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Human Beauty: General Perception

Ungku Mohd Shahrin Mohd Zaman, Editor-In-Chief

Human beauty is a complex and multifaceted concept that has been studied by scholars and artists for centuries. Despite its subjective nature, certain characteristics such as symmetry, clear skin, and a youthful appearance are widely recognized as indicators of beauty. From a biological perspective, human beauty is closely linked to evolutionary fitness. Research has shown that individuals with symmetrical faces and bodies are often perceived as more attractive because symmetry signals good health and genetic fitness [1]. Additionally, features associated with youth and vitality, such as clear skin and shiny hair, are considered attractive because they suggest reproductive potential and the ability to care for offspring [2].

Cultural factors also play a significant role in shaping perceptions of beauty. Standards of beauty vary widely across cultures and historical periods, reflecting the diverse values and priorities of different societies. For instance, while a fuller figure may be admired in some cultures, others may favour a slimmer physique [3]. Similarly, different societies have distinct preferences for skin tone, hair colour, and facial features.

Throughout history, beauty has been celebrated in various forms of art, from the idealized human forms of ancient Greek sculpture to the imagery seen in contemporary fashion photography. However, the concept of beauty has also been used to perpetuate harmful stereotypes and social inequalities, particularly regarding race, gender, and body size. For example, Western beauty standards have historically favoured thin, white, and conventionally attractive women, contributing to the marginalization and discrimination of individuals who do not conform to these ideals [4].

In recent years, there has been a growing movement towards embracing diversity and challenging traditional beauty standards. This shift has led to greater visibility and acceptance of non-traditional forms of beauty, including plus-size models, models of colour, and models with disabilities. These developments reflect an increasing recognition that beauty is not a fixed or objective concept but rather a dynamic and subjective one, influenced by a wide range of social, cultural, and individual factors.

In conclusion, human beauty is a rich and evolving concept shaped by both biological and cultural influences. Although some physical traits are consistently perceived as attractive across different contexts, beauty standards are highly variable and historically contingent. The study of human beauty continues to evolve and mirrors changing social attitudes, along with a broader appreciation for diversity and individuality.

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ORIGINAL ARTICLE

Practice Management Knowledge Amongst Plastic Surgeons in Malaysia: A National Survey

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Abstract: Competence in practice management is essential for plastic surgeons, as it equips them with the necessary skills to operate their practices efficiently. To date, no formal evaluation of practice management knowledge and confidence among plastic surgeons in Malaysia has been conducted. This study aimed to assess the confidence in practice management among plastic surgeons in the country. A survey was distributed to plastic and reconstructive surgeons who are members of the Malaysian Society of Plastic and Reconstructive Surgery (MSPRS). Participants' knowledge and confidence in eight core principles of practice management relevant to plastic surgery were assessed using a 10-point Likert scale, where a score of 1 indicated a lack of knowledge and confidence, while a score of 10 indicated a high level of knowledge and confidence. A total of 27 out of 80 MSPRS members responded to the survey, resulting in a 33.75% response rate, which is relatively low. Most respondents were male (55.6%), aged 30–40 years (66.7%), had less than five years of experience (63.0%), and worked in Ministry of Health, Malaysia hospitals (59.3%), which are government-based institutions. The study revealed that most participants (92.6%) had not received formal training in practice management skills. Furthermore, their knowledge and confidence in practice management were generally low, with scores ranging from 3 to 4.5. However, due to the low response rate, a comprehensive understanding of practice management knowledge and confidence among plastic and reconstructive surgeons in Malaysia remains limited. Further investigation is needed to accurately assess the current situation. Nevertheless, the findings highlight the importance of incorporating structured practice management training to strengthen the non-clinical competencies of plastic surgeons in Malaysia. As part of ongoing efforts to improve the efficiency and sustainability of surgical services, it is recommended that such training be integrated into postgraduate surgical education and continuing professional development (CPD) programs. These initiatives could ultimately enhance both the clinical and non-clinical competencies of plastic surgeons in the country.

Keywords: Continuing professional development, Plastic surgeons, Practice management skill

Introduction

In addition to being proficient in surgical techniques and patient care, plastic surgeons must also manage various aspects of their practice, such as financial matters, accounting, and administration [1]. Proficiency in practice management is therefore essential, as it equips plastic surgeons with the skills necessary to operate their practices efficiently [1]. However, the model of medical education often emphasizes clinical competency, while non-clinical aspects of medical practice, such as business and practice management, are frequently overlooked [2,3].

Possessing business and entrepreneurial skills is essential for physicians to establish a successful career, particularly in private practice. Physicians' responsibilities extend beyond clinical care to include tasks such as staff management, negotiating contracts with insurance companies, marketing, and managing office space and equipment rentals or purchases. Effective management of these responsibilities is crucial for ensuring profitability of the practice [4]. Furthermore, to sustain an economically viable healthcare system, it is especially important for medical trainees to be well-versed in the principles of practice management relevant to healthcare delivery [5].

Zarrabi et al. proposed eight core principles of practice management that are particularly relevant to plastic surgeons [6]. These principles include healthcare marketing, business operations, human resource management, negotiation, insurance and medical law, coding and billing, medical record management, and finance and accounting. These principles are essential for the daily operations of both public and private healthcare systems, and when effectively integrated into practice, they can enhance the cost-effectiveness of healthcare delivery [5]. In Malaysia, doctors typically operate in both public and private healthcare settings, underscoring the critical importance of proficiency in business and practice management.

Malaysia's healthcare system faces several systemic challenges, including a shortage of plastic surgeons, centralization of services in major urban centres, and limited formal training in practice management. Many plastic surgeons receive little to no structured education in key administrative areas such as business operations, insurance coding, medical law, and clinic management. This knowledge gap contributes to various issues, including frequent insurance claim rejections, inefficient clinic workflows, poor financial oversight, and increased medico-legal risks.

In the public sector, surgeons are often excluded from administrative decision-making. Meanwhile, those in private practice may struggle with operational management and patient engagement. Plastic surgeons in private settings also face significant difficulties when dealing with insurance companies to claim surgeon fees, particularly for procedures that straddle cosmetic and reconstructive indications. A major issue is the classification of such procedures. Many medically necessary surgeries such as post-bariatric body contouring, functional rhinoplasty, and breast reduction for musculoskeletal symptoms are often labelled as cosmetic and consequently denied insurance coverage. In addition, inconsistencies in procedure coding, low reimbursement rates based on outdated fee schedules, and the bundling of complex surgeries into single claims frequently result in inadequate compensation. Surgeons who operate outside insurer panels may also face partial reimbursements, shifting financial burdens onto patients. Payment delays, cumbersome preauthorization requirements, and inconsistent criteria for determining medical necessity further strain private practices. Although an appeals process exists, it is typically time-consuming and rarely successful without persistent follow-up. Collectively, these issues

contribute to financial uncertainty and administrative inefficiency, potentially limiting patient access to medically indicated but under-recognized procedures.

While the challenges of practice management are universal across surgical specialties, the specific context of healthcare systems and regulatory environments can significantly influence the relevance and applicability of existing training models. This study aims to examine the practice management knowledge and confidence of plastic surgeons within the Malaysian healthcare system, offering insights that may be valuable for understanding similar needs in other low- and middle-income countries (LMICs) and regions undergoing healthcare system development. To date, there has been no formal evaluation of practice management knowledge and confidence among plastic and reconstructive surgeons in Malaysia.

This study aims to address this gap by investigating the following research question: *What is the current level of knowledge and confidence in practice management among plastic and reconstructive surgeons in Malaysia?* The study hypothesizes that plastic and reconstructive surgeons in Malaysia exhibit low levels of knowledge and confidence in practice management skills.

Methodology

The survey was conducted to assess the knowledge and confidence in practice management skills among plastic surgeons. A convenience sampling method was employed to recruit participants. The study was reported in accordance with the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) guidelines [7]. The study was conducted between November to December 2023 and received approval from the UMRA Medical Research Ethics Committee (MREC), UMRAMREC004-23. Only full-fledged plastic surgeons who had provided informed consent were included in the study.

The survey was designed using the Google Forms platform (Google Inc., Mountain View, CA). Personal information was not collected during the administration of the survey, ensuring that responses remained anonymous. However, participants were allowed to manually enter their email addresses, and for those who chose to do so, confidentiality and anonymity were still maintained. Consent was obtained at the beginning of the survey, and approval of the electronic informed consent was mandatory for participation. If a participant did not provide consent, the survey was automatically terminated. Participants were invited to complete the survey via WhatsApp Messenger through a link to a Google Form. The survey link was distributed in three rounds to all plastic surgeons through the Malaysian Society of Plastic and Reconstructive Surgery (MSPRS). WhatsApp Messenger was used as the distribution channel because the MSPRS association maintains the contact details of all its members. Participation was voluntary, and no incentives were offered. While participants were allowed to modify their responses after submission, each participant was limited to one response only.

The survey questions were adapted from Al-Shaqsi et al. and were structured to gather information on the following [5]:

1. Demographic information: Including age, gender, years of practice, current place of practice, and ideal practice setting.
2. Receipt of formal training: Whether participants had received any formal training in practice management skills.
3. Self-reported knowledge: Participants' knowledge of core practice management principles.
4. Training priorities: Preferred areas for further training in practice management principles during residency.

The survey consists of 11 questions, a mix of open-ended and close-ended questions, multiple-choice questions, and a Likert scale, to

assess knowledge of eight core principles of practice management relevant to plastic surgery practice, as identified by Zarrabi et al. [6]. This assessment was conducted using a 10-point Likert scale, where a score of 1 indicated a lack of knowledge and confidence, while a score of 10 denoted high knowledge and confidence. These eight principles have gained widespread recognition as fundamental components of practice management essential for surgical training and have been incorporated into numerous training programs across the United States.

Statistical Analysis

The data collected from the survey were analysed using descriptive and inferential statistics in SPSS (IBM Corp, Armonk, NY). The results were presented as frequencies (%), means, and standard deviations (SD), where appropriate. A multivariate analysis of variance (MANOVA) was conducted to assess whether there were significant differences in practice management knowledge and confidence score across different socio-demographic variables, including age, gender, years of practice, current place of practice, formal training received, and administrative position held.

Results

Demographic Characteristics of Participants

A total of 27 plastic surgeons responded to the survey, out of 80 plastic and reconstructive surgeons who were members of the MSPRS at the time of the study, resulting in a response rate of 33.75%. The demographic characteristics of the participants are summarized in **Table 1.** The majority of respondents were male (55.6%), aged 30–40 years (66.7%), and had less than five years of practice experience (63.0%). Most participants were practicing at Ministry of Health hospitals, which are government-run facilities (59.3%). Additionally, 22.2% held administrative positions at their workplace, such as deputy director, director, deputy head, or head of department/unit. For 63.0% of participants, the ideal practice setting was a combination of government, private, and university hospitals. However, only 7.4% of participants reported having received formal training in practice management skills. This training covered areas such as business operations, human resources, marketing, medical records management, finances, and accounting.

Participants' Knowledge and Confidence in Practice Management Skills

The participants' knowledge and confidence in practice management skills were generally low, with scores ranging from 3 to 4.5 **(Figure 1)**. The highest perceived knowledge and confidence were in medical records management, with a score of 5.11, which indicated an intermediate level. The lowest score was reported in business operations, with a score of 3.52. **Table 2** presents the association between practice management skills knowledge and confidence scores and various socio-demographic variables, including age, gender, years of practice, current place of practice, formal training received, and administrative position held. Overall, most plastic surgeons' knowledge and confidence scores in practice management skills did not differ significantly across socio-demographic variables ($p>0.05$). However, a significant difference was observed between male and female plastic surgeons in marketing skills, with female plastic surgeons reporting higher estimated mean scores for marketing knowledge and confidence. Additionally, negotiation skills

Table 1. Socio-Demographics characteristics of the survey participants.

	Frequency (%)	
Age (years old)		
30- 40	18	(66.7)
41 - 50	7	(25.9)
51 - 60	2	(7.4)
Gender		
Male	15	(55.6)
Female	12	(44.4)
Years of practice		
< 5 years	17	(63.0)
5 - 10 years	5	(18.5)
10 - 15 years	3	(11.1)
> 15 years	2	(7.4)
Current place of practice		
Ministry of Health Hospital based practice	16	(59.3)
University or academic based practice	5	(18.5)
Private or independent practice	6	(22.2)
Ideal setting for practice		
Ministry of Health Hospital based practice	5	(18.5)
University or academic based practice	2	(7.4)
Private or independent practice	3	(11.1)
Combination of above	17	(63.0)
Receive any formal training in practice management skills		
Yes	2	(7.4)
No	25	(92.6)
Holding an administrative position at current place of practice		
Yes	6	(22.2)
No	21	(77.8)

differed significantly based on gender, place of practice, and administrative position. Male plastic surgeons perceived themselves as having higher negotiation skills compared to female plastic surgeons. A significant difference in negotiation skills was observed across different types of practice settings. However, post hoc analysis revealed no statistically significant differences among surgeons working in government, university, or private practice. Meanwhile, those holding administrative positions reported higher perceived negotiation skills than those without such roles. For the socio-demographic factor *'formal training received'*, no p-value was generated in the multivariate analysis, likely due to insufficient data distribution across groups. Therefore, the outcome for this variable could not be interpreted. When asked about the practice management skills they wished to learn during residency, over 70% of participants expressed a desire to gain more knowledge in business operations, insurance and medical regulations **(Figure 2).**

Discussion

Medical school and residency programs primarily focus on building a strong foundation in medical knowledge, clinical skills, and clinical judgment [4]. However, practice management, a critical component of plastic surgery, has been overlooked in the current postgraduate education model [8-12]. This gap is also evident in Malaysia's medical education system. Many surgeons in Malaysia lack structured training in essential areas such as business operations, insurance processes, medical law, and clinic administration. As a result, they may face challenges like claim rejections, inefficient workflows, and increased medico-legal risks. Surgeons in the public sector are frequently excluded from administrative responsibilities, while those in private practice often struggle with operational and patient management issues. Recognizing this gap, this study aimed to assess

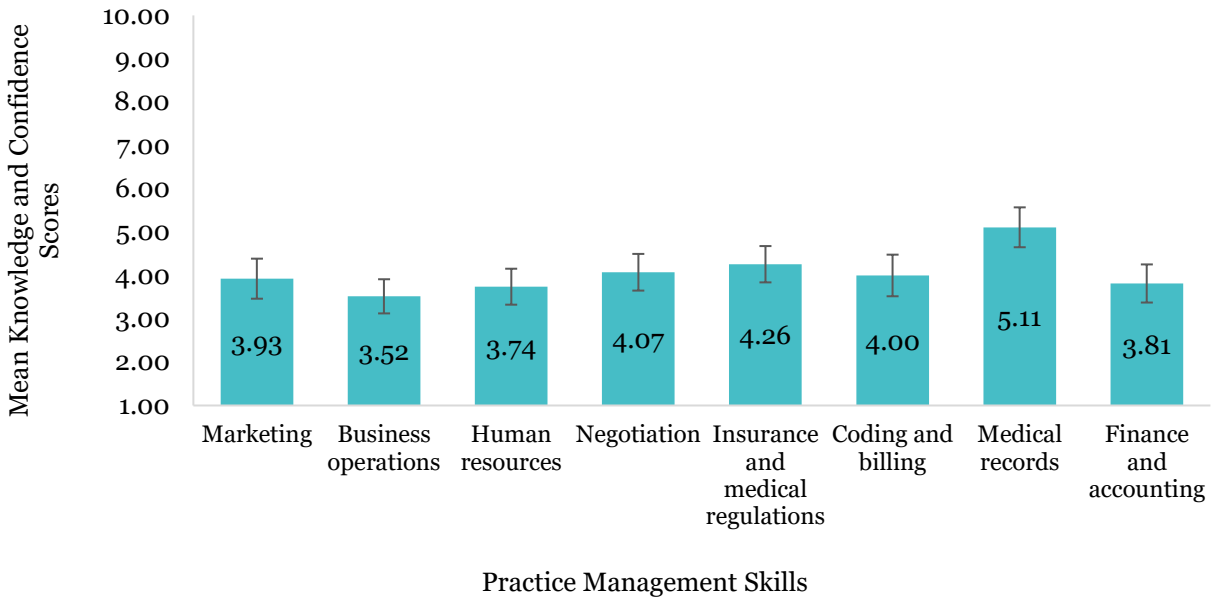

Figure 1. Mean of knowledge and confidence score for practice management skills among plastic and reconstructive surgeon in Malaysia.

Table 2. Association between practice management knowledge and confidence scores with socio-demographic variables.

Practice management skills	Socio-demographic variables	Estimated Mean	Std. Error	p-value	Partial Eta Squared
Marketing	**Age (years old)**				
	30- 40	3.78	0.57	0.072	0.27
	41 - 50	4.17	0.74		
	51 - 60	6.00	1.33		
	Gender				
	Male	4.06	0.53	0.004*	0.55
	Female	4.51	0.72		
	Years of practice				
	< 5 years	2.89	0.59	0.065	0.39
	5 - 10 years	4.75	0.88		
	10 - 15 years	5.33	1.09		
	> 15 years	6.00	1.33		
	Current place of practice				
	Government	4.74	0.60	0.128	0.31
	University	3.11	0.96		
	Private	4.00	0.80		
	Receive formal training				
	Yes	5.00	1.33	n/a	0.00

	No	4.09	0.45		
	Hold administrative position				
	Yes	4.00	0.77	0.093	0.24
	No	4.32	0.51		
Business operations	**Age (years old)**				
	30- 40	3.61	0.59	0.886	0.00
	41 - 50	4.50	0.77		
	51 - 60	3.50	1.39		
	Gender				
	Male	4.03	0.56	0.585	0.03
	Female	3.71	0.75		
	Years of practice				
	< 5 years	2.84	0.62	0.574	0.10
	5 - 10 years	4.50	0.92		
	10 - 15 years	6.00	1.13		
	> 15 years	3.50	1.39		
	Current place of practice				
	Government	4.11	0.62	0.659	0.07
	University	4.00	1.00		
	Private	3.60	0.83		
	Receive formal training				
	Yes	6.00	1.39	n/a	0.00
	No	3.64	0.47		
	Hold administrative position				
	Yes	4.83	0.80	0.856	0.00
	No	3.39	0.53		
Human resources	**Age (years old)**				
	30- 40	3.57	0.65	0.795	0.01
	41 - 50	4.50	0.85		
	51 - 60	5.50	1.53		
	Gender				
	Male	3.97	0.61	0.599	0.03
	Female	4.57	0.83		
	Years of practice				
	< 5 years	2.65	0.68	0.118	0.32
	5 - 10 years	4.75	1.01		
	10 - 15 years	6.00	1.25		
	> 15 years	5.50	1.53		

	Current place of practice				
	Government	4.44	0.69	0.981	0.00
	University	4.00	1.10		
	Private	3.80	0.92		
	Receive formal training				
	Yes	6.00	1.53	n/a	0.00
	No	3.90	0.52		
	Hold administrative position				
	Yes	4.50	0.88	0.373	0.07
	No	3.95	0.59		
Negotiation	**Age (years old)**				
	30- 40	4.03	0.54	0.061	0.28
	41 - 50	4.58	0.70		
	51 - 60	2.50	1.27		
	Gender				
	Male	4.06	0.51	0.011*	0.46
	Female	4.01	0.69		
	Years of practice				
	< 5 years	3.61	0.56	0.187	0.26
	5 - 10 years	4.13	0.84		
	10 - 15 years	6.00	1.04		
	> 15 years	2.50	1.27		
	Current place of practice				
	Government	4.11	0.57	0.042*	0.44
	University	3.78	0.92		
	Private	4.10	0.76		
	Receive formal training				
	Yes	5.00	1.27	n/a	0.00
	No	3.91	0.43		
	Hold administrative position				
	Yes	4.33	0.73	0.028*	0.37
	No	3.87	0.49		
Insurance and medical regulations	**Age (years old)**				
	30- 40	3.89	0.66	0.608	0.03
	41 - 50	5.58	0.86		
	51 - 60	6.50	1.55		
	Gender				
	Male	4.64	0.62	0.447	0.05

	Female	5.33	0.84		
	Years of practice				
	< 5 years	3.16	0.69	0.453	0.13
	5 - 10 years	5.88	1.02		
	10 - 15 years	6.33	1.26		
	> 15 years	6.50	1.55		
	Current place of practice				
	Government	4.81	0.70	0.711	0.06
	University	5.89	1.11		
	Private	4.30	0.93		
	Receive formal training				
	Yes	7.00	1.55	n/a	0.00
	No	4.55	0.53		
	Hold administrative position				
	Yes	5.33	0.89	0.422	0.06
	No	4.56	0.59		
Coding and billing	**Age (years old)**				
	30- 40	3.46	0.73	0.908	0.00
	41 - 50	5.83	0.95		
	51 - 60	3.50	1.72		
	Gender				
	Male	4.15	0.69	0.699	0.01
	Female	4.80	0.93		
	Years of practice				
	< 5 years	2.81	0.76	0.693	0.06
	5 - 10 years	5.25	1.14		
	10 - 15 years	7.33	1.41		
	> 15 years	3.50	1.72		
	Current place of practice				
	Government	4.29	0.78	0.847	0.03
	University	4.78	1.24		
	Private	4.20	1.03		
	Receive formal training				
	Yes	6.50	1.72	n/a	0.00
	No	4.05	0.59		
	Hold administrative position				
	Yes	5.83	1.00	0.561	0.03
	No	3.47	0.66		

Medical records	**Age (years old)**				
	30- 40	5.18	0.80	0.402	0.07
	41 - 50	5.83	1.03		
	51 - 60	6.00	1.87		
	Gender				
	Male	5.18	0.75	0.512	0.04
	Female	6.29	1.01		
	Years of practice				
	< 5 years	4.35	0.83	0.581	0.09
	5 - 10 years	6.25	1.24		
	10 - 15 years	7.00	1.53		
	> 15 years	6.00	1.87		
	Current place of practice				
	Government	5.89	0.84	0.306	0.19
	University	5.44	1.35		
	Private	5.00	1.12		
	Receive formal training				
	Yes	7.00	1.87	n/a	0.00
	No	5.32	0.64		
	Hold administrative position				
	Yes	5.83	1.08	0.141	0.19
	No	5.34	0.72		
Finance and accounting	**Age (years old)**				
	30- 40	3.35	0.68	0.707	0.01
	41 - 50	4.33	0.88		
	51 - 60	7.50	1.59		
	Gender				
	Male	3.70	0.64	0.591	0.03
	Female	5.43	0.86		
	Years of practice				
	< 5 years	2.54	0.70	0.327	0.18
	5 - 10 years	4.75	1.05		
	10 - 15 years	5.33	1.30		
	> 15 years	7.50	1.59		
	Current place of practice				
	Government	4.64	0.72	0.605	0.09
	University	2.89	1.14		
	Private	4.40	0.95		
	Receive formal training				

	Yes	5.50	1.59	n/a	0.00
	No	4.06	0.54		
	Hold administrative position				
	Yes	3.67	0.92	0.350	0.08
	No	4.58	0.61		

** Statistically significant at p < 0.05*
n/a: No p-value shown
Government: Ministry of Health hospital-based practice
University: University or academic-based practice
Private: Private or independent practice

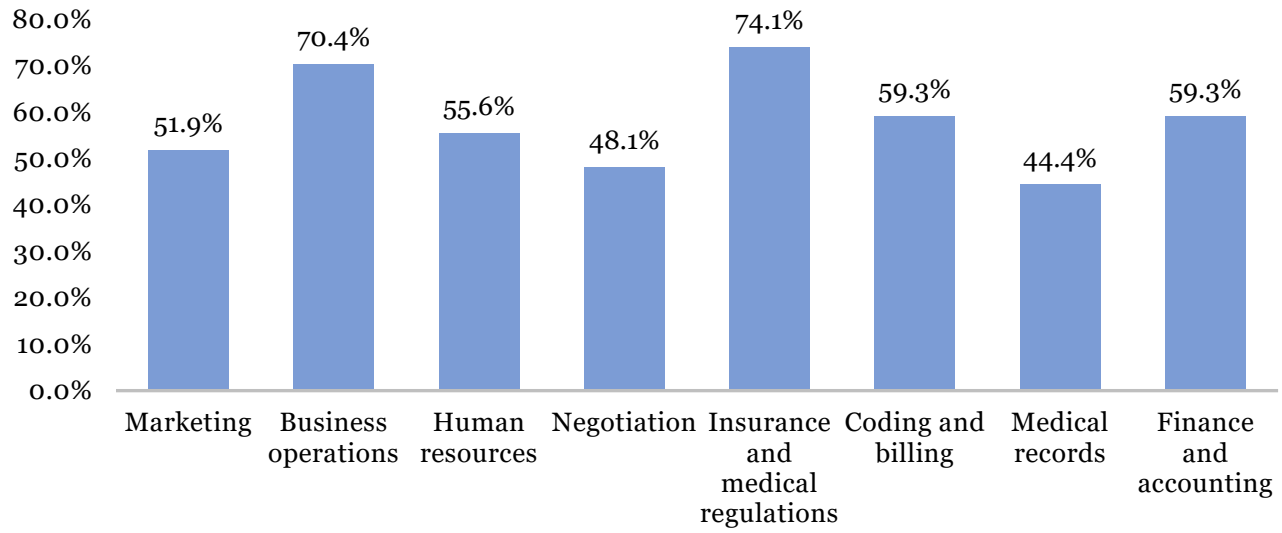

Figure 2. Practice management skills to learn during residency.

the perceived knowledge and confidence of plastic and reconstructive surgeons in Malaysia regarding their practice management skills.

The findings revealed that the majority of participants had not received formal training in practice management. These findings are consistent with previous studies by Ovadia et al. and Al-Shaqsi et al., which reported similarly that most plastic surgeons lacked formal education in business or practice management during residency training [4,5]. This was evident in the assessment of their knowledge and confidence, where participants generally perceived their levels of knowledge and confidence in practice management skills as low. However, the highest reported perceived knowledge and confidence were observed in medical records management. Similarly, Al-Shaqsi et al. found that plastic surgery residents in Canada demonstrated the highest level of knowledge in medical records management [5]. This is likely because this area is commonly emphasized during training and practice as plastic surgeons, with frequent exposure in daily practice. Conversely, areas such as medical insurance, legal aspects, and negotiation are less likely to be encountered routinely, highlighting the need for formal education in these areas. Additionally, most participants expressed a desire to learn more about business operations, insurance, and medical regulations during their residency. This finding aligns with the study by Al-Shaqsi et al.,

which reported that business operations were the highest-prioritized among the eight core areas of business and practice management identified by Canadian plastic surgery residents [5].

Acquiring clinical knowledge during surgical training is challenging due to the limited time available for learning. As a result, introducing nonclinical training, such as business and practice management, into residency programs may raise concerns about reducing clinical exposure. In Malaysia, however, practice management skills can be integrated into postgraduate surgical education and Continuing Professional Development (CPD) programs as an alternative approach. CPD refers to the systematic maintenance, improvement, and broadening of knowledge, understanding, and skills, along with the development of personal qualities necessary for the effective performance of professional duties throughout an individual's career. It encompasses any relevant learning activity, whether formal and structured or informal and self-directed [13]. Registered Medical Practitioners (RMPs) in Malaysia are required to fulfill CPD requirements set by the Malaysian Medical Council (MMC) to renew their Annual Practising Certificates (APCs). Submission of CPD participation records is a mandatory condition for APC renewal [14]. Therefore, incorporating practice management training into CPD programs would allow plastic surgeons to develop these skills continuously throughout their careers.

Limitation of study

This study is not without limitations. The primary limitation is the relatively low response rate, which introduces potential nonresponse bias. To enhance future research, subsequent studies will involve a larger cohort of plastic and reconstructive surgeons in Malaysia, recruiting participants beyond the membership of MSPRS. This approach will help achieve a higher response rate and more generalizable findings. Additionally, the imbalance in subgroup representation made it difficult to compare groups and further limited the generalizability of the findings. Conducting studies with a larger sample size will help address this limitation.

The use of WhatsApp as the primary recruitment tool may have introduced potential selection bias. Individuals who are less active on the platform or who did not engage with the survey invitation may have been inadvertently excluded. To improve representativeness in future studies, we will employ multiple recruitment platforms in addition to WhatsApp, along with structured follow-up reminders to enhance response rates and reduce potential selection bias. Furthermore, direct instruction or endorsement from the MSPRS president may help encourage participation. Another limitation is that we did not track non-responders, conduct follow-up reminders beyond the three rounds of link distribution, or analyse differences between responders and non-responders. Incorporating these steps in future studies would provide valuable insights into potential bias and improve the validity of the findings.

Lastly, the survey instrument primarily measured participants' self-reported confidence and knowledge using a 10-point Likert scale, without the development of specific constructs for each practice management principle. As a result, we did not assess the instrument's reliability and validity. Future studies should refine the survey tool by defining constructs clearly and conducting reliability and validity testing to ensure its appropriateness for evaluating practice management knowledge and confidence among plastic surgeons in Malaysia.

Conclusion

The findings from this study suggest that plastic and reconstructive surgeons in Malaysia may have notable gaps in practice management knowledge and confidence. However, the low response rate limits our understanding of the true extent of this issue among plastic surgeons in the country. Nevertheless, the results

underscore the need for structured practice management training during residency to strengthen the non-clinical competencies of future plastic surgeons.

As part of ongoing efforts to improve the efficiency and sustainability of surgical services in Malaysia, it is recommended that such training be integrated into postgraduate surgical education and CPD programs. This initiative should aim to equip surgeons with essential non-clinical skills, including healthcare finance, insurance coding, legal compliance, business operations, human resource management, medical record optimization, and ethical healthcare marketing. By acquiring these competencies, surgeons will be better equipped to manage both public and private practices effectively. Anticipated outcomes include enhanced financial sustainability, fewer insurance claim rejections, improved legal literacy, and more efficient team-based care. Furthermore, structured exposure to data-driven decision-making and community outreach may improve patient access and health outcomes, particularly in underserved areas. This initiative aligns with the broader national goal of cultivating a more resilient, accountable, and patient-centred surgical workforce in Malaysia.

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Potential Conflict of Interest

The authors declare that there is no conflict of interest.

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CASE SERIES

Evaluating the Efficacy of Ultrasound-Guided Hyaluronidase Treatment for Chronic Inflammatory Reactions Due to Hyaluronic Acid Dermal Fillers.

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Abstract: The use of hyaluronic acid (HA) fillers has become increasingly popular for facial contouring and rejuvenation. Although generally considered safe, HA fillers can occasionally lead to chronic inflammatory reactions, particularly in individuals with underlying skin conditions. These complications may manifest as persistent erythema, telangiectasia, and granulomatous inflammation, often resulting from filler migration and related microvascular changes. This study aims to evaluate the efficacy of ultrasound-guided hyaluronidase treatment for chronic inflammatory reactions to HA fillers. This case series presents seven female patients, aged 29–58 years, with chronic complications following HA filler treatments. All patients underwent clinical evaluation using cross-polarized imaging with the OBSERV® 520x to assess surface erythema and vascular patterns, as well as high-frequency ultrasound to detect subsurface abnormalities, including filler migration and vascular congestion, before treatment. Ultrasound-guided hyaluronidase injections were administered over two to four sessions. Patients were evaluated at 1 month and 6 months to assess the resolution of complications. Baseline evaluation revealed persistent complications in all patients, including erythema, nodular inflammation, and telangiectasia. Post-treatment findings showed significant improvements, including a reduction in erythema, resolution of nodular inflammation, and normalization of vascular flow patterns. Mild, transient swelling at the injection sites was the only reported adverse effect. This study highlights the utility of ultrasound imaging for diagnosing and managing chronic HA filler complications. The integration of ultrasound imaging may enable more precise diagnosis and treatment, reducing diagnostic uncertainty and improving patient outcomes.

Keywords: Hyaluronic Acid Fillers, Chronic Inflammation, Ultrasound-Guided Hyaluronidase, Filler Migration

Introduction

Nowadays, non-surgical treatments such as hyaluronic acid (HA) fillers are increasingly preferred by patients due to their minimal invasiveness, affordability, and fast recovery time [1-4]. Additionally, due to its established safety and tolerability profiles, HA fillers are widely used for facial sculpting and rejuvenation [5]. Over 5 million HA filler treatments were performed worldwide in 2021 alone, reflecting a remarkable increase of more than 60% compared

to 2017. Meanwhile, surgical procedures in the head and neck region saw only a 7.3% increase over the same period, highlighting the growing preference for nonsurgical treatments [6].

However, adverse events can still occur following the administration of HA fillers [7]. These events are classified into vascular and non-vascular complications [8]. Non-vascular complications are more common and can be further categorized into early- and late-onset reactions, including edema, bruising, and nodule formation, among others [9,10,11]. Although most adverse events are mild and transient, such as erythema, edema, and bruising [12], rare but severe complications have also been reported. These include large-caliber vessel compromise, which can lead to skin necrosis, hair loss, and embolic events such as stroke and vision loss due to retinal artery occlusion [12,13,14]. One of the advantages of HA fillers is that they can be dissolved with hyaluronidase in case of complications [15]. When complications occur, it is crucial to identify the location of the filler, as hyaluronidase must be injected directly into the filler mass. However, detecting the filler can be challenging, especially when it is placed deep within the dermis [16].

The use of ultrasound to manage complications related to dermal fillers has gained increasing attention in recent years. According to Schelke et al. [16], ultrasound examination is routinely used in their practice not only to minimize risks but also to locate and identify fillers in patients with complications. Ultrasound enables visualization of the skin and underlying structures, including muscles, veins, and arteries, while simultaneously identifying filler material and observing the injection plane. The authors also found that ultrasound significantly enhances the safety of dermal filler treatments. This case series aims to evaluate the efficacy of ultrasound-guided hyaluronidase treatment in managing chronic inflammatory reactions to hyaluronic acid dermal fillers, ensuring precise and safe administration.

Methodology

Patients

Seven patients, aged 29 to 58 years, presented to Harmony Medical between January and July 2024 with chronic inflammatory complications following hyaluronic acid (HA) filler treatments in facial regions, including the nasal, infraorbital, zygomatic areas, and chin **(Table 1)**. All patients had previously received temporary HA fillers from various brands and were initially treated at other aesthetic clinics. At the time of presentation, they exhibited persistent erythema, nodular inflammation, or telangiectasia lasting for more than three months post-HA filler injection. Ultrasound imaging revealed evidence of filler migration or abnormal deposition. All patients provided informed consent after detailed discussions regarding diagnostic procedures, therapeutic options, potential risks, and anticipated outcomes. Written and verbal consent was obtained for both the treatment and the use of anonymised data for academic purposes. Patient data were handled in accordance with the United Kingdom General Data Protection Regulation (UK GDPR).

Diagnostic procedure

All patients underwent a thorough dermatological evaluation upon presentation, including clinical examination and skin imaging using the OBSERV® 520x cross-polarised imaging system (Sylton, UK). This system provided detailed images to assess erythema, vascular patterns, and dermal texture. Additionally, high-frequency ultrasound (LOGIQ E10, GE Healthcare, Chicago, IL, USA) with an 18 MHz linear transducer was employed to confirm the presence of HA filler deposits and associated tissue changes. The ultrasound was also used to guide the administration of hyaluronidase for the treatment of complications and to monitor treatment outcomes. Vascular involvement and

Table 1. Facial regions treated with HA filler injections

Facial Region	Cheeks	Chin	Prejowl Sulcus	Tear Trough	Jaw	Nose
Patient 1	✓	✓				
Patient 2	✓		✓			
Patient 3	✓			✓		
Patient 4	✓				✓	
Patient 5	✓			✓		
Patient 6				✓		
Patient 7	✓		✓			

hypervascularity, filler migration, encapsulation, and vascular compromise were identified using ultrasound to support therapeutic planning.

Treatment procedure

For all patients, hyaluronidase (1,500 IU per vial) reconstituted in 0.9% sodium chloride was used to treat the complications. It was administered using a 30G needle and a 1 mL Luer lock syringe at multiple sites in areas where the filler was present, including the nasal, infraorbital, zygomatic, and chin regions. Patients received hyaluronidase treatment in two to four sessions, with four-week intervals between sessions **(Table 2)**. The number of vials used per session was determined based on the patient's complication status. Several clinical parameters influenced the dosage, including the volume and distribution of the filler, vascular involvement, tissue changes and severity of complications, anatomical zone and injection depth, as well as the type of filler previously used and the duration since its injection, as summarized in **Table 3.**

Ultrasound was used to identify the injection sites, targeting affected filler deposits or nodules. Ultrasound guidance ensured precise enzyme placement while minimizing risks to surrounding structures. Patients were reassessed six months post-treatment using clinical evaluations, OBSERV® 520X evaluation, and ultrasound to confirm the resolution of complications. Patient satisfaction was evaluated using a satisfaction survey at six months post-treatment. Adverse reactions to hyaluronidase administration were monitored throughout the treatment duration.

Table 2. Hyaluronidase treatment for all patients.

	Number of Sessions	Vials per Session	Total Vials Used	Total Dosage (IU)
Patient 1	3	5	15	22,500
Patient 2	4	5	20	30,000
Patient 3	2	5	10	15,000
Patient 4	2	5	10	15,000
Patient 5	3	5	15	22,500
Patient 7	2	2	4	6,000

Table 3. Clinical parameters and their influence on the number of vials per session.

Parameter / Criterion	Impact on Vial Quantity
Volume and distribution of filler [17]	Larger or deeper deposits required higher enzyme volume; superficial, well-integrated filler required less
Vascular involvement [18]	Low-flow states or vascular compression necessitated higher doses, especially near high-risk zones
Tissue changes and complication severity [19]	Fibrosis, tethering, or dermal tenting required more targeted or repeated dosing
Anatomical zone and injection depth [20]	Thicker tissue zones (e.g. cheek) required more enzyme; delicate zones (e.g. tear trough) required conservative dosing
Previous filler type and duration since injection [21]	Highly crosslinked or aged filler typically needed higher cumulative doses over multiple sessions

Results

This case series presents seven female patients, aged 29 to 58 years, with persistent complications, including erythema, nodular inflammation, and telangiectasia. **Table 4** summarizes the pre- and post-treatment (6-month) evaluations of the patients, including clinical evaluation, skin imaging, and ultrasound assessment. Decreases in erythema were observed in all patients, with complete resolution in five cases at the 6-month follow-up. Ultrasound confirmed the absence of encapsulated nodules in three patients at the six-month follow-up. **Figure 1**, **Figure 2** and **Figure 3** show clinical photographs, OBSERV® 520X images, and ultrasound images of the patients before and after treatment (at the 6-month follow-up). All patients reported improved skin texture and reduced discomfort, with high satisfaction scores regarding the treatment received **(Table 5)**. Two patients experienced transient swelling after hyaluronidase injections, which resolved within 48 hours. No other adverse reactions, including hypersensitivity, were observed.

Table 4. Clinical evaluation, OBSERV® 520X evaluation and ultrasound evaluation of patients before and after hyaluronidase treatment (at the 6-month follow-up).

Patient		Clinical evaluation	OBSERV® 520X evaluation	Ultrasound evaluation
1	Baseline	• Persistent erythema • Vascular congestion	• Diffuse erythema & telangectasia • Vascular congestion	• Moderately defined hyperechoic material in mid to deep dermis and superficial subcutaneous layer • Heterogeneous internal echogenicity • Disruption of normal tissue plane architecture • No extension to periosteum

	6 Month	• Reduction in persistent erythema • Decreased vascular congestion	• Reduction in diffuse erythema and telangiectasia • Decreased vascular congestion	• More diffuse hyperechoic material with less defined borders • More homogeneous echogenicity pattern • Improved tissue plane definition • Preservation of normal anatomical layering
2	Baseline	• Erythema • Filler migration	• Diffuse erythema & telangectasia • Diffuse vascular patterns	• Diffuse hyperechoic material in subcutaneous plane • Moderate definition of borders • Variable echogenicity throughout • Situated in mid-level soft tissue layers
	6 Month	• Decreased erythema • Reduction in visible tissue irregularity	• Reduced erythema Decreased vascular patterns and telangiectasia	• More uniform echogenicity • Reduced distinctness of hyperechoic regions • Improved visualisation of normal tissue planes • Maintenance of anatomical layer integrity
3	Baseline	• Filler migration • Asymmetry nodular swelling • Asymmetry erythema	• Localised vascular congestion	• Hyperechoic material in deep dermis and superficial subcutaneous plane • Variable distribution across scanned area • Heterogeneous echogenicity • Alteration of normal echogenic pattern
	6 Month	• Improved facial symmetry • Decreased erythema	• Reduced localized vascular congestion • Decreased redness	• More uniform distribution of hyperechoic material • More consistent echogenicity • Better defined tissue planes • Reduced disruption of normal echogenic pattern

4	Baseline	• Erythema • Nodular swelling • Subcutaneous swelling	• Irregular vascular patterns	• Well-defined hyperechoic regions in deep dermis and subcutaneous layer • Relatively distinct borders • Some compression of adjacent tissue planes • Heterogeneous internal pattern
	6 Month	• Reduced erythema • Decreased nodular and subcutaneous swelling	• More normalized vascular patterns • Reduced irregular pigmentation	• Less defined hyperechoic areas • Reduced prominence of borders • Improved definition of normal tissue planes • More uniform echogenicity
5	Baseline	• Chronic erythema • Subcutaneous nodules	• Diffuse erythema • Granulomatous patterns	• Heterogeneous hyperechoic material in subcutaneous plane • Colour Doppler signal present in adjacent tissues • Variable echogenic pattern • Adjacent hypoechoic regions
	6 Month	• Reduction in chronic erythema • Decreased subcutaneous nodules	• Reduced diffuse erythema • Decreased visible capillary networks	• More organised distribution of hyperechoic material • Reduced colour Doppler signal • More uniform echogenicity • Less prominent hypoechoic regions
6	Baseline	• Severe erythema • Inflammatory nodules	• Diffuse erythema • Telangiectatic patterns	• Multiple hyperechoic areas in superficial to mid-level soft tissues • Moderate definition of borders • Predominantly in subcutaneous layer • Variable echogenicity
	6 Month	• Reduction in erythema • Decreased nodular prominence	• Reduced diffuse erythema • Decreased telangiectatic patterns	• Reduced prominence of hyperechoic areas • More diffuse appearance • Better visualisation of normal tissue planes • More homogeneous echogenicity

7	Baseline	• Mild erythema • Inflamed nodular lesions	• Erythema Vascular • Congestion lesions around nasolabial folds	• Hyperechoic material in subcutaneous and superficial fascial planes • No definitive evidence of intramuscular material • Some distortion of normal tissue plane architecture • Heterogeneous echogenicity pattern
	6 Month	• Decreased erythema • Reduction in nodular lesions	• Reduced erythema • Decreased vascular congestion around nasolabial folds	• More diffuse hyperechoic appearance • Improved definition of tissue planes • More uniform echogenicity • Better preservation of normal anatomical layers

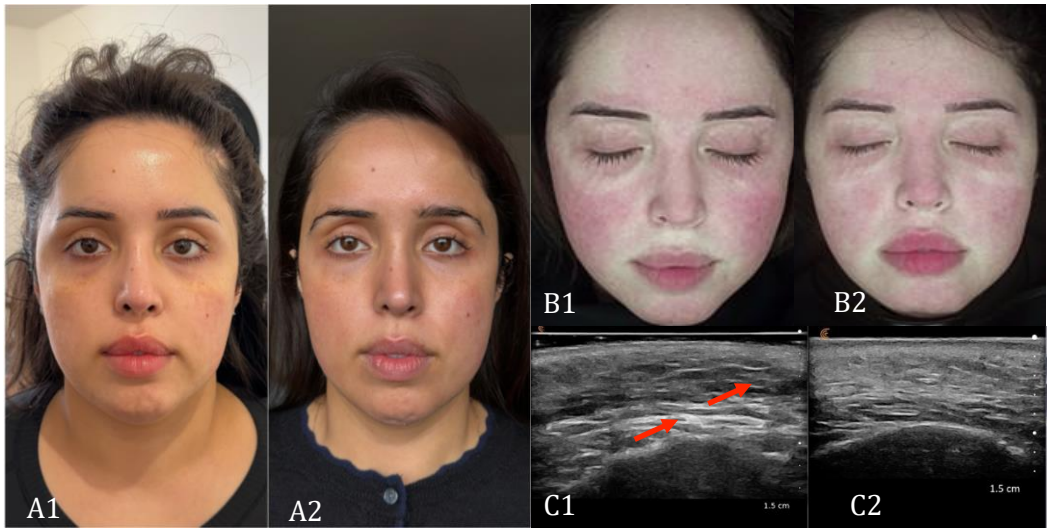

Figure 1. (A) Clinical photographs between pre-treatment (A1) and post-treatment (A2), which showing resolution of hyaluronic acid filler complications post treatment, with reduced skin inflammation and irregularities. (B) OBSERV® 520X imaging demonstrating vascular changes, with pre-treatment (B1) showing significant erythema and telangiectasia, and post-treatment (B2) displaying normalised vascular patterns. (C) High-frequency ultrasound imaging at 1.5 cm depth, illustrating the transformation of soft tissue architecture. The pre-treatment scan (C1) exhibits disrupted tissue planes and heterogeneous material. Red arrows in (C1) indicate hyperechoic filler deposits, likely surrounded by fibrotic tissue. The lobulated appearance and increased density suggest chronic inflammatory or granulomatous changes. The post-treatment scan (C2) shows improved echogenicity and preserved anatomical layering.

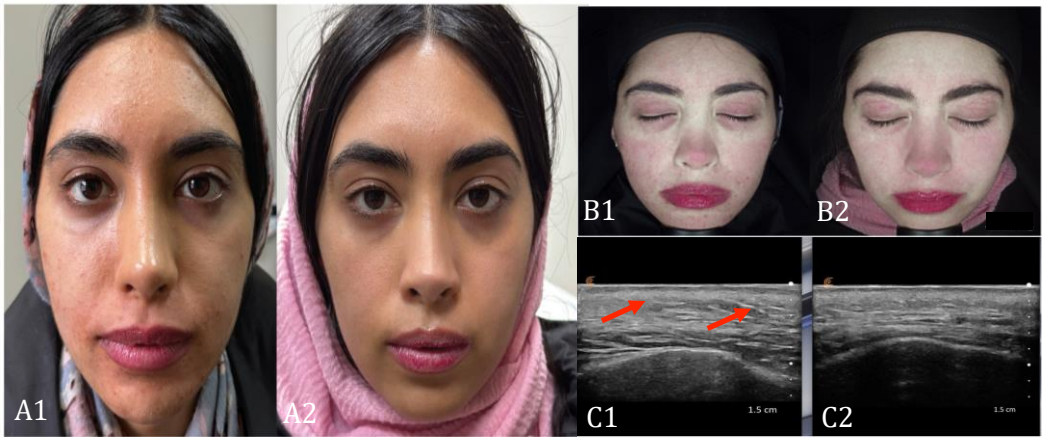

Figure 2. (A) Clinical photographs demonstrating the resolution of hyaluronic acid filler-related complications. The pre-treatment image (A1) reveals significant skin inflammation, irregular texture, and widespread acneiform eruptions. The post-treatment image (A2) shows marked improvement in skin appearance, with reduced inflammation and more uniform complexion. (B) OBSERV® 520X vascular imaging illustrating the vascular changes associated with hyaluronidase intervention. The pre-treatment image (B1) displays extensive erythema and irregular vascular patterns. The post-treatment image (B2) demonstrates a notable reduction in vascular congestion and skin redness. (C) High-frequency ultrasound imaging at 1.5 cm depth capturing the structural modifications in soft tissue following hyaluronidase treatment. The pre-treatment scan (C1) shows heterogeneous hyperechoic material with disrupted tissue architecture, indicative of HA filler complications. Red arrows in (C1) indicate regions of heterogeneously distributed echogenic material, consistent with migrated or poorly integrated hyaluronic acid filler, contributing to soft tissue disruption.The post-treatment scan (C2) reveals a more uniform echogenicity and improved tissue plane definition, suggesting successful resolution of the initial filler-induced tissue irregularities.

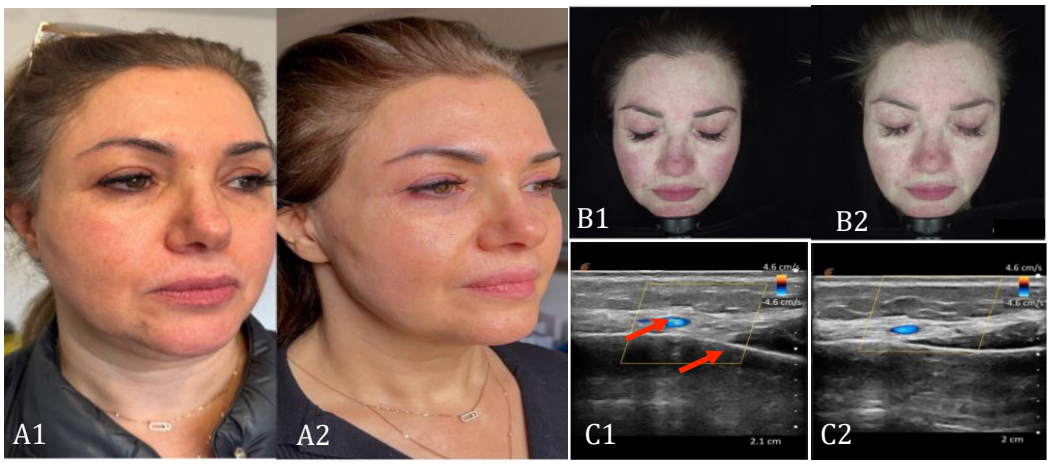

Figure 3. (A) Clinical photographs between pre-treatment (A1) and post-treatment (A2). The pre-treatment image reveals significant inflammatory changes associated with hyaluronic acid filler complications, characterised by erythema and uneven skin texture. The post-treatment image shows a marked improvement in overall facial appearance and skin quality. (B) OBSERV® 520X vascular imaging depicting the microvascular changes resulting from hyaluronidase intervention. The pre-treatment image (B1) exhibits extensive vascular congestion and diffuse erythema, while the post-treatment image (B2) demonstrates a normalisation of vascular patterns and reduced inflammatory response. (C) High-frequency ultrasound imaging at 2.1 cm depth capturing the soft tissue transformation. The pre-treatment scan (C1) reveals hyperechoic material with variable distribution in the deep dermis and superficial subcutaneous plane, characterised by heterogeneous echogenicity and disrupted normal tissue architecture. Red arrows in (C1) identify residual or migrated filler

deposits within the subcutaneous tissue, presenting as mixed echogenicity zones suggestive of early fibrotic or inflammatory tissue response.The post-treatment scan (C2) shows a more uniform distribution of hyperechoic material, improved echogenicity consistency, and better-defined tissue planes, indicating a reduction in the disruption of the normal echogenic pattern.

Table 5. Patient satisfaction survey (n=7).

Question	Frequency (n)
Satisfaction with dissolving treatment	
I feel very satisfied with the treatment	3
I feel satisfied with the treatment	3
I'm not sure	1
Felt fully informed about the dissolving process	
I felt informed	7
Level of care and support received	
The level of care and support was excellent	4
The level of care and support was good	3
Treatment met expectations	
The treatment exceeded my expectations	3
The treatment met my expectations	3
The treatment somewhat met my expectations	1

Discussion

In the under-regulated aesthetic landscape of the United Kingdom (UK), the increasing prevalence of excessive filler use (15-20 ml) and full-face treatments administered by non-medical practitioners highlighted the need for enhanced safety measures. In this context, ultrasound guidance proved to be an invaluable tool. This case series aimed to evaluate the potential use of ultrasound in improving the diagnosis and management of HA filler-related complications. Ultrasound has become an important imaging tool for evaluating the soft tissues of the face and neck because of its superior diagnostic accuracy compared to other established methods [22,23]. In this case series, ultrasound was used to assist in the administration of hyaluronidase injections.

Ultrasound offered several advantages, including the absence of ionizing radiation, real-time imaging capability, and ease of reproducibility [22]. Using ultrasound guidance enhanced the precision of the intervention by ensuring that hyaluronidase was accurately delivered to the affected areas, thereby improving treatment efficacy and minimizing residual inflammation. Additionally, ultrasound enabled the differentiation of HA and hyaluronidase enzyme, with HA appearing hypoechoic to anechoic and hyaluronidase appearing hyperechoic [24].

In this case series, all complications in the patients were resolved at the six-month follow-up. These findings were consistent with previous studies demonstrating the efficacy of ultrasound-guided hyaluronidase interventions. For instance, Garcia et al. [25] reported successful treatment of a vascular complication resulting from HA injection into the nasolabial fold, while Schelke et al. [26] observed improved outcomes in 21 cases of HA filler-related adverse events. Another study also demonstrated the effectiveness of ultrasound assistance in addressing complications following a lip-filling procedure with HA [27].

Ultrasound can also help locate migrated filler. Filler migration is one of the potential adverse events of dermal filler injections, though it is relatively uncommon and often delayed in onset [28-33]. Clinical manifestations may remain subclinical until secondary complications, such as granuloma, edema, or cyst formation, arise. In severe cases, filler migration can lead to aesthetic concerns, chronic

inflammation, infection, and even vascular compromise, including stroke and blindness. Diagnosis usually relies on clinical examination and the patient's medical history, but imaging techniques can be used to locate filler material in deeper tissue layers [34]. For instance, high-frequency ultrasound has been utilized to identify dermal fillers in the facial area [35,36].

Ultrasound played a crucial role in accurately diagnosing the aforementioned cases, preventing potential misdiagnoses that might have occurred otherwise. Studies by Urdiales-Gálvez et al. [37] and Magacho-Vieira and Santana [38] demonstrated the efficacy of ultrasound in identifying filler materials within various tissue planes, including instances of migration that were not clinically apparent. The literature also highlighted that different dermal fillers exhibit distinctive sonographic patterns, with hyaluronic acid fillers frequently showing heterogeneous echogenicity influenced by factors such as crosslinking, concentration, and degradation state. Notably, clinical observations suggested that dermal fillers rarely appeared as singular hypoechoic nodules, contrary to common depictions in existing literature. Instead, they frequently exhibited mixed echogenicity patterns, likely due to the gel-like properties of hyaluronic acid products and their variable hydration states over time. Nevertheless, further comprehensive documentation and investigation are needed to enhance the scientific understanding of these patterns.

Furthermore, ultrasound is not only beneficial for managing HA complications but also for enhancing the safety of filler injections. Besides assisting in the treatment of adverse events [24, 26], it can also be employed in facial filler procedures to prevent complications [16, 23, 37, 39] and guide the injection process [16, 40]. By using ultrasound guidance, hyaluronidase can be administered effectively, restoring normal blood flow and preserving local anatomy, thereby leading to a more predictable and safer approach [27]. Establishing a standardized protocol for ultrasound-guided facial harmonization is therefore recommended, as it may significantly improve procedural success and complication management [27]. Increased routine use of ultrasound during HA injection procedures may enhance patient satisfaction and improve procedural safety [16,41].

Limitations of study

While this case series provides valuable insights into the use of ultrasound for managing HA filler-related complications, there are several limitations that should be considered. In this case series, the results are based on a small sample size of only seven patients, which may limit the generalizability of the findings. Additionally, variations in patient histories, such as differences in filler location and injection techniques, may have influenced the outcomes. Further studies are needed to validate these results in larger cohorts with more specific patient histories. Moreover, the cases presented only involve complications related to HA fillers. Additional research should assess the capability of ultrasound in managing complications associated with other fillers, such as calcium hydroxyapatite and polymethylmethacrylate. While ultrasound guidance improved treatment precision, it may not be universally accessible, and proper training is required, limiting the broader application of this approach. Furthermore, the absence of a standardized protocol is another factor that may hinder its widespread use.

Conclusion

Current literature provides limited insight into extensive, multi-layered product accumulation resulting from repeated treatments, a scenario commonly encountered in clinical practice. This highlights a discrepancy between published research, which predominantly addresses

controlled, single-treatment complications and the complexities observed in real-world settings, particularly in less regulated markets. In this study, ultrasound imaging played a crucial role by allowing for the precise localization of filler deposits beneath the skin, confirming cases of migration, and guiding targeted interventions with hyaluronidase. This diagnostic approach enabled a more accurate assessment of the extent of the problem and optimized treatment by ensuring that the enzyme effectively reached the areas of migrated filler. Integrating ultrasound into routine diagnostic protocols for filler-related complications could enhance clinical outcomes by providing a clearer understanding of the underlying issues.

As the demand for HA fillers continues to rise, adopting these techniques in aesthetic and dermatological settings will equip clinicians to manage complications more effectively, thereby advancing the standard of care in these fields. Additionally, integrating ultrasound into clinical practice enhances patient understanding and engagement by clearly demonstrating the location and extent of filler migration, transforming consultations into collaborative discussions. Future research should focus on validating these findings across larger populations, standardizing imaging protocols, and exploring their application to complications arising from non-HA fillers, thereby broadening their clinical relevance.

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Potential Conflict of Interest

The author declares no potential conflict of interest.

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CASE REPORT

Combination Therapy Using Q-Switched Nd:YAG Laser and Oral Tranexamic Acid for Melasma Treatment

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Abstract: Melasma is a skin condition characterized by symmetrical hyperpigmentation over the malar region, primarily affecting women with darker skin types. Its pathogenesis is multifactorial, involving ultraviolet (UV) exposure, hormonal influences, and genetic predisposition. Effective management remains challenging due to the condition's chronic nature. Low-fluence Q-switched Nd:YAG laser (LFQSNY) has shown promising results, particularly when combined with oral tranexamic acid (TA). This case report evaluates the effects of combination therapy using 1064 nm LFQSNY and oral TA in a 49-year-old woman with a 10-year history of melasma and a strong family history of the condition. The treatment led to significant improvement, with her modified Melasma Area and Severity Index (mMASI) score decreasing from 13.8 to 5.8. These findings suggest that the combination of LFQSNY and oral TA may be an effective treatment option for managing chronic melasma and warrants further investigation.

Keywords: Q-switched Nd:YAG laser, Tranexamic acid, Melasma, Melasma treatment

Introduction

Melasma is a common pigmentation disorder that primarily affects women and individuals with darker skin types (Fitzpatrick III–V) [1]. It is a major source of cosmetic concerns and psychosocial distress, impacting quality of life. [2,3], thereby necessitating effective treatment strategies.

Managing melasma remains challenging due to its high recurrence rates. However, low-fluence Q-switched Nd:YAG laser (LFQSNY), commonly referred to as laser toning (LT), has emerged as a gold standard treatment [1]. This technique typically involves 10 weekly or biweekly sessions using a low-fluence (1–3 J/cm²) collimated beam, a large spot size, and a frequency of 5–10 Hz, with faint erythema as the clinical endpoint [1].

The LFQSNY laser is the preferred treatment for melasma, as traditional laser therapies pose a higher risk of post-treatment hyperpigmentation and recurrence, particularly in individuals with darker skin. It selectively targets and destroys melanosomes while preserving melanin-containing cells [1].

Combining LFQSNY with other treatments, such as topical bleaching agents, oral tranexamic acid, or chemical peels may help minimize side effects and enhance treatment efficacy compared to LFQSNY alone [1]. According to Neagu et al. [4], combination therapies, whether dual or

triple, generally yield better clinical outcomes compared to monotherapy.

Tranexamic acid (TA) is an antifibrinolytic agent commonly used to treat menorrhagia and as a prophylactic measure against bleeding in haemophilia patients undergoing procedures such as tooth extraction [5]. Study have shown that TA is a safe and effective treatment for melasma [6]. It inhibits the plasminogen activator pathway in the skin, preventing melanocyte activation triggered by ultraviolet (UV) light, hormones, and injured keratinocytes. Additionally, TA suppresses vascular endothelial growth factor (VEGF), leading to reduced angiogenesis in dermal blood vessels [5].

Research on oral TA doses ranging from 500 to 1500 mg has found no significant difference in effectiveness [7]. Most studies utilize oral TA doses of 250 mg, taken twice or thrice daily, for a minimum of three months [5]. One study reported that a dosage of either 250 mg twice daily or 500 mg twice daily significantly reduced mMASI scores at 12 weeks, with results maintained even 12 weeks after discontinuation [8].

Research on melasma patients has shown that combining LFQSNY with oral TA is more effective in reducing melasma than using oral TA alone [9,10]. However, the effects of this combined treatment have not been fully evaluated in Malaysia. This case report examines the treatment of melasma using LFQSNY in combination with oral tranexamic acid and evaluates its treatment outcomes.

Case Presentation

This is a case of a 49-year-old nulliparous Chinese woman who presented with bilateral cheek hyperpigmentation persisting for over 10 years. She had no prior history of aesthetic treatments. She spends most of her time indoors but enjoys traveling. There is a strong family history of similar pigmentation issues. The condition significantly affected her self-esteem, as the pigmentation became difficult to conceal with makeup, hindering her social interactions. On physical examination, she was classified as Fitzpatrick skin type IV. Bilateral, symmetrical dark brown hyperpigmented patches were observed on her cheeks, nasal area, lower jaw, perioral region, and chin **(Figure 1).** The patches were irregular in shape. She was diagnosed with severe centrofacial melasma.

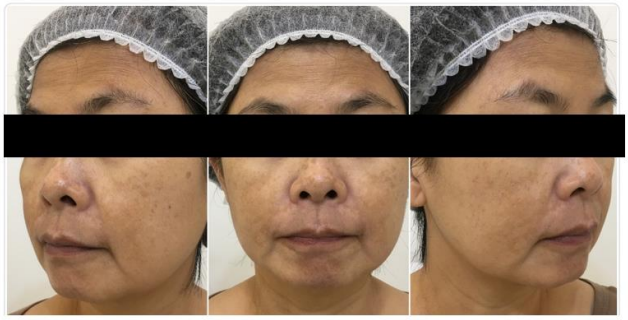

Figure 1. Left (45-degree), front, and right (45-degree) facial views of the patient at presentation. Irregular dark brown hyperpigmented patches were observed on both cheeks and the nose, extending to the lower jaw, perioral region, and chin.

Management and Outcome

The LFQSNY (Spectra XT™, Lutronic Corporation, Korea), was used to treat her melasma, with treatment parameters set to a 10 Hz frequency, an 8 mm spot size, and a fluence ranging from 0.55 J/cm² to 0.85 J/cm², applied in three passes, as shown in **Table 1**. The patient underwent laser treatment after providing written informed consent. A total of 18 laser sessions were performed, with monthly treatment intervals initially recommended. However, some sessions were postponed due to the patient's busy schedule. She was advised to use regular physical sunscreens for photoprotection.

The treatment outcome was monitored using the modified Melasma Area and Severity Index (mMASI) score. Photographs were taken before and after each session using an iPhone 7 camera at five different angles: front, right 45 degrees, right 90 degrees, left 45 degrees, left 90 degrees. Her mMASI score was evaluated at the

1st, 8th, 10th, and 18th sessions **(Table 1).** At the 8th session, she experienced a melasma flare with sunburn following an overseas trip, after which oral tranexamic acid (TA) was introduced. Initially, her mMASI score was 13.8 at the 1st session, when LFQSNY laser was used as monotherapy. However, after the sunburn, her mMASI score increased to 15.3, prompting the addition of oral TA to her treatment regimen. Oral TA was continued for six months, with a notable reduction in the mMASI score observed three months after initiation. Her mMASI score reduced from 15.3 at the 8th session to 8.7 at the 15th session, and further to 5.8 at the final session. The mMASI score continued to reduce even after discontinuation of oral TA. Throughout the treatment, the patient reported no adverse effects. She was consistently advised to apply physical sunscreens regularly for long-term photoprotection.

Table 1. Laser fluence used and mMASI score of the patient at the 1st, 8th, 10th, and 18th sessions.

Session	Fluence (J/cm²)	Oral Tranexamic Acid (mg)	mMASI
1	0.85	-	13.8
2	0.90	-	
3	0.90	-	
4	0.90	-	
5	0.85	-	
6	0.85	-	
7	0.85	-	
8	0.55	250 OD	15.3
9	0.60	250 OD	
10	0.60	250 OD	12.3
11	0.60	250 OD	
12	0.55	250 OD	
13	0.55	250 OD	
14	0.55	-	
15	0.55	-	8.7
16	0.55	-	
17	0.55	-	
18	0.55	-	5.8

**OD: once daily*

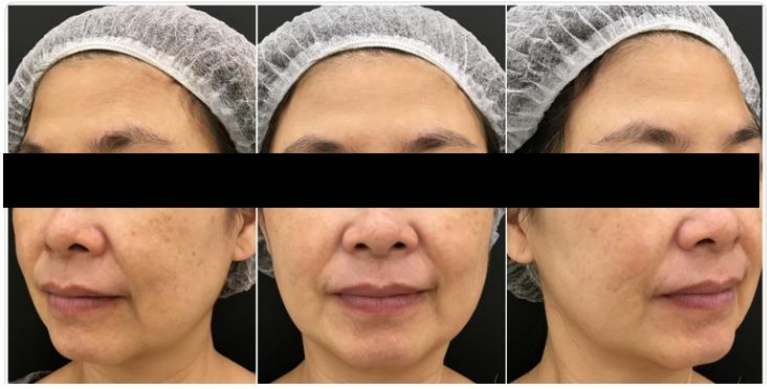

Figure 2. Left (45-degree), front, and right (45-degree) facial views of the patient during her 18th session. Noticeable improvement in melasma was observed, with a brighter skin tone and complexion.

Discussion

Treating melasma remains a significant challenge, as outcomes are often inconsistent and unsatisfactory, with recurrence or worsening of the condition being a common occurrence during or after treatment [1]. The LFQSNY laser has been used as one of the treatment approaches for melasma. It is often combined with various other treatment modalities in clinical practice to improve safety and enhance clinical outcomes [11,12]. Combining LFQSNY with treatments such as oral tranexamic acid can help reduce side effects and yield better results than LFQSNY alone [1].

In this case report, the patient was initially treated with LFQSNY and later prescribed oral TA after experiencing a melasma flare triggered by excessive UV exposure. Due to poor adherence, oral TA was continued for a total of six months. Following the addition of oral TA, her melasma improved compared to the initial results, with no adverse events observed. These findings suggest that adding oral TA to the treatment regimen may enhance melasma improvement. Consistent with previous studies, the combination of LFQSNY and oral TA has been shown to be more effective than monotherapy alone. Studies have demonstrated that combining LFQSNY with oral TA leads to a significant reduction in mMASI scores compared to monotherapy with either LFQSNY or oral TA alone [9,13].

Conclusion

The combination of the LFQSNY laser and oral TA may yield better results in treating melasma compared to LFQSNY alone. Further research is needed to evaluate the efficacy of this combined treatment for melasma of all types, including dermal, epidermal, and mixed, particularly in the Malaysian population.

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Potential Conflict of Interest

The author declares no potential conflicts of interest.

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Treatment of Acquired Bilateral Nevus of Ota with Concomitant Dermal Melasma Using Q-Switched Nd:YAG Laser: A Case Report

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Abstract: The concurrent presence of melasma and ABNOM presents unique challenges in dermatological treatment, as both conditions involve pigmented lesions but require distinct approaches. This case report discusses the treatment of a patient with acquired bilateral nevus of Ota-like macules (ABNOM) and concomitant dermal melasma using the 1064-nm Q-switched Nd:YAG laser (QSNYL). A 50-year-old female patient with Fitzpatrick type IV presented at our clinic with both ABNOM and dermal melasma. She was treated with 1064-nm QSNYL for 20 sessions over 21 months, with treatment intervals ranging from 4 to 6 weeks. The outcome showed significant improvement in both ABNOM and melasma, as evidenced by the clearance of ABNOM lesions and a reduction in the modified Melasma Area and Severity Index (mMASI) score, which decreased from 21.60 at the initial consultation to 6.40 over 21 months. In conclusion, our findings suggest the potential efficacy of 1064-nm QSNYL in treating patients with both ABNOM and dermal melasma in a Malaysian population. Further studies are needed to determine the efficacy and safety of 1064-nm QSNYL in treating larger cohorts of patients with ABNOM and concurrent melasma.

Keywords: Acquired bilateral nevus of Ota, Melasma, Q-switched Nd:YAG laser

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Introduction

Melasma and acquired bilateral nevus of Ota-like macules (ABNOM) are distinct hyperpigmentation disorders, both acquired. Melasma is a type of hypermelanosis that presents as symmetrical, irregular, brown-colored hyperpigmented patches on sun-exposed areas, mainly the face [1]. It predominantly affects individuals with darker skin tones, especially those with Fitzpatrick phototypes III–IV [2]. The primary factors contributing to melasma include prolonged ultraviolet exposure, female hormone stimulation, and genetic predispositions [3,4,5].

ABNOM is an acquired skin condition that typically manifests during the fourth or fifth decade of life and is usually bilateral in distribution [6]. It is characterized by numerous speckled macules with blue-brown or slate-gray pigmentation, most commonly affecting the malar regions and, less frequently, the forehead, upper eyelids, cheeks, and nose. Histologically, ABNOM is marked by irregularly shaped, bipolar melanocytes scattered within the papillary and mid-dermis, particularly in the subpapillary

layer, without any alteration to the normal skin architecture [7]. Although its exact etiology remains unclear, ABNOM is thought to result from the activation of previously dormant dermal melanocytes [8,9]. Potential triggers include ultraviolet (UV) exposure [8,10,11], inflammatory responses [9,12], and hormonal fluctuations [8, 13,14].

The concomitant occurrence of melasma and ABNOM creates distinct challenges in dermatological treatment, as both conditions involve pigmented lesions but necessitate different treatment strategies. Managing these overlapping pigmentation disorders often demands a personalized strategy that simultaneously addresses both conditions while minimizing the risk of adverse effects. The 1064-nm QSNYL has demonstrated efficacy in the treatment of both ABNOM [6,15,16] and melasma [17-21]. QSNYL emits a longer wavelength compared to many other lasers, enabling selective targeting of deeper dermal layers with minimal epidermal melanin absorption, making it safer for individuals with darker skin tones [22]. This case report aims to evaluate the efficacy of QSNYL in treating ABNOM with concurrent melasma in a Malaysian patient.

Case Presentation

This case report presents a 50-year-old Chinese Malaysian woman with Fitzpatrick skin type IV, who has experienced progressive hyperpigmentation on both cheeks since her 20s. She is a mother of five, leads a sedentary lifestyle with minimal sun exposure, and reports a family history of similar pigmentation. She follows a consistent daily skincare routine and denies having any chronic illnesses, undergoing hormonal treatments, or making changes to her systemic medications.

Clinical examination and imaging using the ISEMECO® S7 device (Guangzhou Newlife New Material Co., Ltd., Guangzhou, China) revealed irregular dark brown patches predominantly on the cheeks, with a pronounced and persistent hue suggestive of dermal melasma. Superimposed on these patches were bilateral bluish-gray pigmented macules distributed across the malar and periocular areas, strongly indicative of acquired bilateral nevus of Ota-like macules (ABNOM). Based on the clear clinical presentation, a diagnosis was made without the use of adjunct tools such as Wood's lamp or dermoscopy. A skin biopsy was not performed due to cosmetic considerations. **Figure 1**, **Figure 2**, and **Figure 3** show clinical photographs of the patient under normal and ultraviolet (UV) light.

Management and Outcome

Treatment for both ABNOM and melasma was performed using a 1064-nm laser QSNYL. For ABNOM, a 4 mm spot size, energy density ranging from 3.0 to 6.0 J/cm², and a pulse frequency of 5.0 Hz were used, delivered in 3 to 5 passes per session. The initial treatment was administered at a fluence of 3.0 J/cm². After assessing the patient's skin response, specifically minimal lightening of the lesion without any serious adverse effects such as hypopigmentation, blistering, or scarring, the fluence was gradually increased to 6.0 J/cm².

For melasma, the fluence was reduced to 0.8 J/cm², using a larger spot size of 8 mm and a pulse frequency of 10 Hz, with 3 passes per session. Ice packs were applied after each treatment to reduce thermal damage. Treatment sessions were spaced at intervals of 4 to 6 weeks, with a total of 20 sessions completed over 21 months. The patient was advised to apply broad-spectrum sunscreen, minimize sun exposure, and maintain a consistent daily skincare routine.

The clearance of both ABNOM and melasma lesions was evaluated through visual assessment using serial photographic documentation taken prior to each treatment session, allowing for comparative analysis over time. In addition, the modified Melasma Area and Severity Index (mMASI) was used to monitored melasma improvement in the treated areas.

The treatment outcome was satisfactory, with visual clearance of both ABNOM and melasma lesions, as evidenced by reduced pigmentation and lesion size. The modified Melasma Area and Severity Index (mMASI) score decreased from 21.60 at the initial consultation to 6.40 after 20 laser sessions over 21 months, as shown in **Table 1**. The patient reported high satisfaction with the results. Notable reduction of ABNOM and substantial attenuation of melasma patches are illustrated in **Figure 1**, **Figure 2**, and **Figure 3**.

Table 1. Patient's mMASI scores across laser sessions.

Laser Session	mMASI score
1	21.6
3	21.6
5	20.6
7	20.4
9	19.6
11	18.9
13	17.8
15	16.8
17	12.6
20	6.4

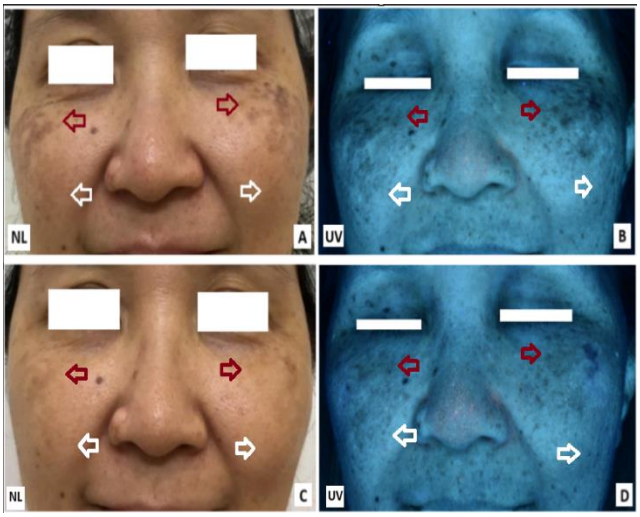

Figure 1. Clinical photographs of the patient with acquired bilateral nevus of Ota-like macules (ABNOM) (red arrows) and melasma (white arrows) at baseline (A, B) and after 20 sessions of 1064-nm Q-switched Nd:YAG laser (QSNYL) treatment (C, D); NL: normal light; UV: ultraviolet light.

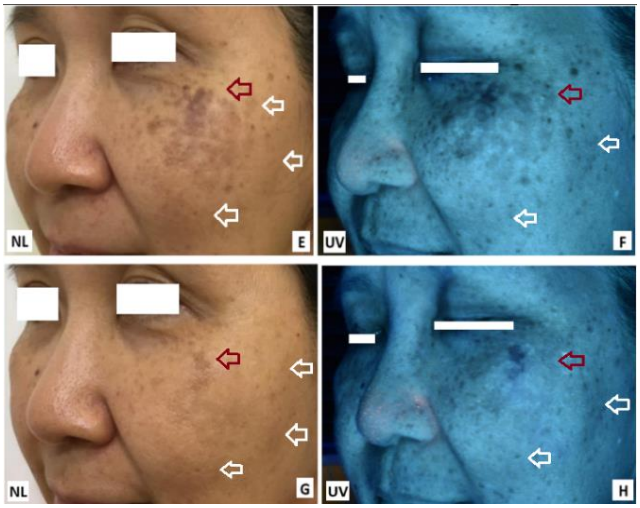

Figure 2. Clinical photographs (left oblique view) of the patient with acquired bilateral nevus of Ota-like macules (ABNOM) (red arrows) and melasma (white arrows) at baseline (E, F) and at 21 months following 20 sessions of 1064-nm Q-switched Nd:YAG laser (QSNYL) treatment (G, H); NL: normal light; UV: ultraviolet light.

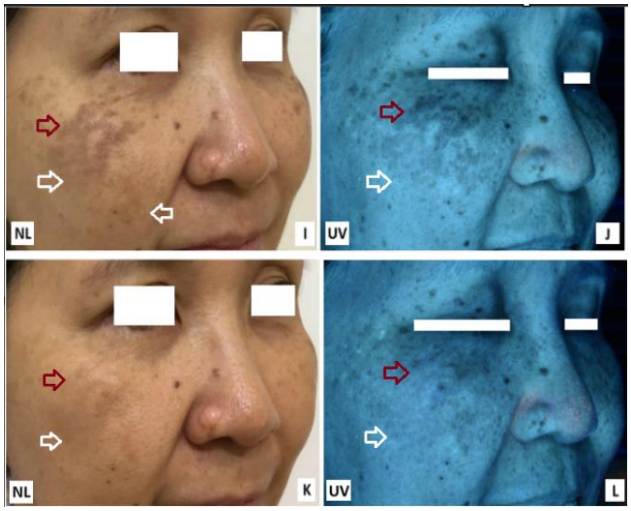

Figure 3. Clinical photographs (right oblique view) of the patient with acquired bilateral nevus of Ota-like macules (ABNOM) (red arrows) and melasma (white arrows) at baseline (I, J) and at 21 months following 20 sessions of 1064-nm Q-switched Nd:YAG laser (QSNYL) treatment (K, L); NL: normal light; UV: ultraviolet light.

Discussion

Managing ABNOM with concomitant dermal melasma presents unique challenges due to the depth of pigmentation and various exacerbating factors. A study by Yang et al. reported that with increasing age, patients with ABNOM were more likely to present with concurrent melasma and darker lesion coloration, both of which increase the risk of post-inflammatory hyperpigmentation (PIH), thereby complicating treatment and reducing therapeutic efficacy [15]. Consequently, inadvertent development or worsening of melasma during QSNYL treatment for ABNOM has been reported, particularly in patients with pre-existing melasma [15,23].

Therefore, in our case, recognizing the potential risks associated with treating ABNOM with QSNYL in patients with concurrent melasma guided our treatment approach, aiming to reduce pigmentation while minimizing the risk of PIH and melasma exacerbation. This involved customizing treatment settings, using QSNYL fluence levels of 3–6 J/cm² for ABNOM treatment, while applying a lower fluence of 0.8 J/cm² for dermal melasma. It was recommended to use lower energy settings during laser treatments for patients with both ABNOM and melasma, as they are at a higher risk of PIH and melasma worsening [15]. Additionally, we initiated treatment with a fluence of 3.0 J/cm² and gradually increased it to 6.0 J/cm² after assessing the patient's skin response. Each laser session began with an assessment of the patient's skin condition and pigmentary changes, including visual evaluation by comparing pre-treatment photographs with clinical examination. This allowed us to monitor lesion clearance and detect any adverse effects or aggravation of melasma.

When the patient's skin became dry, additional moisturizer was applied to maintain skin barrier function. We also emphasized the importance of consistent sun protection and adherence to an effective skincare routine. As suggested by Wang et al., patients with both ABNOM and melasma should be advised to maintain skin barrier function and use sun protection following 1064-nm QSNYL treatment to minimize the risk of melasma exacerbation [23]. The patient was instructed to return immediately if any adverse effects were observed. This stepwise approach, along with frequent monitoring, likely contributed to the positive outcome in our patient.

Conclusion

This case report highlights the potential efficacy of 1064-nm QSNYL in treating ABNOM with concurrent melasma in a Malaysian patient. Additionally, it provides insights into achieving pigment reduction through personalized treatment plans while minimizing adverse effects in patients with both ABNOM and melasma. The favorable outcome observed in this case can be attributed to the tailored treatment strategy, which included adjusting fluence levels, frequent careful monitoring, and ensuring the patient adhered to strict sun protection and skincare.

However, a key limitation of this report is that findings from a single patient cannot definitively establish the efficacy of this treatment approach. Future research should involve larger patient cohorts to further determine the efficacy and safety of QSNYL

specifically for treating patients with both ABNOM and melasma in Malaysia.

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Potential Conflict of Interest

The author declares no potential conflict of interest.

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Evaluating the Efficacy of 1064nm Q-Switched Nd:YAG Laser in Q-PTP Mode for Treating Concurrent Nevus of Ota and Melasma: A Case Report

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Abstract: Nevus of Ota and melasma are common dermal hyperpigmentation disorders that present significant treatment challenges due to their varied etiologies and inconsistent responses to therapy. This case report presents a 44-year-old Chinese woman with Fitzpatrick skin type IV, diagnosed with Type III Nevus of Ota and melasma. The patient had longstanding pigmentation on the left side of her face and forehead since childhood, which significantly impacted her confidence and self-esteem. She had previously undergone non-ablative laser therapy and used various skincare products without any notable improvement. The patient subsequently received ten sessions of treatment using a 1064 nm Q-switched Nd:YAG laser (QSNYL) in Quickly-pulse-to-pulse (Q-PTP) mode over the course of one year, with intervals of 1 to 2 months between sessions at our clinic. For Nevus of Ota, the QSNYL was applied in Q-PTP mode with a fluence of 4.0 to 5.2 J/cm², a spot size of 4 mm, and a pulse rate of 5 Hz, with one pass over the entire face. For melasma, the same mode was used, but with a lower fluence (0.7 to 0.8 J/cm²), a spot size of 8 mm, and a pulse rate of 10 Hz, with three passes over the entire face. Upon completion of the treatment sessions, the patient's MASI score decreased from an initial score of 5.2 to 2.6 after the 10th session. The patient's response to Nevus of Ota treatment was classified as Grade II (26%-50% improvement), indicating moderate improvement. Despite this, she reported high satisfaction, particularly with the overall enhancement in skin tone and the reduction in Nevus of Ota. The 1064 nm QSNYL in Q-PTP mode may be a promising treatment option for patients with concurrent Nevus of Ota and melasma. Further research with larger sample sizes is needed to validate its efficacy and safety in the Malaysian population.

Keywords: Nevus of Ota; Melasma; Q-switched Nd:YAG laser; Quickly-pulse-to-pulse (Q-PTP) mode

Introduction

Nevus of Ota and melasma are common dermal hyperpigmentation disorders that present significant treatment challenges due to their diverse causes and varied therapeutic responses. Nevus of Ota is characterised by blue or grey-brown pigmentation, typically affecting the areas innervated by the ophthalmic and maxillary division of the trigeminal nerve [1]. The condition predominantly affects individuals of Asian and African descent, particularly women at a ratio of 5:1 [2,3] and can have a significant psychological impact due to its visible nature. Although the precise aetiology remains unclear, hypotheses have suggested potential roles of genetic mutations, prior radiation exposure, and hormonal factors [4].

Melasma, a common skin condition affecting women of childbearing age, develops due to multiple factors, including genetic, hormonal, and environmental influences, particularly UV exposure. Although common, melasma remains challenging to manage due to its chronic nature, frequent recurrence, and an incomplete understanding of its pathogenesis [5], making treatment often refractory and prone to relapse [6].

The 1064 nm Q-switched Nd:YAG laser (QSNYL) has been used as treatment option for both Nevus of Ota and melasma. Studies conducted among Indian patients with Nevus of Ota have demonstrated that QSNYL is both safe and effective, showing varied efficacy, ranging from moderate to marked lesion clearance and even near-total improvement in some cases [1,7]. Similarly, for melasma, several studies have also reported that QSNYL is a safe and effective treatment option [8-12].

The QSNYL Quick-pulse-to-pulse (Q-PTP) mode is a recent advancement in dual-pulse QSNYL technology, which splits a single pulse into two sub-pulses (80 µsec apart). This enhances peak power, transitioning from a photoacoustic to a photothermal effect. The dual-pulse mechanism boosts energy accumulation, increases the target temperature, and minimizes pain and skin erythema, thus improving safety and patient acceptance compared to single-pulse QSNYL [6].

However, few studies have explored the use of QSNYL with Q-PTP mode for the treatment of Nevus of Ota and melasma, particularly in Malaysian patients. This case report aims to evaluate the effectiveness of QSNYL in Q-PTP mode for managing concurrent Nevus of Ota and melasma.

Case Presentation

A 44-year-old Chinese woman, with Fitzpatrick skin type IV and no underlying medical conditions presented to our clinic with pigmentation on the left side of her face and forehead, which had been present since childhood. She also noticed uneven skin tone over her right face since childbirth. She reported experiencing insecurity and low self-esteem from an early age, which significantly affected her confidence. During her teenage years, she sought treatment at a beauty centre and underwent a course of non-ablative laser therapy, but it yielded no improvement. She also tried various skincare products without success, leading to further frustration.

She is married with two children and works as an accountant. Her hobbies include yoga and Pilates, both of which are indoor activities. She follows a consistent daily skincare routine and has no family history of pigmentation disorders. Additionally, she is not on hormonal treatments or oral contraceptive pills.

On physical examination, a diffuse slate-blue patch of pigmentation was observed on the left side of her face and forehead. Irregular brown patches were also present on the right malar region, forehead, and chin **(Figure 1)**. Based on photographic assessment and clinical judgment, she was diagnosed with Type III Nevus of Ota according to Tanino's classification **(Table 1)** and melasma.

Table 1. Tanino's classification for Nevus of Ota [13].

Type	Subtypes	Areas involved
Type I	IA	Distribution over the upper and lower eyelids, periocular and temple region
	IB	Infrapalpebral fold, nasolabial fold and zygomatic regions are affected
	IC	Forehead only
	ID	Nasal only
Type II		Moderate type-The lesions affect upper and lower eyelids, periocular, zygomatic, cheek and temple

Type III	Scalp, forehead, eyebrow and nose.
Type IV	Bilateral

Management and Outcome

The patient underwent laser treatment at our clinic using the Q-Switched Nd:YAG 1064nm Laser in Q-PTP mode (Spectra XT, Lutronic Corp., Goyang, Korea), after providing written informed consent. A total of ten laser sessions were completed at treatment intervals of 1 to 2 months over the course of 1 year. For Nevus of Ota, the fluence ranged from 4.0 to 5.2 J/cm² with a spot size of 4 mm and a pulse rate of 5 Hz, applied in a single pass over the whole face **(Table 2)**. Melasma was treated with a low-fluence Q-switched Nd:YAG laser, with fluence set between 0.7 to 0.8 J/cm², a spot size of 8 mm, and a pulse rate of 10 Hz, applied in three passes over the entire face **(Table 3)**. She was instructed to apply an adequate moisturizer and a broad-spectrum sunscreen with an SPF of 30+ and UVA protection (PA+++) to her entire face to minimize sun exposure throughout the treatment phase.

Evaluation of the results was based on visual inspection, comparison of serial photographs, and clinician grading of both melasma and Nevus of Ota before treatment and after each treatment session. Melasma improvement was graded using the Melasma Area and Severity Index (MASI) score, while the patient's response to treatment for Nevus of Ota was assessed based on lesion clearance using the following quartile grading scale [1]:

- Grade I: <25% improvement (minimal improvement)
- Grade II: 26%-50% improvement (moderate improvement)
- Grade III: 51%-75% improvement (marked improvement)
- Grade IV: >75% improvement (near-total improvement)

After completing ten sessions over one year, the patient's MASI score decreased from an initial score of 5.2 to 2.6. The patient's response to Nevus of Ota treatment was classified as Grade II (26%-50% improvement), indicating moderate improvement. Despite this, she reported high satisfaction, particularly with the overall enhancement in skin tone and the reduction in Nevus of Ota **(Figure 2)**.

Table 2. Laser treatment parameters for Nevus of Ota using 1064nm Q-switched Nd:YAG laser in Q-PTP mode.

Session	Spot Size (mm)	Fluence (J/cm²)	Pulse Rate (Hz)	Number of Passes
1–6	4	4	5	1
7	4	4.0–4.4	5	1
8	4	4.2–4.6	5	1
9	4	5.2	5	1
10	4	4.4–4.8	5	1

Table 3. Laser treatment parameters for melasma using 1064nm Q-switched Nd:YAG laser in Q-PTP mode.

Session	Spot Size (mm)	Fluence (J/cm²)	Pulse Rate (Hz)	Number of Passes
1–5	8	0.7	10	3
6–10	8	0.8	10	3

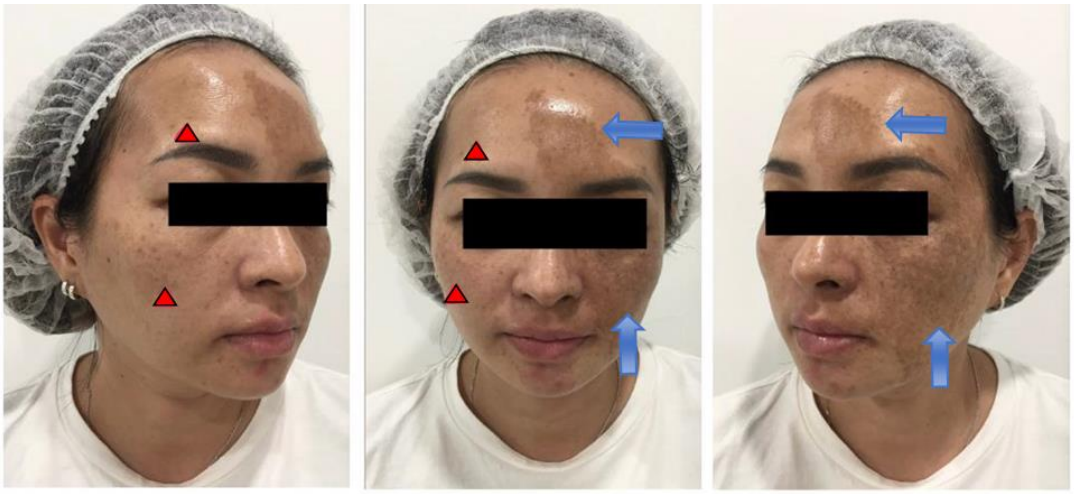

Figure 1. Clinical photograph of the patient before treatment: right face (45-degree angle), front view, and left face (45-degree angle). Melasma was distributed over the right malar region and right forehead (red arrow). The Nevus of Ota covered 90% of the left face and 50% of the left forehead (blue arrowhead).

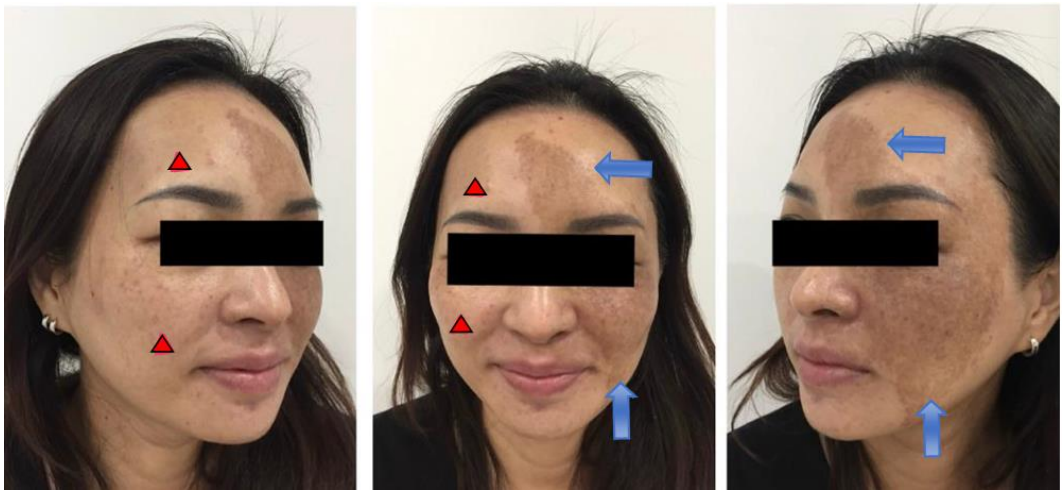

Figure 2. Clinical photograph of the patient after the 10th treatment: right face (45-degree angle), front view, and left face (45-degree angle). Notable improvement in melasma on the right malar region (red arrow) and Nevus of Ota on the left face (blue arrowhead) based on reduced pigment intensity.

Discussion

The QSNYL has been explored as an alternative treatment for Nevus of Ota and melasma, with various studies showing promising results. QSNYL treatment operates on the principle of selective photothermolysis, where high fluence is used to target and destroy pigment-containing cells. The resulting cell death triggers the release of prostaglandins and cytokines, leading to an inflammatory response and potential damage to the basement membrane. This can result in melasma relapse, exacerbation, or pigmentary changes [14].

The QSNYL in Q-PTP mode has emerged as a significant advancement in dual-pulse laser technology, operating by dividing a single pulse into two sub-pulses with an 80 µsec interval between them [6]. Guo et al. compared the efficacy of the QSNYL in Q-PTP mode versus single-pulse mode for women with mild to severe melasma. The study found that Q-PTP mode resulted in better lesion clearance with less pain and erythema post-treatment, making it a more comfortable and effective option for melasma treatment [6]. Similarly, a study in Korea evaluated the efficacy and safety of dual-pulsed versus single-pulsed modes of QSNYL in a split-face clinical trial. While both dual-pulsed and single-pulsed modes demonstrated similar efficacy, side effects such as pain and post-laser erythema were less and resolved more quickly in the dual-pulsed mode [15], suggesting it as a promising alternative with fewer side effects.

While research supports Q-PTP as a promising option for melasma treatment, its effectiveness for Nevus of Ota remains underexplored, highlighting the need for further investigation into its potential benefits for pigmentary disorders beyond melasma. In this case report, we examine the efficacy of QSNYL in Q-PTP mode in a patient with both Nevus of Ota and melasma. Although the patient showed notable improvement in melasma, only moderate improvement was observed for Nevus of Ota after the 10th session of treatment. Further research is needed to identify the effects of various laser parameters and the number of sessions on the treatment of Nevus of Ota with QSNYL in Q-PTP mode.

Conclusion

In conclusion, this case study demonstrated that the 1064 nm Q-switched Nd:YAG laser (QSNYL) in Q-PTP mode may be a promising treatment option for Nevus of Ota and melasma in Malaysian patients. However, further research is warranted to evaluate its efficacy and safety in larger sample sizes, as well as to determine the optimal laser parameters and number of treatment sessions for optimal clinical outcomes.

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Potential Conflict of Interest

The author declares no potential conflict of interest.

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Efficacy of Combination Therapy for Melasma Using Low Fluence Q-Switched Nd:YAG Laser (LFQSNYL), Pulsed Dye Laser (PDL), High-Intensity Focused Ultrasound (HIFU), and Polynucleotides: A Case Report

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Abstract: Melasma is characterized by dark-brown patches on the face, and its treatment remains challenging due to its complex pathogenesis. This case report aims to evaluate the efficacy of a combination treatment using multiple targeted approaches, including 1064 nm Low Fluence Q-Switched Nd:YAG laser (LFQSNYL), 595 nm Pulsed Dye Laser (PDL), High-Intensity Focused Ultrasound (HIFU), and Polynucleotides (PN). A 41-year-old woman with Fitzpatrick skin type III and no known medical conditions presented to our clinic with pigmentation on both cheeks that had been present for seven years. Upon examination, she exhibited marked telangiectatic erythema within symmetric, reticulated hyperpigmented patches with irregular borders on both cheeks. Based on the clinical presentation, she was diagnosed with melasma. The patient received a total of five sessions of 1064 nm LFQSNYL combined with 595 nm PDL, two sessions of HIFU, and three sessions of PN treatment. The total treatment duration was four months, with intervals between each treatment modality ranging from one to three months. One month after the fifth treatment session, her modified Melasma Area and Severity Index (mMASI) score decreased from 13.2 to 3.3. The patient expressed high satisfaction with the overall outcome. In conclusion, the combination of LFQSNYL, PDL, HIFU, and PN may offer a promising approach to treating melasma, particularly in cases with telangiectasia. To fully establish the efficacy of this combination treatment, further clinical trials involving larger sample sizes, long-term follow-up, and optimization of treatment protocols are necessary.

Keywords: High intensity focused ultrasound, Low fluence Q-switched Nd:YAG laser, Melasma, Pulsed dye laser, Polynucleotides

Introduction

Melasma is an acquired skin disorder that clinically presents as symmetrical hyperpigmentation, appearing as light brown to dark, muddy brown patches and macules on the face, typically affecting the forehead, cheeks, and chin. It is more commonly seen in individuals with darker skin tones, particularly those classified as Fitzpatrick skin types III and IV [1].

The main factors contributing to the development of this condition include ultraviolet (UV) radiation, female sex hormones, inflammation, and genetic susceptibility.

Treating melasma remains difficult due to inconsistent outcomes and frequent recurrences [2]. In managing this condition, it is important to approach melasma as both a pigmentation disorder and photoaging condition, and avoiding all known triggering factors. Available treatment options include topical depigmenting agents, oral tranexamic acid (TXA), and energy-based therapies. Energy-based devices improve melasma treatment by targeting melanin, addressing vascular components, and promoting skin rejuvenation [3].

Low Fluence Q-switched Nd:YAG laser (LFQSNYL) is the most widely used energy-based treatment for melasma, particularly among Asians. Studies have consistently shown that LFQSNYL whether used alone or combined with medications or other energy-based treatments, produces notable therapeutic effects [3]. This laser therapy is considered one of the most effective monotherapy for melasma, and when combined with other therapies, it tends to yield even better outcomes [4].

Pulsed dye laser (PDL) therapy is regarded as the gold standard for treating vascular lesions [5]. Increased vascularization in melasma has been identified through dermoscopy and reflectance confocal microscopy, with asignificant upregulation of vascular endothelial growth factor (VEGF) expression in melasma lesions [6]. Therefore, targeting vascular lesions in melasma with PDL may help suppress melanocyte activation. The addition of PDL therapy could be particularly beneficial for managing melasma that presents with a telangiectatic component [7]. By targeting blood vessels, PDL therapy reduces stimulation of melanocytes, thereby helping to prevent the recurrence of pigmentation spots [8].

High intensity focused ultrasound (HIFU) have also been investigated for the management of melasma. Theoretically, HIFU can stimulate neocollagenesis and enhance the photoaged condition of lesions, thereby contributing to the improvement of melasma [3]. The mechanism of HIFU involves the application of high-frequency ultrasound beneath the skin, causing targeted thermal damage at specific depths [9-11]. In a split-face study involving patients with melasma, the combination of HIFU and 2% hydroquinone showed significant improvement from baseline, although no significant difference was observed when compared to the side treated with 2% hydroquinone alone [11]. Choi et al. found that HIFU improved UVB-induced pigmentation in guinea pig skin, suggesting that it may have a mechanical destructive effect, removing pigment from the epidermis and upper dermis [9]. A study by Abdulhadi et al. showed that the combination of LFQSNYL and HIFU was more effective than using the laser alone in treating resistant melasma [12].

Polynucleotides (PN) are highly refined natural DNA fragments, consisting of deoxyribonucleotide chains ranging from 50 to 200 base pairs [13]. They exhibit anti-inflammatory, anti-ischemic, pro-angiogenic, and cell-stimulating properties [14]. Due to their ability to enhance tissue repair and regeneration, PN have been adopted for aesthetic purposes in facial and body rejuvenation [15]. In vitro studies found that PN reduces Microphthalmia-Associated Transcription Factor (MITF) signaling and downregulates melanogenic genes [16,17].

The histopathological features commonly seen in melasma include elevated melanin levels within keratinocytes and macrophages, an increased number of mast cells, dilated dermal vessels, solar elastosis, and disruption of the basement membrane [18]. Due to its complex pathogenesis, treatment strategies targeting various structural components of melasma have been suggested [19], including melanin production, vascularization, and basement membrane disruption. These approaches may offer an effective treatment option. Therefore, this case report aims to evaluate the efficacy of a combination treatment with multiple targeted

approaches, including LFQSNYL, PDL, HIFU, and PN, for melasma.

Case Presentation

A 41-year-old woman with Fitzpatrick skin type III and no known medical conditions, presented to our clinic with pigmentation on both cheeks that had been present for seven years. She reported that the pigmentation worsened after her second pregnancy. Her menstrual cycle is regular, and she is not using any hormonal contraception. There is no significant family history of pigmentation. She works as a finance manager in an indoor office and has minimal involvement in outdoor activities. She has no previous aesthetic history, such as chemical peeling or laser therapy. However, she has been using a topical depigmentation cream for the past year, with no observed improvement. Her skincare regimen includes toner, moisturizer, and sunscreen. On examination, there was marked telangiectatic erythema within symmetric, reticulated hyperpigmented patches with irregular borders on both cheeks **(Figure 1).** The clinical presentation led to a diagnosis of malar melasma.

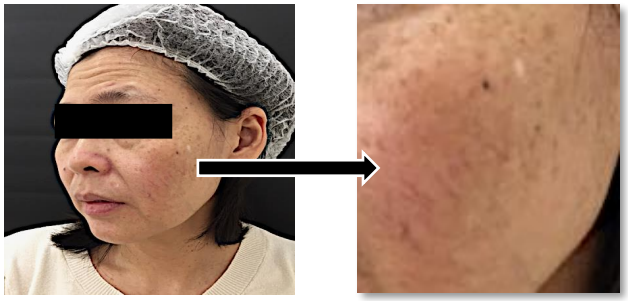

Figure 1. Pronounced telangiectatic erythema in a background of symmetric reticulated hyperpigmented patches with irregular borders.

Management and Outcome

The patient was treated with combination therapy consisting of LFQSNYL, PDL, HIFU, and PN for her melasma. Treatment was administered following written consent. The total duration of treatment was four months, with intervals for each treatment modality ranging from one to three months. The patient received a total of five sessions of 1064 nm LFQSNYL (Spectra XT™, Lutronic Corporation, Korea) with 595 nm PDL (Spectra XT™, Lutronic Corporation, Korea), two sessions of HIFU (Ultraformer III; Classys Inc., Seoul, Korea), and three sessions of PN (Plinest®, Mastelli, Sanremo, Italy) injections **(Table 1).**

Three-angle photographs were taken using a smartphone (iPhone model 7) at the initial session and at the final evaluation, one month after the fifth session. Improvement in melasma was assessed visually using the modified Melasma Area and Severity Index (mMASI) score. Patient satisfaction was also evaluated at the end of treatment. The patient indicated her satisfaction on a 5-point scale (very satisfied, satisfied, neither satisfied nor unsatisfied, unsatisfied, or very unsatisfied).

The fluence for the LFQSNYL laser was set at 0.90 J/cm², with a spot size of 8 mm and a pulse rate of 10 Hz, and 3 passes were performed on each side of the face. For the 595 nm PDL, the fluence was set at 0.3 J/cm², with a spot size of 5 mm and a pulse rate of 2 Hz, and one pass was performed on each side of the face. For PN, 2.0 mL was delivered subdermally to the face using a 27G, 38 mm cannula via the retrograde technique (0.1–0.2 cc per tract), primarily targeting areas affected by melasma. The HIFU device was used to target three different skin depths: 4.5 mm, 3.0 mm, and 2.0 mm. A total of 400 shots were delivered in each treatment session. For the 4.5 mm skin depth, the energy fluence was 0.6 J; for the 3.0 mm skin depth, the fluence was 0.3 J; and for the 2.0 mm skin depth, the fluence was 0.1 J. The patient underwent two sessions of HIFU, with a three-month gap between sessions. After each treatment session, the patient was advised to apply sunscreen daily and maintain her regular skincare routine.

One month after the fifth treatment session, noticeable improvement in her melasma was observed. The patient's initial mMASI score of 13.2 was reduced to 3.3. Additionally, the redness associated with telangiectasia on her

bilateral cheeks had diminished **(Figure 3).** The patient experienced mild discomfort in the mandibular region following the first HIFU session, which resolved within two days. No significant side effects, such as post-inflammatory hyperpigmentation (PIH) or scarring, were noted during the treatment period. The patient expressed being very satisfied with the overall outcome. A continuous follow-up was conducted three months after the final session, and no recurrence was observed. The patient's mMASI score remained at 3.3, and her telangiectatic erythema did not recur.

Table 1. Treatments administered in each session.

Session	LFQSNYL (1064 nm)	PDL (595 nm)	HIFU	PN-HPT
1	✓	✓		✓
2	✓	✓	✓	✓
3	✓	✓		✓
4	✓	✓		
5	✓	✓	✓	

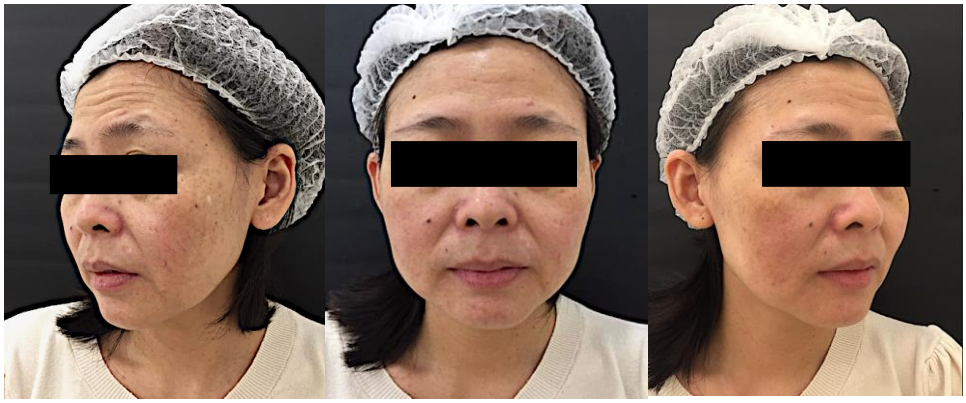

Figure 2. Clinical photograph of the patient showing left (45-degree), front, and right (45-degree) views at her first presentation. Pronounced telangiectatic erythema was noted against a background of symmetrical, reticulated hyperpigmented patches with irregular borders covering the bilateral cheeks.

Discussion

Managing melasma presents significant challenges due to the variability in treatment outcomes and frequent relapses, which can have a profound impact on patients' psychological well-being and overall quality of life. While energy-based therapies have shown promise in treating melasma, combination treatments targeting multiple factors may provide a more effective approach [3].

In this case report, we aimed to evaluate the effectiveness of combination therapy using a multi-targeted approach involving LFQSNYL, PDL, HIFU, and PN for treating melasma. One month after completing five sessions of the combination treatment, the patient showed significant improvement, as evidenced by a reduction in her mMASI score. The observed improvement may be attributed to the various targeted mechanisms offered by the combination therapy administered to her.

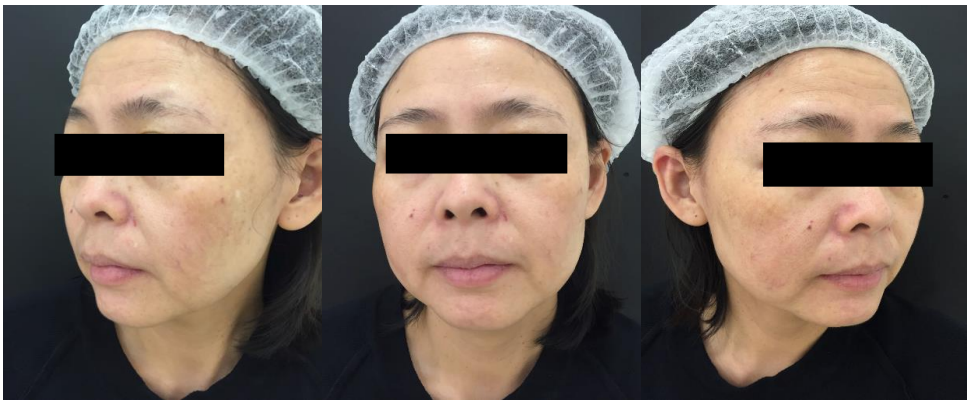

Figure 3. Clinical photograph of the patient showing left (45-degree), front, and right (45-degree) views one month after the fifth treatment session. The hyperpigmented patches have reduced, and telangiectatic erythema has improved.

LFQSNYL specifically target melanin by destroying intracellular melanosomes through subcellular selective photothermolysis [20]. It will preserve melanocytes, leading to a reduction in melanin at the affected site while minimizing both inflammation and side effects [3]. Additionally, according to Kim et al. targeting vascular components during melasma treatment is advantageous since increased vascularization is one of the histopathological characteristics of melasma, which may worsen the hyperinflammatory condition [21]. Therefore, the use of laser or light treatments that are absorbed by blood vessels, such as PDL, can reduce vascularization and improve the appearance of melasma [22]. PDL targets oxyhemoglobin in the blood vessels of the skin and is commonly used to treat various vascular conditions [7]. According to Kong et al., combining LFQSNYL with PDL may provide an effective therapeutic approach for melasma by addressing both melanin and vascular factors [7]. Furthermore, treatments that improve skin rejuvenation such as HIFU and PN are also beneficial, as melasma is recognized as a photoaging disorder characterized by solar elastosis and disruption of the basement membrane [23]. Therefore, the combination of LFQSNYL, PDL, HIFU, and PN in this study may be advantageous for the patient, as these therapies target different underlying factors.

Conclusion

The combination of LFQSNYL, PDL, HIFU, and PN may offer a promising approach for melasma treatment, particularly in cases with telangiectasia. This multifaceted approach targets different aspects of the condition, including pigmentation and vascular issues, which could lead to more effective and sustainable results. However, further studies are needed to validate these findings in a larger cohort, assess long-term outcomes, and determine the optimal treatment protocols.

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Potential Conflict of Interest

The author declares no potential conflicts of interest.

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Efficacy of Combination Treatment with 1064-nm Low-Fluence Q-Switched Nd:YAG Laser (LFQSNY), 595-nm Pulsed Dye Laser (PDL), and Oral Tranexamic Acid for Melasma Complicated by Post-Inflammatory Hyperpigmentation and Hypopigmentation: A Case Report.

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Abstract: Treatment for melasma remains challenging due to high recurrence rates and the adverse effects associated with available treatment options. This case report examines the efficacy of a combination therapy involving the 1064-nm Low-Fluence Q-Switched Nd:YAG laser (LFQSNYL), 595-nm Pulsed Dye Laser (PDL), and oral tranexamic acid (TA) for managing melasma complicated by post-inflammatory hyperpigmentation (PIH) and hypopigmentation. A 53-year-old Chinese Malaysian woman with Fitzpatrick skin type III presented to the author's clinic with melasma complicated by PIH and hypopigmentation following an ablative laser procedure performed by a non-professional. She underwent 20 sessions of LFQSNY and PDL at 4- to 6-week intervals over a period of 1 year and 6 months. Oral TA was administered at 250 mg once daily for 6 months. Improvement was assessed using a skin analyzer and a modified Melasma Area and Severity Index (mMASI) score. The patient's melasma showed improvement. At the initial consultation, her mMASI score was 4.2, which reduced to 1.20 by the twentieth session. No deterioration in hyperpigmentation or hypopigmentation was observed, and no rebound melasma was reported throughout the treatment course. The combination of 1064-nm LFQSNY, 595-nm PDL, and oral TA appears to be a promising therapeutic option for melasma complicated by PIH and hypopigmentation. Further large-scale studies are essential to validate the efficacy and safety of this combination treatment in the Malaysian population.

Keywords: 1064-nm Low Fluence Q-Switched Nd:YAG laser, 595-nm Pulsed Dye Laser, Hypopigmentation, Melasma, Post-inflammatory hyperpigmentation

Introduction

Melasma, also known as chloasma, is a common pigmentary skin condition characterized by bilateral, irregular brown patches on facial areas frequently exposed to sunlight. [1]. While melasma does not cause physical pain, it often leads to considerable psychological distress due to its cosmetic impact. Sun exposure, genetic factors, and elevated estrogen levels are well-

established contributors to its development and persistence [2].

Melasma significantly impacts quality of life, often lowering self-esteem and causing feelings of frustration and embarrassment [3]. Studies have also found an association between melasma and depressive disorders [4-7]. Because melasma lesions typically appear on the face and are highly visible, they often cause significant stress, negatively affect daily life and emotional well-being, and frequently lead patients to seek dermatological care [8].

Treatment for melasma remains challenging due to its high recurrence rates and the adverse effects associated with available treatment options. Managing the condition can be difficult for both physicians and patients [9]. Melasma management has advanced over time, with available treatments ranging from topical agents to more advanced laser-based therapies. The low-fluence Q-switched Nd:YAG laser (LFQSNY), often referred to as laser toning, has been established as a new benchmark for melasma treatment in Asia. This laser uses low fluence (typically 1–3 J/cm^2), a large spot size, and a frequency of 5–10 Hz. The desired outcome of the procedure is to achieve faint erythema [10]. LFQSNY is recognized for its ability to selectively eliminate melanin in melanophores while sparing melanin-containing cells, resulting in safe depigmentation [11,12].

However, LFQSNYL are not without adverse effect. The most frequent complications of LFQSNYL include PIH, hypopigmentation, rebound hyperpigmentation, and melasma recurrence. Of these, hypopigmentation is often considered the most concerning [13]. To ensure safer and more effective clinical outcomes, LFQSNY is often combined with other treatment modalities in clinical practice [14,15].

Pulsed-dye laser (PDL), regarded as the gold standard for treating cutaneous vascular lesions [16], has also demonstrated effectiveness in managing melasma when combined with pigment-targeted therapies, as reported in several studies [17-20]. PDL operates on the principle of selective thermolysis, utilizing light to heat and destroy specific target structures. It emits pulses of visible light at wavelengths of 585 or 595 nm. PDL plays a crucial role in treating vascular conditions by delivering light energy at a wavelength that selectively targets oxyhemoglobin. Its precision ensures minimal or no damage to surrounding tissues, effectively eliminating only the targeted vessels. Over time, the damaged vessels are absorbed by the body, leading to a reduction in symptoms caused by abnormal vasodilation or the overgrowth of cutaneous vessels [21], both of which play key roles in the development of PIH.

Tranexamic acid (TA) has been used for melasma treatment either as monotherapy or in combination with other therapies. It is a synthetic derivative of the amino acid lysine, binding to lysine sites on plasminogen and blocking its activation to plasmin. This, in turn, inhibits melanogenesis [22]. TA has been reported to improve melasma when used either orally or topically [23,24]. TA suppresses angiogenesis and neovascularization induced by basic fibroblast growth factor, helping to reduce both erythema and pigmentation [25]. Its anti-angiogenic effect is thought to result from lowered expression of vascular endothelial growth factor and endothelin-1, key elements in the vascular theory of melasma pathogenesis [26]. Various routes of TA administration, including oral intake, intradermal injections, microneedling, iontophoresis, and topical application, have been employed in the treatment of melasma [27]. However, studies indicate that oral TA is more effective and preferable for managing melasma compared to other routes [28].

The optimal treatment strategy can be achieved by combining multiple approaches to address several factors, such as using topical agents to inhibit melanin production and transfer to keratinocytes, along with laser or light therapies to enhance melanin clearance [29]. Therefore, this case report will assess the efficacy and safety of treating a Malaysian patient with

melasma complicated by PIH and mottled hypopigmentation using a combination of 1064-nm LFQSNYL, 595-nm PDL, and oral TA.

Case Presentation

This case report presents a 53-year-old Chinese woman with melasma complicated by both hyperpigmentation and hypopigmentation following six sessions of monthly ablative laser therapy administered by a beautician for facial melasma treatment. She has no pre-existing medical conditions and no personal or family history of vitiligo, though her mother has melasma. After each treatment session by the beautician, she experienced skin irritation lasting over a week, which worsened with sun exposure. Otherwise, she was in good systemic health.

Her initial consultation took place when she noticed mottled hypopigmentation on her cheek area. Upon examination, bilateral malar melasma was observed, along with PIH and several areas of mottled hypopigmentation. No dyspigmentation was noted on the forehead or chin. Skin analysis using the ISEMECO® S7 device (Guangzhou Newlife New Material Co., Ltd., Guangzhou, China) revealed more distinct areas of hyperpigmentation and hypopigmentation, as well as an inflamed skin base **(Figure 2).**

Management and Outcome

The patient received a combination of LFQSNY and PDL treatments, along with oral tranexamic acid, for her melasma complicated by post-inflammatory hyperpigmentation and hypopigmentation. The LFQSNY (Spectra XT™, Lutronic Corporation, Korea) was set with a fluence of 0.7 J/cm², a frequency of 10 Hz, and a spot size of 8 mm, with 3 passes per session. The 595 nm PDL (Spectra XT™, Lutronic Corporation, Korea) was set with a fluence of 0.24 J/cm², a frequency of 2 Hz, and a spot size of 5 mm, with 1 pass per session. Both lasers were administered for a total of 20 sessions, conducted at 4- to 6-week intervals over a period of 1 year and 6 months. She was also prescribed oral tranexamic acid at a dosage of 250 mg once daily for 6 months, starting from the second session and continuing until the eighth session. Although she was advised to begin oral tranexamic acid at the initial treatment session, the patient gave consent only at the second session.

Improvement of melasma was assessed using the modified Melasma Area and Severity Index (mMASI). At the initial consultation, the mMASI score was 4.2. By the tenth session, notable improvement was observed, with the score reduced to 2.40. Further progress was seen at the twentieth session, culminating in a final mMASI score of 1.20 **(Table 1).** Hyperpigmentation of the bilateral malar region improved after five sessions of combined treatment with PDL, LFQSNY, and oral tranexamic acid, with no new cases of PIH, hypopigmentation, or rebound melasma.

Along with the improvements in melasma, both PIH and hypopigmentation showed enhancement. However, it is important to note that complete resolution of all hypopigmentation was not achieved, although considerable progress was observed throughout the treatment regimen **(Figure 1).**

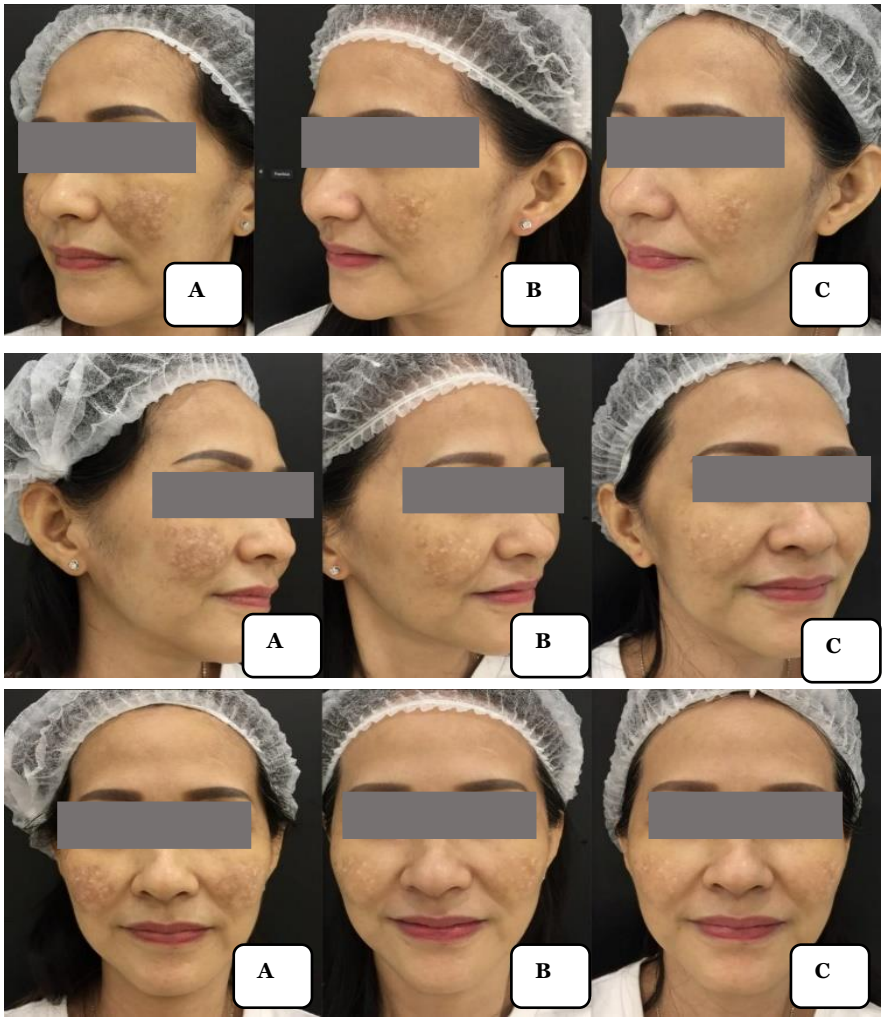

Figure 1. Clinical photographs of the patient at the 1st (A), 5th (B), and 8th (C) treatment sessions, showing front, left, and right views. Improvement in hyperpigmentation was observed by the 8th session.

Table 1. mMASI score of the patient.

Session	mMasi score
1	4.2
5	3.6
8	2.4
10	2.4
15	2.4
18	2.4
20	1.2

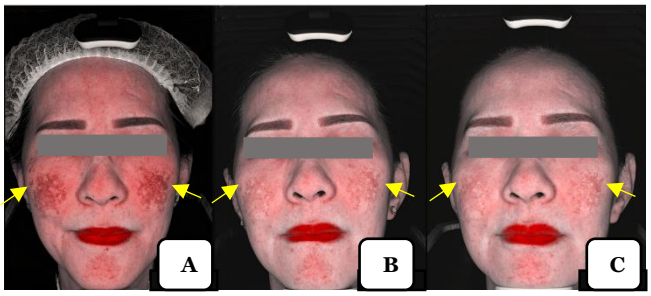

Figure 3. ISEMECO® AI skin analysis images at the 1st (a), 5th (b), and 8th (c) treatment sessions. Yellow arrows indicate areas of inflammation. Progressive improvement in inflamed areas was observed over the course of the 8 sessions.

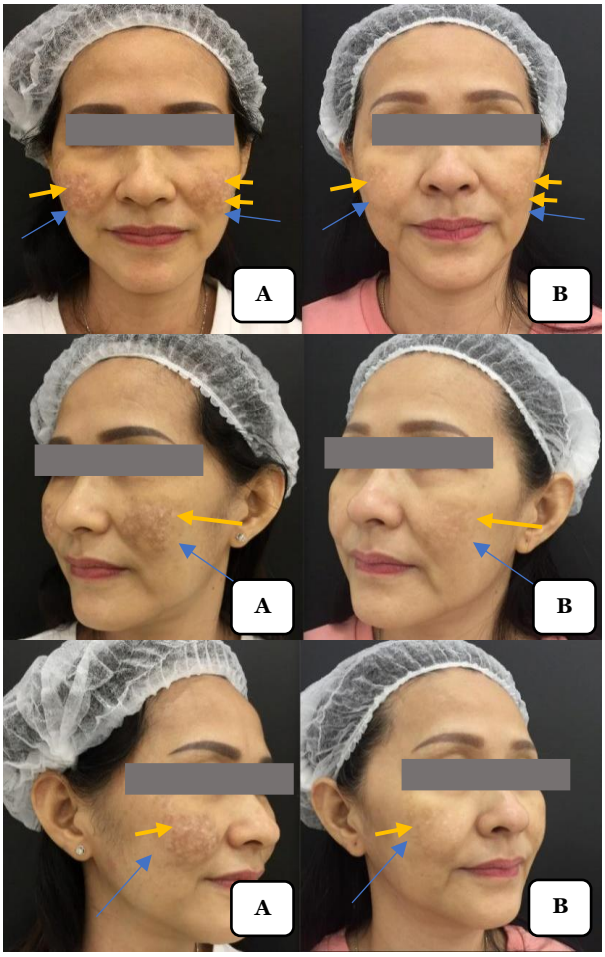

Figure 2. Clinical photographs of the patient at the 1st session (A) and 20th session (B), showing front, left, and right views. Blue arrows indicate areas of hyperpigmentation; yellow arrows indicate areas of hypopigmentation. Improvement in both hyperpigmentation and hypopigmentation was observed after the 20th session.

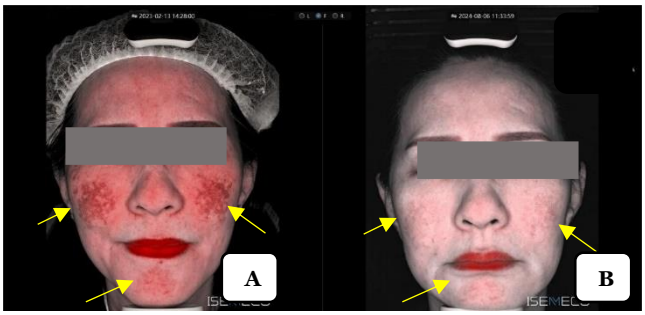

Figure 4. ISEMECO® skin analysis infrared images at the 1st session (A) and 20th session (B). Yellow arrows indicate areas of inflammation. Notable improvement in skin inflammation was observed after the 20th session.

Discussion

LFQSNYL as treatment of melasma has shown promising results [30-32]. However, the risk of developing hypopigmentation remains a significant concern with this treatment, as spontaneous recovery is rare [33]. Furthermore, in contrast to other complications, certain hypopigmented lesions may persist permanently despite prolonged and active repigmentation treatments [31-36].

Combination therapy may enhance clinical efficacy and reduce the adverse effects associated with LFQSNYL treatment. Therefore, in this case report, the author aims to evaluate the safety and efficacy of combination therapy involving LFQSNYL, PDL, and oral TA. The patient in this case report presented with melasma, along with PIH and hypopigmentation resulting from ablative laser treatment performed by a non-professional. Furthermore, skin analysis revealed significant inflammation. Therefore, in addition to targeting melasma, incorporating therapy that addresses the vascular component would be particularly beneficial for this patient.

Patient have shown improvement combined treatment with PDL, LFQSNY, and oral TA, with no new cases of PIH, hypopigmentation, or rebound melasma. Combining therapy with different targeted approach might be the possible reason for patient improvement in this case report.

Increased vascularity may significantly contribute to the pathogenesis of melasma and the development of PIH following laser therapy, through the elevated release of cytokines and soluble factors from proliferating vessels [37]. According to Kong et al., using lasers such as PDL to target blood vessels could reduce melanocyte stimulation and help prevent relapse. Therefore, by addressing both melanin and vascular components, the combination of PDL with LFQSNY may offer an effective and promising treatment strategy for melasma [16].

Additionally, the inclusion of oral tranexamic acid (TA) could further enhance treatment efficacy in this patient, as a study found that oral TA improves the effectiveness and reduces the side effects of QSNYL therapy [38]. Besides melasma, TA has also shown effectiveness in treating other hyperpigmentation disorders, including PIH [39].

Therefore, by addressing melanin production, vascularization, and PIH in the patient, the combination of LFQSNY with PDL and oral TA could provide an effective treatment strategy for melasma complicated by PIH and hypopigmentation. However, despite improvements in the pigmented lesions, the hypopigmentation was not fully resolved, although some progress was observed throughout the treatment course.

Conclusion

In conclusion, the combination of 1064-nm LFQSNY, 595-nm PDL, and oral TA demonstrated promising results in treating melasma complicated by PIH and hypopigmentation, with no observed worsening of PIH, hypopigmentation, or rebound melasma. Nevertheless, further large-scale studies are warranted to confirm the efficacy and safety of this combination approach in the Malaysian population.

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Potential Conflict of Interest

The author declares no potential conflict of interest.

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A Rare Convergence: Cutaneous Squamous Cell Carcinoma in a Patient with Extensive Vitiligo

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Abstract: Cutaneous squamous cell carcinoma (cSCC) is the second most common skin cancer globally, with incidence rates varying across different regions. This case report describes a 72-year-old Chinese woman with extensive vitiligo and Fitzpatrick skin type II who presented with suspicious lesions on her scalp and cheek. Upon examination, the lesions exhibited distinct morphologies, and histopathological analysis confirmed invasive squamous cell carcinoma on the scalp and verrucous carcinoma on the cheek. The diagnosis was established through a punch biopsy of the scalp lesion and excision of a cutaneous horn on the right cheek. The patient subsequently underwent wide local excision and was referred for oncologic evaluation. The occurrence of cSCC in patients with vitiligo is rare, and most studies suggest these individuals have a lower risk of skin cancer. However, this case highlights the development of cSCC in a vitiligo patient, emphasizing the importance of increasing patient awareness, particularly regarding skin self-examination, early medical consultation, and sun protection. These factors are crucial for early detection and improving outcomes. Early recognition, prompt biopsy of atypical lesions, and ongoing dermatologic surveillance ensure timely diagnosis and effective management.

Keywords: Cutaneous horn, Cutaneous squamous cell carcinoma, Skin cancer risk, Vitiligo, Verrucous carcinoma

Introduction

Cutaneous squamous cell carcinoma (cSCC) is the second most common form of skin cancer globally, following basal cell carcinoma [1] with an age-standardized incidence rate (ASIR) of 30.3 per 100,000 population in 2019 [2]. The incidence of cSCC varies significantly by geographic and demographic factors. For instance, the Southeast Asia region reports a

much lower ASIR of 0.88 per 100,000 population [2]. In Malaysia, the National Cancer Registry Report documented an age-standardised incidence rate (ASIR) of 3.1 per 100,000 males and 2.3 per 100,000 females for non-melanoma skin cancer (NMSC) between 2012 and 2016. The ASIR for males further increased to 3.5 per 100,000 between 2017 and 2021. However, the report did not include incidence data for females during this later period [3]. To date, the specific incidence rate of cSCC is not well-defined.

Several risk factors for cSCC development have been identified over the years. This includes cumulative ultraviolet (UV) radiation exposure, ageing, fair skin, male sex, and acquired immunosuppression, as seen in haematological malignancies and immunosuppressive treatments. Additional risk factors include chronic wounds, certain genetic syndromes, and a prior history of squamous cell carcinoma. [4]. Certain hereditary factors, including a blue-eyed phenotype and a family history of skin cancer, as well as inherited disorders with a clear association to photosensitivity such as xeroderma pigmentosum, oculocutaneous albinism, and Kindler syndrome have been associated with an increased risk of developing cSCC [5,6,7]. Environmental exposure, such as arsenic, radon, and polycyclic aromatic hydrocarbons, exposure to medications such as immunosuppressive agents or antimetabolites, and human papillomavirus (HPV) infection increase the risk of developing cSCC as well [5]. According to Andrade et al., approximately 70.7% of all cSCC cases were located on sun-exposed areas, with the majority occurring on the face (51.9%), followed by the upper limbs (15.7%), lower limbs (12.5%), scalp (8.3%), genital area (4.2%), and neck (4.1%). [8].

Vitiligo is a chronic acquired autoimmune disorder characterised by depigmentation due to the destruction of melanocytes [9]. Global prevalence of vitiligo is estimated at 0.5% - 1% and varies geographically [10]. A systematic review and meta-analysis by Haulrig et al., which included 112 studies and a total of 373.8 million participants, reported an overall vitiligo prevalence of 0.4%. Regionally, the highest prevalence was observed in West Asia, while the lowest was reported in East Asia. At the country level, Jordan recorded the highest prevalence, whereas Sweden had the lowest [9].

However, the literature on the relationship between vitiligo and cSCC remains inconsistent, with varying postulations and evidence. In this report, we describe a case of a patient with vitiligo who presented with squamous cell carcinoma at multiple sites, exhibiting distinct morphologies.

Case Presentation

A 72-year-old Chinese woman presented to the dermatology clinic with progressively enlarging skin lesions on the scalp and a growth on her right cheek, both of which had been present for approximately eight months. Her medical history included vitiligo for more than 30 years, primary hypothyroidism, ischemic heart disease, and bronchial asthma. Although she had never sought treatment for her vitiligo, she regularly attended follow-up appointments for her other chronic conditions at a district hospital. She was a non-smoker and a housewife with no history of using biofuel or coal for cooking. Additionally, she did not consume well water, both of which are considered potential environmental risk factors for cSCC due to exposure to arsenic and polycyclic aromatic hydrocarbons.

On examination, the patient had extensive vitiligo universalis with Fitzpatrick skin type II, resulting in near-total depigmentation of her body. A past photograph revealed her original skin, which had been of Fitzpatrick skin type IV and appeared pigmented. An irregular ulcer with raised borders, measuring 2.0 × 2.5 cm, was observed on the vortex of the scalp **(Figure 1).** The ulcer's base appeared clean. The scalp lesion initially appeared as a small, red, itchy patch, which led to frequent scratching and subsequent skin breakdown. Over time, the lesion failed to

heal, occasionally bled, and progressively increased in size.

The lesion on the right cheek was a conical, hard, white structure, measuring 0.6 × 1.0 cm, protruding from a dull red, scaly base **(Figure 2).** The cheek lesion presented as a solid, hyperkeratotic growth with a firm consistency, protruding from a red, scaly base. Additionally, multiple small, yellowish, scaly plaques suggestive of actinic keratosis were noted on the face. These findings were non-tender and located within the vitiliginous areas. Both lesions were painless, which contributed to the delayed presentation. The general examination revealed no other abnormalities.

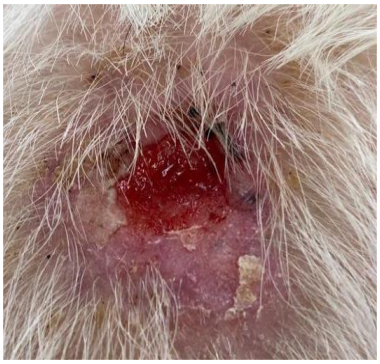

Figure 1. Ulcer on vortex scalp

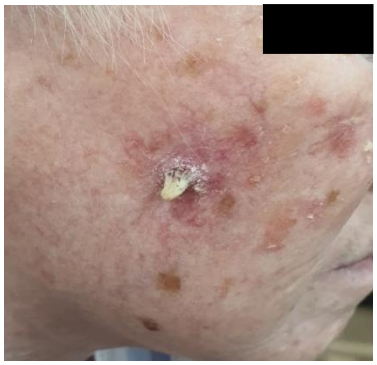

Figure 2. Cutaneous Horn

The initial clinical impression suggested squamous cell carcinoma of the scalp and a cutaneous horn on the right cheek, with potential premalignant or malignant underlying pathology. Diagnostic interventions included a punch biopsy of the scalp lesion and complete excision of the cutaneous horn along with its base. Histopathological analysis confirmed an invasive, poorly differentiated squamous cell carcinoma of the scalp, characterized by frequent mitoses. The lesion on the right cheek was diagnosed as verrucous squamous cell carcinoma, with a deep margin clearance of only 1 mm. Given the high-risk anatomical locations (scalp and face), the presence of a poorly differentiated tumor with frequent mitoses on the scalp, and the close deep margin of the cheek lesion (<2 mm), the overall risk stratification indicated a very high risk of recurrence and metastasis. Following this diagnosis, the patient was scheduled for a computed tomography (CT) scan of the thorax, abdomen, and pelvis to assess for potential metastases. She was subsequently referred to a plastic surgeon and an oncologist for wide local excision of the scalp lesion and further oncologic management.

Discussion

The occurrence of skin cancer in individuals with vitiligo is rare [11]. While skin pigmentation is known to protect against UV radiation, theoretically increasing the risk of non-melanoma skin cancers (NMSC) in vitiligo patients, genetic studies suggest otherwise. A large-scale cohort study analyzing Genome-Wide Association Study (GWAS) data from the UK Biobank (UKBB), using Mendelian Randomization Analysis, identified single nucleotide polymorphisms (SNPs) in three loci: TYR, MC1R-DEF8, and RALY-EIF2S2-ASIP-AHCY-ITCH, which demonstrate an inverse genetic relationship between vitiligo and skin cancer [12].

In addition, a cross-sectional study by Paradisi et al. and Teulings et al. found that patients with vitiligo have a decreased risk of developing melanoma and NMSC, with an 81% and 72% lower risk of NMSC, respectively [13,14]. A study conducted in the UK reported a 38% reduced risk of new-onset skin cancer among patients with vitiligo compared to the

general population, with a 33% and 35% reduced risk of squamous cell carcinoma and basal cell carcinoma, respectively [15]. Similarly, another study in Taiwan showed a 79% reduced risk of NMSC among patients with vitiligo compared to the general population [16].

Several explanations have been proposed for the inverse relationship between vitiligo and NMSC. One factor is the increased use of sunscreen among vitiligo patients. A study conducted in Australia revealed that vitiligo patients have better sunscreen habits compared to the general population [17]. Furthermore, a study by Gonzalez et al. found that a diagnosis of vitiligo influences individuals' sun protection behaviors. Before their diagnosis, only 24.4% of respondents used sunscreen daily or frequently, but this figure rose to 60.3% after the diagnosis [18]. Additionally, a systematic review by Rooker et al. hypothesized several mechanisms, including both immune-mediated and non-immune pathways, that may explain the reduced risk of NMSC in vitiligo patients [19].

Despite the inverse relationship between vitiligo and NMSC, this case report presents a vitiligo patient diagnosed with cSCC. She had never sought treatment for her vitiligo and did not use sunscreen, likely increasing her risk of cSCC due to prolonged ultraviolet (UV) exposure Although skin cancer is rare in patients with vitiligo, a small subset may be at risk due to chronic sun exposure [11], as UV radiation is a major risk factor for the development of cSCC [20]. Apart from her advanced age and lack of sun protection, no other significant risk factors were identified.

Conclusion

Skin cancer development in patients with vitiligo is uncommon, which may have led to chronic sun exposure being overlooked as a risk factor for the development of squamous cell carcinoma (SCC) in vitiligo patients [Seo]. This case highlights the importance of patient education and awareness, especially regarding skin self-examination, early medical consultation, and sun protection, all of which are vital for promoting early detection and improving outcomes.

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Potential Conflict of Interest

The author declares no potential conflicts of interest.

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