

COMPARISON OF MICRONEEDLING COMBINED WITH PRP AND HYALURONIC SERUM FOR PERIORBITAL PIGMENTATION

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Abstract

Background:

Periorbital hyperpigmentation (POH) represents an important problem in aesthetic medicine due to its diverse etiology, which may include both genetics, vasculature problems, and lifestyle-related factors. Recently, there has been increased interest in the use of microneedling in combination with other procedures, such as PRP and hyaluronic acid serum application, aimed at increasing skin rejuvenation effects.

Objective:

To analyse and compare the effectiveness and safety of microneedling with platelet-rich plasma versus microneedling with hyaluronic acid serum in treating periorbital hyperpigmentation.

Methodology:

The study was conducted on 30 patients who were clinically diagnosed with POH. Patients were randomized that received either microneedling with PRP or microneedling with hyaluronic acid serum. Assessments were performed with the help of clinically approved scales, ceroscopy data, and patient satisfaction reports.

Results:

Positive results were noted in both treatment regimens. Microneedling combined with PRP demonstrated significantly better results related to pigment reduction and skin rejuvenation, whereas the second group reported only positive changes in hydration levels and minor reduction of pigmentation.

Conclusion:

It seems that microneedling along with PRP is more effective for the treatment of periorbital hyperpigmentation, whereas microneedling with HA serum serves as an additional alternative treatment. Both treatments proved to be safe for use.

Introduction

Periorbital pigmentation is one such common cosmetic concern that has been seen frequently, involving a dark coloration of the infraorbital

tissue, giving a worn-out, fatigued, stressed, and prematurely aged appearance, even though it is a medically harmless process, having serious aesthetic and psychosocial consequences of

significant proportions, where darkening of the periorbital area is perceived as a manifestation of ill health, sleep deprivation, stress, anxiety, Over a short period of time, it has been identified that societal focus on facial aesthetic and young appearance has raised an increase in patient concern regarding periorbital pigmentation (1).

The periorbital area has several special characteristics. Overall, it is an anatomically special and structurally different surgical site. The periorbital skin has an especially thin epidermis and dermis, minimum subcutaneous fat, small number of sebaceous glands, and an extensive superficial vascular network. Underneath, the orbicularis muscle is immediately beneath the layer of skin. It has weakened ligaments that accompany aging, making early structural alterations (2).

Periorbital pigmentation has been found to be more commonly associated with people of darker complexion. This encompasses a range of dermatome types ranging from type IV to type VI. The pathophysiology of periorbital pigmentation is complex and multifactorial, involving a combination of pigmentary, vascular, structural, and inflammatory mechanisms. Excessive accumulation of melanin within the epidermis and dermis, dermal melanocytosis, and post-inflammatory hyperpigmentation are important contributors. Chronic inflammation stimulates melanogenesis through cytokine-mediated pathways, resulting in persistent discoloration. It has also been noted to be more commonly associated in women than men (3).

The vascular factors include venous congestion, slow blood circulation, or an increased prominence of the sub-dermal vascular plexus, giving a bluish or violaceous color to the infraorbital area. Thinning of the skin tissues, including the lack of collagen, adds to this effect by increasing translucency. Anatomical concerns include tearing of the tissues beneath the eye or a fat herniation (4).

Exacerbating factors for periorbital pigmentation include several external and lifestyle factors: chronic ultraviolet exposure, sleep deprivation, psychological stress, allergic conditions, and habitual eye rubbing. Ultraviolet radiation

stimulates melanocyte activity, while repeated mechanical trauma leads to inflammation and deposition of pigment. Nutritional deficiencies and anemia have also been blamed, although evidence does remain inconsistent (5).

Various treatments for periorbital pigmentation include topical treatments that use depigmenting agents, chemical peeling techniques, laser treatments, and injectable. Topical treatments may prove to be ineffective on some patients when they fail to penetrate adequately and may irritate the skin. Percutaneous collagen induction therapy or microneedling is a procedure that induces micro-injury in the skin tissue, thereby activating its healing cascade, stemming from wound healing, fibroblast stimulation, neocollagenesis, production of elastin, angiogenesis, skin remodeling, and increased skin thickness (6).

Microneedling facilitates better drug delivery through the skin by creating temporary microchannel on the skin surface. It is a beneficial adjuvant treatment because it helps to penetrate and increase the efficacy of various “topical and biological” medications used to enhance aesthetics. Platelet rich plasma, which means an autologous platelet concentrate with a high level of growth factors like platelet-derived growth factor, transforming growth factor-beta, vascular endothelial growth factor, and epidermal growth factors (7,8).

Hyaluronic acid is a naturally occurring glycosaminoglycan essential for maintaining skin hydration and viscoelasticity. The non-cross linked hyaluronic acid administered through the microchannel induced by microneedling enhances hydration, supports wound healing, and reduces inflammation of the delicate periorbital skin (9).

Though such treatments have gained popularity in clinics, scientific evidence supporting such an approach is limited in view of the very few samples used in each case, along with diverse applications of each procedure. Objective methods of assessment are necessary for laying down guidelines in treatment procedures with long-term effects (10).

Methodology:

This was a comparative interventional research

design aimed at comparing the effectiveness and safety of two common treatment methods. Both procedures were performed in a dedicated treatment room with sterile conditions. The calculated sample size was approximately 30. The inclusion criteria selected for participants aged 18–45 years. The study duration lasted for about 4 months. The exclusion criteria includes history of having undergone any skin or cosmetic treatments, active skin infection, inflammation, eczema, or open sores in the area surrounding the eyes.

RESULTS

Overview:

The study had a total of thirty participants. The results were arranged and shown using tables and figures to show the respondents' demographic traits.

Age Distribution Of Prticipants:

Table 5.1: Age Distribution of Participants

The findings show that the bulk of participants—50.0% of all respondents—were in the 18–25 age range. Just 5.6% of participants were between the ages of 35 and 50, whereas 27.8% of participants were between the ages of 25 and 35.

Age Groups	Frequency	Percentage
18-25	18	50.0
25-35	10	27.8
35-50	2	5.6
Total	30	83.3

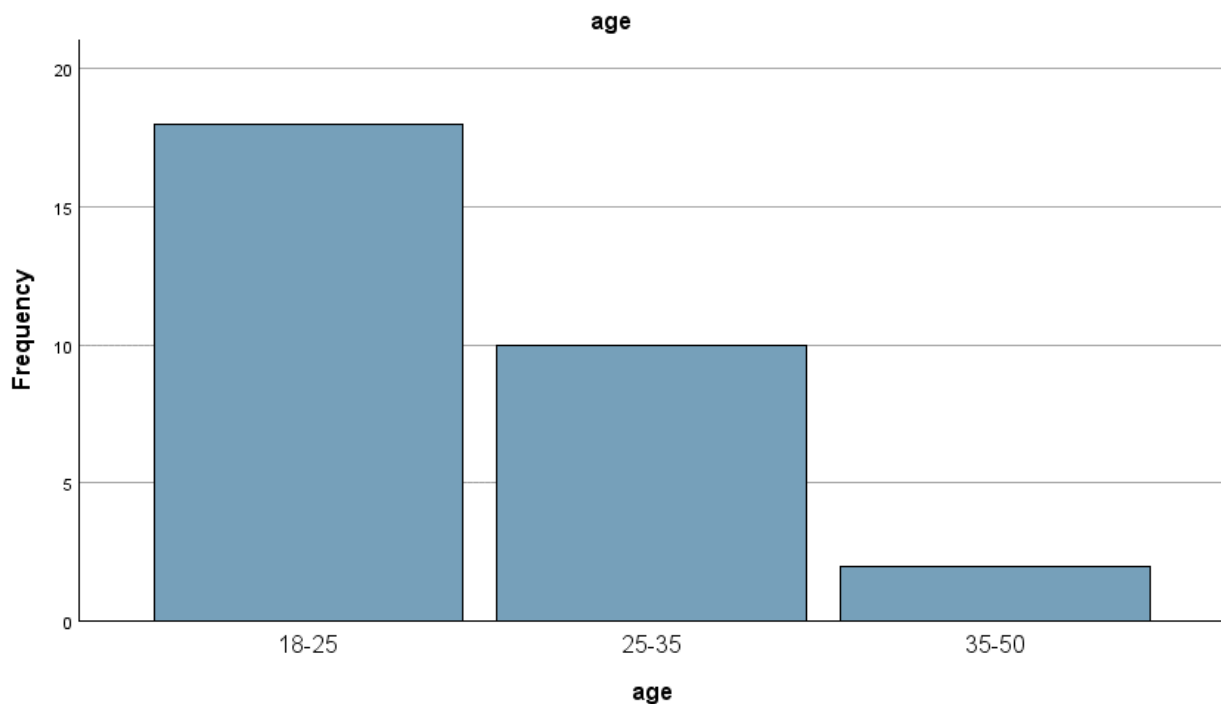


Figure 1 Age Distribution of Participants

Gender Distribution of Participants

Table 5.2: Gender Distribution of Participants

With 22 responders, or 61.1% of the sample as a whole, the gender distribution results show that

male participants made up the majority of the study population. Eight respondents, or 22.2% of the study population, were female participants

Gender	Frequency	Percentage
Male	8	61.1
Female	22	22.2
Total	30	83.3

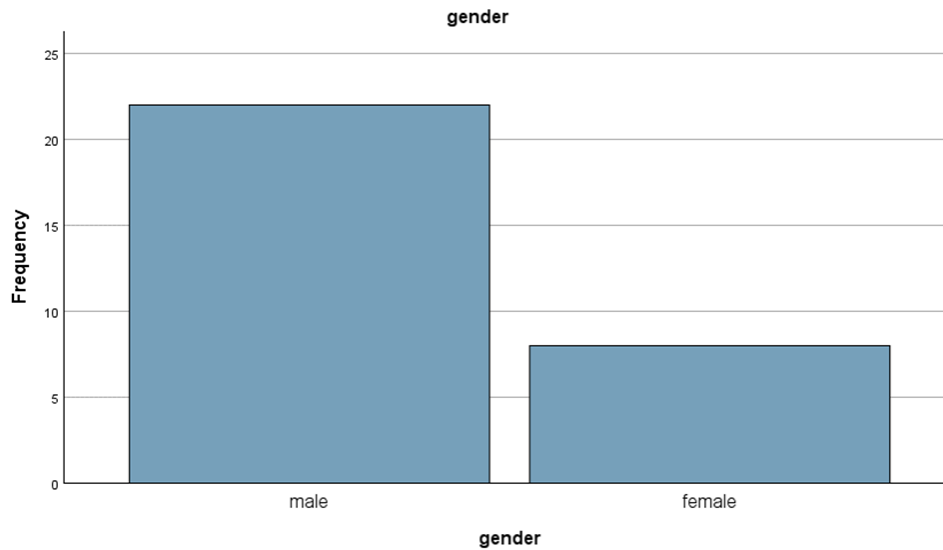


Figure 2 Gender Distribution among Participants

Marital Status Distribution of Participants

Table 5.3: Marital Status Distribution of Participants

The participants' marital status distribution is shown in Table 5.3. Thirteen (36.1%) of the thirty individuals were single, while seventeen (47.2%) were married.

Marital Status	Frequency	Percentage
Single	13	36.1
Married	17	47.
Total	30	83.3

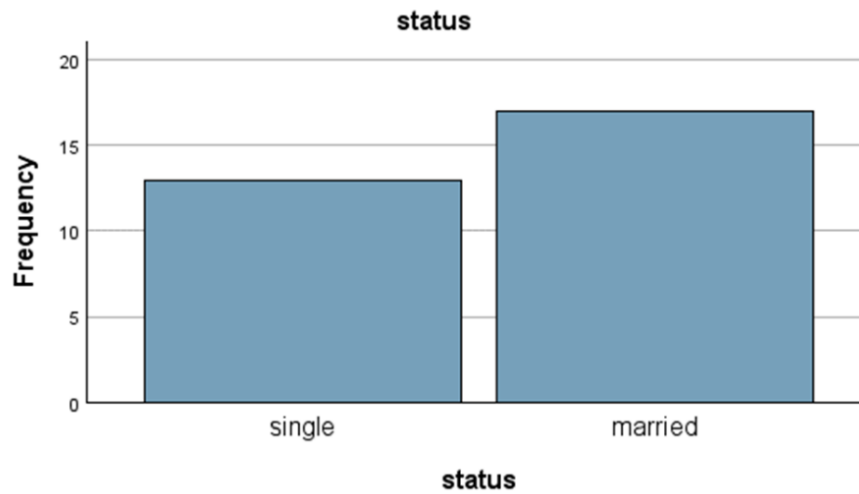


Figure 3 Marital Status of Participants

Occupational Distribution of Participants:

Table 5.4: Occupational Distribution of Participants

The participants' occupational distribution is shown in Table 5.4. Of the thirty participants, five

(13.9%) were stay-at-home moms, nine (25.0%) were employed, and sixteen (44.4%) were students.

Occupation	Frequency	Percentage
Student	16	44.4
Employed	9	25.0
Homemaker	5	13.9
Total	30	83.3

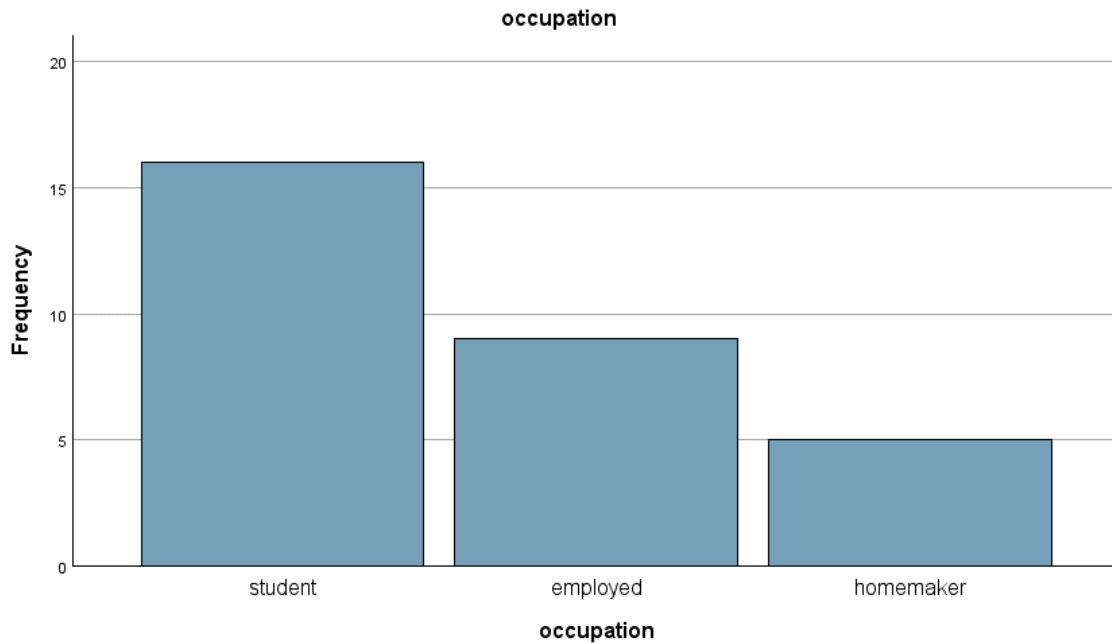


Figure 4 Occupation Distribution among Participants

Periorbital Pigmentation Characteristics Distribution:

Table 5.5: Distribution of Periorbital Pigmentation among Participants

According to the distribution of Periorbital Pigmentation Characteristics, the majority of subjects exhibited moderate pigmentation severity (43.3%), mild pigmentation (33.3%), and severe pigmentation (23.3%).

PPC Severity Level	PPC Values	Frequency	Percentage
Mild	8-11	10	33.3
Moderate	12-15	13	43.3
Severe	16-21	7	23.3
Total		30	100.0

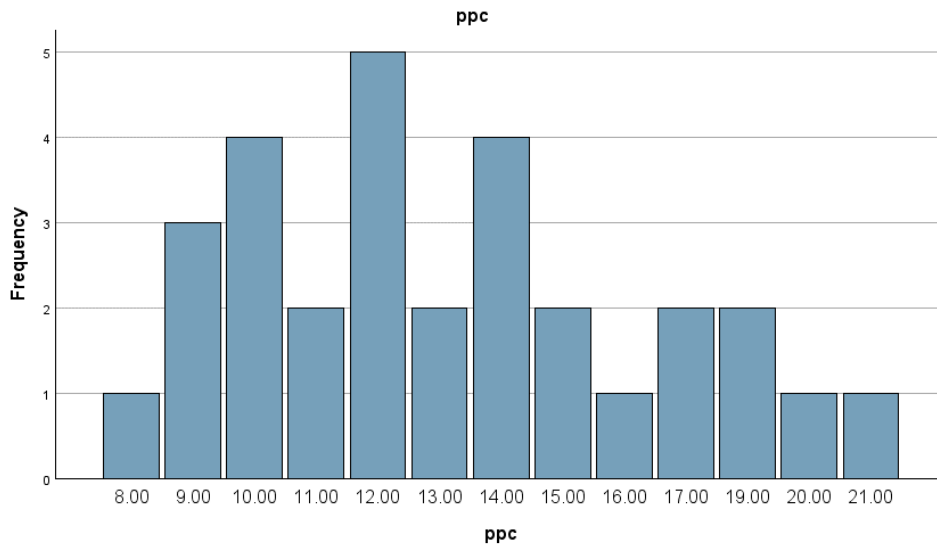


Figure 5 Periorbital Pigmentation Characteristics Distribution

Lifestyle and Contributing Factors Distribution:
Table 5.6: Lifestyle Factors among Participants
 The distribution of lifestyle characteristics revealed that only a small percentage of participants had

healthy (8.3%) or extremely healthy (2.8%) lifestyles, while the majority had substandard (19.4%) or acceptable lifestyles (16.7%).

Lifestyle Factors	Frequency	Percentage
Unhealthy Lifestyle	5	13.9
Suboptimal Lifestyle	7	19.4
Moderately Healthy Lifestyle	5	13.9
Acceptable Lifestyle	6	16.7
Healthy Lifestyle	3	8.3
Highly Healthy Lifestyle	1	2.8
Total	30	100.0

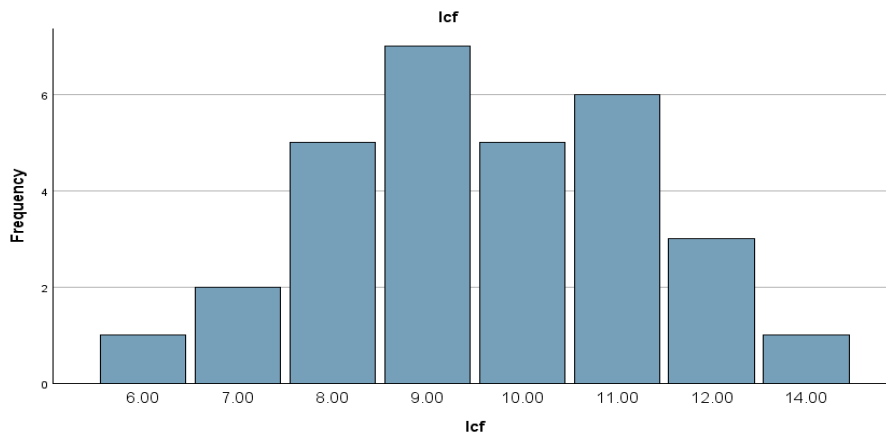


Figure 6 Lifestyle and Contributing Factors among Participants

Table 5.5 Table of Chi-Square Tests of Between Periorbital Pigmentation Characteristics and Lifestyle Contributing Factors

Thirty valid examples were included in the analysis, and the Pearson Chi-Square test result

was 77.979 with a p-value of 0.03. A statistically significant correlation between PPC and ICF was found among the study participants since the p-value was smaller than 0.05.

PPC * ICF	Value
Pearson Chi-Square Test	77.979
No. of Valid Cases	30

Awareness Satisfaction of Participants:

Table 5.7: Awareness Satisfaction of Participants

Only a tiny percentage of individuals showed outstanding satisfaction (2.8%), while the majority

reported moderate (27.8%) or below-average (22.2%) satisfaction levels, according to the awareness satisfaction rating

Awareness Satisfaction	Frequency	Percentage
Poor	4	1.1
Below Average	8	22.2
Moderate	10	27.8
Good	6	16.7
Excellent	1	2.8
Total	30	83.3

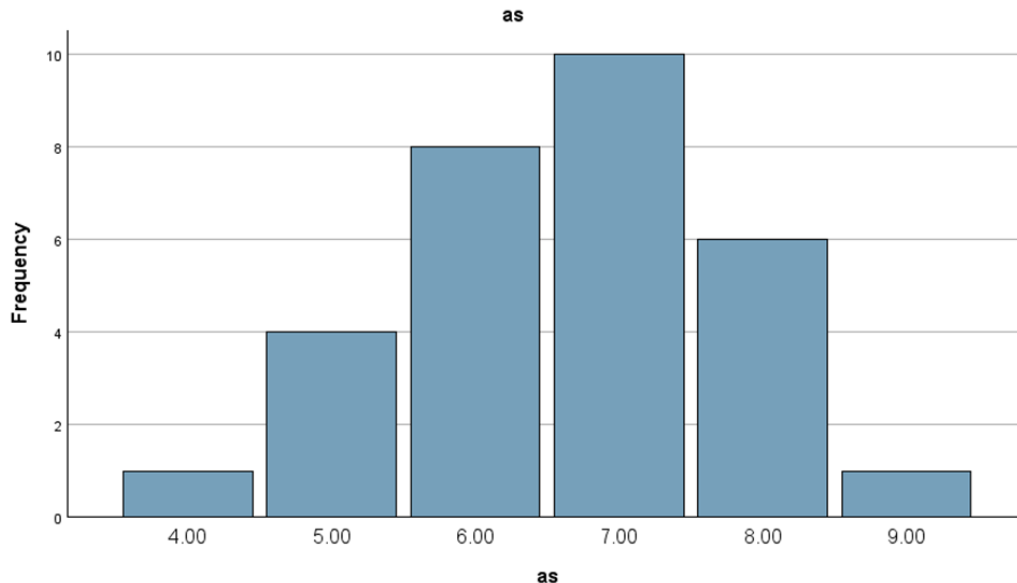


Figure 7 Awareness Satisfaction among Participants

Intervention Detail Distribution of Participants:
Table 5.8: Intervention Detail Distribution of Participants

According to the results, topical creams accounted for 26.7% of all participants and were the most

commonly utilized intervention. Respondents also frequently favored serum treatments (20.2%) and chemical peeling (22.3%). Conversely, just a tiny percentage of people reported injectable therapies

and no intervention, indicating a lower desire for these options.

Intervention Details	Frequency	Percentage
Topical Creams	8	26.7
Chemical Peeling	6	22.3
Serum	5	20.2
Prp Therapy	4	13.3
Micro needling	3	10.0
Fillers	3	10.0
injectable	2	6.7
None	1	3.3
Total	30	100.0

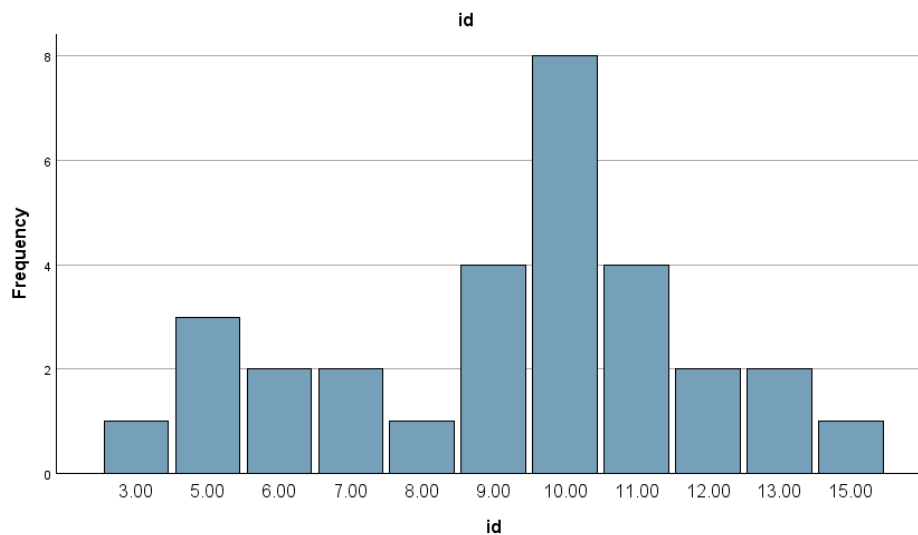


Figure 8 Intervention Detail of Participants

Table 5.8: Table of Chi-Square Tests of Between Awareness Satisfaction and Intervention Detail among Participants

30 valid examples were included in the analysis, and the Pearson Chi-Square test result was 34.979

with a p-value of 0.03. There was a statistically significant correlation between participants' awareness satisfaction and intervention details since the p-value was less than 0.05.

Chi-Square Tests

As * Id	Values
Pearson Chi- Square	34.979
No. of Valid Cases	30

DISCUSSION

The current comparative intervention trial was performed to examine the efficacy and safety of microneedling with PRP compared with

microneedling with hyaluronic acid serum for the management of POH. Periorbital hyperpigmentation is a complex medical condition caused by multiple factors including

pigmentary, vascular, structural, and inflammatory conditions. As it results from a complicated mechanism and due to the nature of the periorbital area, the treatment is difficult. According to the outcomes of the current research, both groups showed positive results in the form of improved pigmentation, skin quality, and patients' satisfaction; nonetheless, better outcomes were achieved in the group using microneedling along with PRP. The results of the study correspond with the literature on the effects of PRP (11).

The demographic characteristics of the present study indicated that the majority of participants were relatively young to middle-aged adults, mostly within the age range of 21–40 years. This result is in agreement with the epidemiology demonstrated by (Sarkar et al., 2023) according to whom POH is more prevalent among people aged 16-35 years, especially females. Likewise mentioned that the average age for POH patients ranges from 21 to 40 years. The higher frequency of cases can be explained by higher aesthetic awareness, work-related stress, poor sleep quality, excessive exposure to screens, and cosmetic concerns. Also, the higher number of female patients in this study correlates with the findings presented by (Watanabe et al., 2019), where the authors emphasized that the prevalence of POH in females results from hormone-induced periorbital skin coloration, cosmetics, and health seeking behaviour (12).

Mixed-type POH proved to be the most common clinical subtype among patients in the present study. This conclusion corroborates the classification of POH conducted by (Huang et al., 2014), who divided it into pigmented, vascular, structural, and mixed types and concluded that mixed and vascular patterns predominate in Asian population (13).

Likewise, it was found by (Rossi et al., 2023) that the prevalence rate of mixed POH was close to 78% in Taiwanese patients. This is the reason for partial therapeutic efficacy with monotherapy in mixed-type POH. Hence, regenerative combination therapy is an ideal choice in such cases, as applied in the present study (14).

In this study, microneedling was preferred over other techniques because of its proven capacity to

create controlled dermal micro injuries, activate fibroblasts, stimulate collagen production, and facilitate better topical agent penetration through the skin. These results are consistent with the report published by (Aust et al., 2016) demonstrating that percutaneous collagen induction can effectively remodel the dermis without causing AAdamage to the epidermis. Similar observations were reported by (El-Domyati et al., 2018). These authors showed the histological presence of collagen fibres, elastin production, and dermal thickness in patients subjected to multiple microneedling sessions. The findings of the current study also confirmed that microneedling could significantly improve skin texture and translucency (15).

Nevertheless, the experimental group that received microneedling combined with PRP had better results in terms of reduced pigment intensity and skin brightness than the group receiving hyaluronic acid. (Bermain et al., 2021) This could be attributed to the biological makeup of PRP, which consists of highly concentrated autologous growth factors such as PDGF, TGF- β , VEGF, EGF, and FGF. These growth factors are important in promoting angiogenesis, tissue repair, collagen production, and inflammation control (16).

According to (Smith et al., 2023), PRP is an effective biological stimulus that can enhance skin quality and color inconsistencies. Likewise, (Evans et al., 2020), in their systematic review of 455 patients from nineteen clinical trials, found that PRP had significant impacts on periorbital skin quality, pigmentation, and patient satisfaction (17).

Moreover, the exceptional results of the PRP group in this current study align with those of (Khunger et al., 2022), which showed that PRP treatment had considerable positive effects on skin elasticity, dermal thickness, wrinkle reduction, and pigmentation ratings using objective imaging methods. Histological examinations also showed that PRP administration resulted in improved collagen alignment and extracellular matrix remodeling. The regenerative properties of PRP are especially pertinent in cases of POH, where

skin thinning and vessel visibility result in under-eye darkening (18).

Furthermore, the outcomes from the present study can be corroborated by the studies conducted by (Bermain et al., 2021), who noted that, whereas hyaluronic acid leads to changes related to hydration, PRP results in deeper biological responses through the growth factors' activation. In addition, (Nagase et al., 2022) found out that PRP applied through microneedling penetrates deeper into the dermis, leading to long-lasting effects compared to the application of hyaluronic acid topically (19).

In terms of safety, there were no serious adverse events like infections, scarring, inflammation, or allergic reactions. Both groups reported mild redness and swelling immediately after each treatment session. These results concur with the research conducted by (Mostafa et al., 2024), who observed that microneedling-PRP had high safety profiles and minimal downtime when treating periorbital areas. Hydration, smoothness, and superficial brightness (20).

In relation to safety outcomes, both the treatments were well-tolerated, with only mild transient erythema, edema, and discomfort noted soon after the treatment sessions. No serious complications such as infections, scarring, PIH, or allergic reactions were recorded in the sample population. This result is consistent with that of who noted no serious side effects in their analysis of the use of microneedling-PRP procedure in periorbital rejuvenation therapy. In addition, (Ozer & Colak., 2019) found high levels of satisfaction with minimal adverse effects in PRP-based regenerative therapies (21).

Limitations

- This study suggests that when used in conjunction with adjuvant therapies, microneedling is a successful therapeutic strategy for enhancing periorbital pigmentation.
- Hyaluronic acid serum and platelet-rich plasma (PRP) both showed positive results in improving the periorbital area's overall look, hydration, and skin texture.

- Its capacity to promote tissue repair, stimulate collagen formation, and have regenerative potential.
- Hyaluronic acid serum was a supportive and well-tolerated solution that greatly improved skin hydration and mildly reduced pigmentation.
- In controlling periorbital pigmentation, combination therapies were often more successful than microneedling alone,

Recommendations

- Patients with periorbital pigmentation may consider microneedling in conjunction with PRP as a preferred treatment option because of its enhanced regeneration effects.
- Hyaluronic acid serum can be utilized as an alternate or supplemental treatment, especially for people who want less invasiveness and better hydration.
- For best results, patients must be properly educated about several sessions, post-procedure care, and reasonable expectations.
- Integrating these modalities with preventative and lifestyle changes may enhance treatment results and patient satisfaction even further.
- Regular use of broad spectrum sunscreen.

CONCLUSION

The present study has certain limitations that should be considered while interpreting its findings.

First we did not have a lot of people in the study, which may have made it harder to find differences in how well the treatment worked for different types of periorbital hyperpigmentation like vascular or pigmentary.

Second we only did the study in one place with people from an area so we do not know if the results would be the same for people from other places or with different skin types like Fitzpatrick types IV-VI or for people of different ages.

Third we used some measures like asking people how happy they were with the treatment and looking at pictures, which can be influenced by the

person looking at the pictures or the person reporting the results.

Also the way we prepared the PRP and the way we did the microneedling and HA serum infusion could have been slightly different each time which could have made the treatment a little inconsistent.

We did not have a group of people who just got microneedling or HA serum infusion so it is hard to know exactly how much each part of the treatment helped.

Finally we knew about some things that could have affected the results, like genetics or allergies. We did not control for them, which could have influenced how well the treatment worked for each person.

Despite these limitations the study gives us some initial evidence that using PRP with microneedling and HA serum infusion is safe and might be effective for treating periorbital hyperpigmentation.

Cases

**Figure 1.1
Dark Circle Treatment**



Figure 1.2



Figure 1.3



Figure 1.4



Figure 1.5



Figure 1.6



Figure 1.7



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