on 45 cases of pigmentation after burn. *J Youjiang Med Coll Nat* 2009; 11: 1051-1052.
15. Xu X, Shi C, Zhu J, Cui X, Zhang B, Zhang G. Clinical observation on the treatment of pigmentation after burn by intense pulse light. *Acta Academiae Medicinae CPAPF* 2009; 20: 698-699.
16. Zhang Z, Lei J, Hao W, Zhang F. Clinical observation of intense pulse light in the treatment of facial pigmentation after burn. *Shanxi Med J* 2009; 38: 333.
17. Qin X, Cao C, He M, Li S. Study on comprehensive care of burned skin hyperpigmentation. *Chongqing Med J* 2008; 30: 65-113.
18. Ma Y. Research on coupling prediction of mooring line tension and motion response of vertical axis floating tidal energy converter. *J Coast Res* 2015; 496-504.
19. Wu Y, Chai J, Chen M, Li G, Liu C, Chen B, Sheng Z. Effective of IPL on face pigmentation after burn injury. *Chinese J Aesthetic Med* 2007; 11: 664-666.
20. Cao C. Clinical observation of intense pulsed light for skin hyperpigmentation in burned and post skin-transplanted patients. *China Acad J Electr Publ H* 2006.

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