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COMPARISON OF CARBOXY THERAPY AND PLATELET-RICH PLASMA THERAPY IN PATIENTS WITH PERIORBITAL HYPERPIGMENTATION

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Abstract

Objective: To compare the efficacy of carboxy therapy and Platelet-Rich Plasma therapy in patients with periorbital hyperpigmentation.

Methodology: This RCT study was conducted on 50 patients presenting with periorbital hyperpigmentation, divided in two groups equally, group A underwent PRP therapy and group B underwent carboxy therapy. Treatment response and pain was assessed between both groups.

Results: PRP therapy group showed significant efficacy in terms of response to treatment as compared to the carboxy therapy groups (P = 0.01), significant efficacy was seen in patients' perception of treatment response in PRP therapy group (P = 0.007), In group A the patients had significantly higher pain score on VAS scale as compared to group B.

Conclusion: From our study we conclude that Platelet-Rich Plasma therapy was significantly more effective in patients with periorbital hyperpigmentation than carboxy therapy (P = 0.01)

Keywords: Periorbital hyperpigmentation, Carboxy therapy, Platelet-Rich Plasma, Efficacy

INTRODUCTION:

The pursuit of youthful, radiant skin has been a timeless endeavor, driving individuals to explore various cosmetic treatments and therapies. Among the many skin concerns that individuals seek to address, periorbital hyperpigmentation stands out as a common and often distressing issue [1]. Periorbital hyperpigmentation, characterized by darkening of the skin around the eyes, can result from a variety of factors such as genetics, aging, sun exposure, and even lifestyle choices. This aesthetic concern can lead to a loss of self-confidence and psychological distress, making it a significant concern for those affected [2].

In the quest to alleviate the effects of periorbital hyperpigmentation, numerous treatments have emerged over the years, each with its own approach and mechanism of action. Two such treatments that have gained popularity in recent years are Carboxy Therapy and Platelet-Rich Plasma Therapy (PRP). Both of these treatments offer potential solutions to periorbital hyperpigmentation, but they do so through distinctly different methods [3].

Carboxy Therapy, also known as carbon dioxide therapy or carboxygenation, is a non-invasive aesthetic procedure that involves the subcutaneous injection of medical-grade carbon dioxide gas into the affected area. This treatment is based on the premise that the introduction of carbon dioxide gas stimulates blood circulation, triggers collagen production, and encourages the body to metabolize and eliminate excess pigments around the eyes. The gas is administered using micro-needles or fine-gauge needles, ensuring minimal discomfort and no downtime [4, 5].

On the other hand, Platelet-Rich Plasma Therapy (PRP) is a regenerative treatment that relies on the natural healing properties of platelets found in a patient's own blood. A small amount of blood is drawn from the patient and processed to concentrate the platelets [6]. This platelet-rich plasma is then injected into the periorbital area. PRP is believed to stimulate tissue regeneration, collagen production, and the repair of damaged skin, potentially reducing the appearance of periorbital hyperpigmentation [7-10].

The effectiveness and safety of these treatments are crucial considerations for both patients and practitioners. Carboxy Therapy has shown promise in improving periorbital hyperpigmentation, with some studies reporting significant reductions in pigmentation and improved skin texture. It is generally considered safe with minimal side effects such as temporary redness or bruising [11, 12]. PRP Therapy has also demonstrated efficacy in treating periorbital hyperpigmentation, with the potential for longer-lasting results. Since PRP uses a patient's own blood components, allergic reactions and adverse events are rare. However, like any medical procedure, it carries its own set of risks, including infection and bruising [13, 14].

Both Carboxy Therapy and PRP Therapy offer promising solutions for addressing periorbital hyperpigmentation. However, their mechanisms of action, effectiveness, safety profiles, and patient experiences differ. This comprehensive analysis will delve deeper into these aspects to provide a well-rounded understanding of these treatments, aiding individuals in making informed decisions about their skincare journey and assisting healthcare professionals in guiding their patients toward the most suitable option for their unique needs.

MATERIAL AND METHODS:

This randomized controlled trail was conducted on 50 patients presenting with periorbital hyperpigmentation to the dermatology OPD from September 2022 to March 2023. An ethical certificate was obtained from the hospital’s ethical board. Patients having age between 20 to 55 years were enrolled in the study of either gender. Patients were divided in two groups equally, group A patients underwent Platelet-Rich Plasma therapy and group B patients underwent carboxy therapy. The administration of carboxytherapy involved the intradermal injection of carbon dioxide gas on a weekly basis over a period of six weeks. A 5cc injection of CO2 was supplied to each eyelid, precisely targeting the one-third lateral area. This was done using a 30-gauge needle with an injection rate of 50 cc per minute. It was strongly highlighted that the application of pressure to the injection site should be avoided.

The utilization of the double spin technique was implemented in the preparation of platelet-rich plasma (PRP). In the first step, a sterile 10 ml syringe was used to collect 10 ml of venous blood from each patient. The syringe was equipped with trisodium citrate, which served as an anticoagulant agent. Subsequently, the blood samples were subjected to two successive cycles of centrifugation. The initial centrifugation phase was performed with the objective of segregating platelets from red and white blood cells. This process was carried out at room temperature, subjecting the sample to a centrifugal force of 150-200 g for a duration of 10 minutes. The

subsequent centrifugation procedure, conducted at a force of 1500-2000 g for a duration of 15 minutes, was employed to segregate platelet-rich plasma from platelet-poor plasma. As a result, the concentration of the generated platelet-rich plasma (PRP) was roughly three to four times higher compared to that of whole blood cells.

Following this, the PRP that was acquired was put into a 1-ml insulin syringe and then activated with the addition of 0.1 ml of calcium chloride to 0.9 ml of PRP. Subsequently, the contralateral side of the patient's face underwent therapy with the administration of one cubic centimeter of platelet-rich plasma (PRP) into the periorbital region, employing an insulin syringe, at a biweekly interval, culminating in a total of three treatment sessions. The intradermal injections were delivered at a location roughly 1 centimeter below the lower eyelid. The injection depth at each spot was 1.5-2 mm. The injection sites were positioned at regular intervals of 1 centimeter. Following the administration of injections, it is highly recommended to abstain from utilizing cold compression in order to uphold the optimal functionality of platelets at the sites of injection. The only necessary postoperative measure was the application of sunscreen on the periocular regions in order to safeguard the treated areas from the harmful effects of sun exposure. The treatment response was taken from both dermatologists and patients after 3 months, responses were noted after viewing the photographs of the patients taken with a camera having 48 Megapixels.

1. Excellent Response: This outcome signifies a complete resolution of the dark halos, resulting in skin that matches the surrounding area in color.
2. Moderate Response: In cases of a moderate response, there is an improvement in color, but it still falls short of matching the surrounding skin.
3. Mild Response: A mild response indicates an improvement in color, although it remains quite similar to the preoperative appearance, albeit slightly better.
4. No Response: When there is no response to the treatment, it means that the color of the dark halos remains the same as it was before the procedure, with no discernible improvement.

These descriptions help evaluate the effectiveness of the treatment in addressing the issue of dark halos. Pain was assessed using VAS scale. All the variables were assessed using SPSS 24. Numerical variables were assessed using mean and standard deviation while categorical were assessed using frequencies and percentages. Chi Square test was used for comparison of categorical variables between both groups keeping P value at < 0.05 as significant.

RESULTS:

This RCT study was conducted on 50 patients, the mean age of the patients was 33.46±9.31 years. Regarding the gender distribution there were 68% female while 32% male patients. About 16% of the patients had family history of periorbital hyperpigmentation. Regarding the response to treatment we observed that mild improvement was observed in 8% patients, moderate in 32% patients and excellent in 60% patients, in group B (Carboxy therapy) 12% patients showed no improvement, mild improvement was observed in 36% patients, moderate improvement was observed in 24% patients and excellent improvement was observed in 28% patients, significant difference was seen between both groups ($P = 0.01$). Regarding the patients' perception of improvement on response to treatment we observed that in group A (PRP therapy) 8% showed no improvement, mild improvement was observed in 12% patients, moderate in 32% patients and excellent in 48% patients, in group B (Carboxy therapy) 12% patients showed no improvement, mild improvement was observed in 52% patients, moderate improvement was observed in 24% patients and excellent improvement was observed in 12% patients, significant difference was seen between both groups ($P = 0.007$). Regarding the pain, we observed that the patients in group A reported significantly higher frequencies of moderate and severe pain as compared to patients in group B ($P = 0.0001$)

Figure 1 Gender distribution

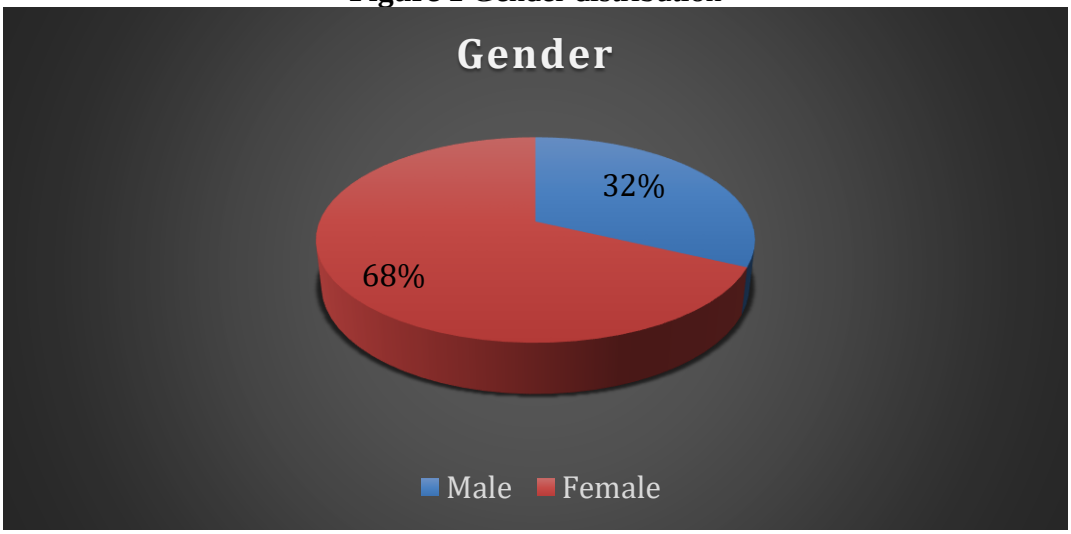

Table 1 Comparison of response to treatment between both groups

		Treatment response				Total	P value
		No change	Mild	Moderate	Excellent		
Groups	Group A (PRP therapy)	0	2	8	15	25	0.01
		0.0%	8.0%	32.0%	60.0%	100.0%	
	Group B (Carboxy therapy)	3	9	6	7	25	
		12.0%	36.0%	24.0%	28.0%	100.0%	
Total		3	11	14	22	50	
		6.0%	22.0%	28.0%	44.0%	100.0%	

Table 2 Comparison of response to treatment based on patient's perception between both groups

		Patient's perception				Total	P value
		No change	Mild	Moderate	Excellent		
Groups	Group A (PRP therapy)	2	3	8	12	25	0.007
		8.0%	12.0%	32.0%	48.0%	100.0%	
	Group B (Carboxy therapy)	3	13	6	3	25	
		12.0%	52.0%	24.0%	12.0%	100.0%	
Total		5	16	14	15	50	
		10.0%	32.0%	28.0%	30.0%	100.0%	

Table 3 Comparison of pain between both groups

		VAS pain score				Total	P value
		No pain	Mild pain	Moderate pain	Severe pain		
Groups	Group A (PRP therapy)	0	6	11	8	25	0.0001
		0.0%	24.0%	44.0%	32.0%	100.0%	
	Group B (Carboxy therapy)	11	11	3	0	25	
		44.0%	44.0%	12.0%	0.0%	100.0%	
Total		11	17	14	8	50	
		22.0%	34.0%	28.0%	16.0%	100.0%	

DISCUSSION:

Periorbital hyperpigmentation (POH), alternatively known as periocular hyperpigmentation, infraorbital darkening, and periorbital melanosis, is a prevalent dermatological issue and a matter of aesthetic significance. The condition is distinguished by the existence of brown macules in the

periocular region, manifesting symmetrically in a circular or semicircular arrangement. POH can be classified into four distinct categories, namely vascular, structural, pigmentary, and mixed. This particular situation can exert a substantial influence on an individual's subjective experience of overall satisfaction and contentment, potentially resulting in a propensity towards seeking aesthetic solutions.[15]
The precise etiology of POH remains uncertain, nevertheless, it significantly impacts the selection of therapeutic approaches. There are multiple treatment options that can be utilized for the management of periorbital hyperpigmentation (POH). These include skin bleaching, laser therapy, dermal fillers, chemical peels, autologous fat transplantation, carboxytherapy, and blepharoplasty. Nevertheless, the efficacy of various interventions has elicited divergent viewpoints.[16]

Carboxytherapy entails the utilization of carbon dioxide (CO2) gas to augment the circulation of blood at the specific location of injection, hence eliciting the stimulation of collagen synthesis inside the dermal layer of the skin. This technique is commonly utilized in cosmetic interventions, including skin tightening, rejuvenation, treatment of striae alba, and management of lipolysis.[17]

Plasma centrifugation is a procedure commonly employed in the management of POH, with a specific focus on platelet-rich plasma (PRP) therapy. The aforementioned procedure leads to a notable elevation in plasma concentration, and the autologous platelets acquired are later administered through injection to the affected region. A significant majority, exceeding 95%, of growth factors, such as platelet-derived growth factors, vascular endothelial growth factors (VEGFs), transforming growth factors, and epithelial growth factors (EGFs), exhibit the ability to bind to their respective receptors within a span of one hour, so initiating their functions in the processes of tissue repair and regeneration. The effectiveness of dermatological uses of platelet-rich plasma (PRP), such as lip augmentation, reduction mammoplasty, platysmaplasty, and rhytidectomy (facelift), is still undetermined.[18]

The efficacy of PRP treatment is dependent on the release of growth factors from activated platelets contained within intracellular granules. For instance, previous studies have demonstrated the impact of transforming growth factor-b1 (TGF-b1) and epidermal growth factor (EGF) on the regulation of melanogenesis. The inhibitory effect of TGF-b1 on melanin formation is mediated through the activation of extracellular signal-regulated kinase (ERK) in a manner that is dependent on the quantity of TGF-b1. In contrast, it has been observed that EGF exerts a suppressive effect on melanin synthesis by melanocytes, achieved by the reduction of tyrosinase enzyme activity and the modulation of prostaglandin-E2 expression. The efficacy of EGF has been evaluated in the context of its potential role in the prevention of periorbital hyperpigmentation.[18]

We conducted this study on 50 patients having mean age 33.46±9.31 years, we found that most of the patients were females as compared to male patients and only 16% patients had family history of periorbital hyperpigmentation, a study[19] reported that the mean age of their patients was 37.76±8.13 years and majority of their patients were females.
In accordance to a study[20] we observed that in PRP majority of the patients showed moderate to excellent results, in group A patients who underwent PRP therapy 32% exhibited moderate while 60% showed excellent results, in group B patients who underwent carboxy therapy 24% showed moderate while 28% showed excellent results, there was a significant difference between both groups (P = 0.01). From patient's perspective we found a significant difference as well (P = 0.007) which is also in comparison with the aforementioned study regarding the comparison of PRP and carboxy therapy for periorbital hyperpigmentation, they reported that PRP therapy was more effective.[20]
We observed that 32% patients in the PRP group reported severe pain while 44% reported moderate pain while only 12% patients in carboxy therapy reported moderate pain and no patients reported severe pain. The difference was statistically significant (P = 0.0001).

CONCLUSION:

From our study we conclude that Platelet-Rich Plasma therapy was significantly more effective in patients with periorbital hyperpigmentation than carboxy therapy (P = 0.01), however patients in PRP therapy group reported moderate to severe pain significantly higher than the carboxy therapy group (P = 0.0001).

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