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Dear esteemed reader,

Aesthetic medicine is a relatively new field in medicine. Conventionally, it was categorized under beauty treatment (or anti-aging, wellness). However, the medical fraternity realizes that such treatment can cause an anatomical, chemical, and biological reaction on the human tissues that either display a favourable outcome or may cause complications, which raises the safety issue among the public.

In Malaysia, the Ministry of Health (MOH) defined aesthetic medicine as "An area of medical practice which embraces multidisciplinary modalities dedicated to create a harmonious physical and psychological balance through non-invasive, minimally invasive and invasive treatment modalities which are evidence-based. These modalities focus on the anatomy, physiology of the skin and its underlying structures, to modify the otherwise 'normal' (non-pathological) appearance in order to satisfy the goals of the patient and are carried out by registered medical practitioners".

As we know, the practice of EBM involves the integration of clinical expertise with the best available clinical information to deliver optimal patient care. Knowledge based on expert opinions, pathophysiologic reasoning, noncritical reviews, and the tradition of experience is not sufficient in guiding medical decisions; hence the importance of well-conducted trials with sound methodology cannot be overstated. Unfortunately, the application of well-conducted trials in aesthetic medicine (and other specialties, e.g., aesthetic surgery) is still low. In a systematic review study on a ten-year review of Quality of Clinical Studies in Aesthetic Surgery Journals by Chang E et al. (2009), out of 1419 manuscripts included, RCTs were identified in 45 papers (3.2 percent). Sixty (4.2 percent) of the studies were prospective cohort studies. There were 90 papers (6.3 percent) that were retrospective cohort studies. The remaining 1224 articles (86.3 percent) consisted of case studies, case reports, reviews, or expert opinions. From Malaysia's perspective, a search in National Malaysia Research Registry (NMRR) shows no record of aesthetic medicine related clinical research documentation in their registry.

A medical journal is a publication of scientific papers that communicates medical information to physicians and other health professionals, whereby a peer-reviewed medical journal is a publication that allows sharing of new findings and knowledge written by experts and are reviewed by several different reviewers before the article is published in the journal, to ensure its quality. (The article has a better chance of being scientifically valid, reaching reasonable conclusions, and so on). In the Malaysian context, we are yet to have any such journal available hence deter the advancement of aesthetic medicine knowledge. Most of the established medical journals only accentuate medical drugs and other conventional medical specialty research.

PREPARATION FOR THE JOURNAL

Esthetic Medical Solution Sdn Bhd (EMS) is one of the leading academic and training providers in aesthetic medicine in Malaysia. They started nine years ago, providing a good teaching program to all medical doctors who wanted to learn about this new medical field. As time goes, they expanded into organizing a medical aesthetic conference (IMACE), the formation of Aesthetic, Pharmaceuticals and Regenerative medicine research and innovation centre (USMARI centre), and also providing book publishing services since 2018 (EMS publication). Starting this year, after consulting with some experienced medical journal editors, EMS decided to introduce open access, an online medical aesthetic journal called Journal of Asia Pacific Aesthetic Sciences (JAPA), with the primary goal to improve medical care by publishing sound scientific articles (both research and practice papers) and focusing on topics that are of great importance to its readership. An editorial board was formed consist of local and international experts in this field with all the necessary preparation to accept the manuscript submission.

CHALLENGES THAT LIE AHEAD

As JAPA is at its infancy stage, we aspire to strengthen the manuscripts' scientific rigor further as we grow. To ensure JAPA contains high-quality articles with the content of scientific merit, the editorial board is required to maintain its impartiality and professionalism in reviewing all manuscript submissions, especially in regards to the scope, methodology, originality, and depth of work undertaken. In the near future, we hope that JAPA could establish itself as a credible journal and apply for the journal to be indexed, i.e., PubMed. However, before indexing can be sought, a great deal of work is needed to build up the scientific worthiness and timeliness of the journal, among other imperatives. We should set our vision on a road map, especially in light of the high value being placed on citations of publications worldwide. It is through citations that others become aware of our work. Citation implies our data are worth quoting. Most importantly, through publications and citations, we as the author indicate that we are prepared to defend the intellectual content, including the result and conclusions. For this inaugural issue, we wish to thank all manuscript contributors, reviewers, and all who have supported the success of the first publication.

Dr Ungku Mohd Shahrin b. Mohd Zaman, MD
Editor in-Chief



JOURNAL OF ASIA PACIFIC AESTHETIC SCIENCES

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Effectiveness of Smart Phone Use for Clinical Photograph

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Dear Editor,

Clinical photography is an essential process in current medical practice for surgical procedure planning and outcome evaluation. Clinicians help to enhance patient care while demonstrating their treatment methods and skills. High-quality images complement the pre-procedure assessment, diagnosis, post-procedure documentation and medical education. Additionally, it serves as teaching material for publication, medicolegal documents, and proof of example in court cases. In this digital era, post-procedure good outcome photos function to promote potential clients and boost one's private practice visibility.

The advancement of technology has made it possible to produce high-quality imaging with minimal technical expertise and a more straightforward device. The cost and mobility achievable with current devices allow photography to be practical in clinical and operative theatre settings. The gold standard for medical photography was confined to digital cameras single-lens reflex (DSLR) devices where high quality, consistent, reproducible, and predictable images could be produced. However, the usage of DSLR requires training, technical skills, and experience to provide efficient photos.

Keeping up with the expansion of digital photography, smartphone cameras can potentially replace DSLR, mirrorless and even compact digital cameras for daily practical use. Portability, size, build-in applications of smartphones eliminate the need to carry multiple devices for clinical photography. The smartphone manufacturers engagement in 'camera wars' since 2019 are incorporating excellent cameras, backed up by even better software. Smartphones in our pockets can rival mirrorless cameras and are integrated with advanced processing techniques to create photographs that mimic professional systems. Camera capabilities are advancing to a higher megapixel lens with a bigger sensor, simplified shooting process, and faster image production.

Multiple surveys among physicians show smartphones usage for clinical photography and related communication. Despite the advantages of smartphone photography, explicit consent, patient confidentiality, and secure image storage are areas that need further study and governance. We need to further explore matters concerning data security and breach, contingency methods for stolen or lost devices, and policies in place on smartphones photography by our Ministry of Health.

As outlined by Hagan, [1] a few principles of photography that are addressed include (1) Accuracy vs favorability; showing off every detail present on the subject, in contrast, to portrait photography where fine details are removed. (2) Consistency; the same way every photograph is taken with standardizing the lighting, precise patient positioning to camera angle, consistent background, patient exposure and clothing. (3) Identical magnification for comparative images; same camera distance from a patient for pre-and post-procedure imaging to provide standardization and avoid distortion.

Light exposure plays an essential role in the quality of imaging, and the knowledge of the Exposure Triangle is vital, which comprises the aperture(depth-of-field), shutter speed (light) and International Standards Organization (ISO) Speed (texture and noise). A low ISO speed of 100-200 is preferred in medical photography to give a smoother, less grainy image (minimal digital noise). [2] Emphasis is also given to image distortion while using a smartphone camera. The lenses autofocus preferentially uses the largest aperture when the camera application is open for the initial maximal exposure of an image. On this zoomed-out auto setting, the image can gain a fish-eye appearance. This distortion can be rectified by distancing away from the subject and taking the photo from the midway point of full zoom capability.[3]

Appreciating the above principles requires control of multiple factors for good quality photography; hence automation of this process with the sophisticated smartphone camera processing allows a greater chance of creating consistent images.

Reviews for the best smartphone camera for the past year by multiple tech websites placed the Samsung Galaxy series, Apple iPhone Pro Max series, and Google Pixel series as top choices by experts. Most smartphone cameras in this category utilize a quad-camera which includes a depth sensor to get better portrait effects. The primary camera sensor combined with an ultra-wide lens and telephoto lens creates a professional quality close to DSLR.

Camera Settings and Methodology

We explain our method using iPhone 12 Pro Max (Apple Inc., Cupertino, CA, USA) for clinical photography. Images are taken in Portrait mode to create a depth-of-field effect with a sharp focus. Fine details usually wiped out in this mode by the older generation of the camera were preserved using the Natural Light setting. (Figure 1) The blurring of background that occurs in Portrait mode was corrected by increasing the Depth Control to f/16. For images taken with Studio Light setting, the shutter speed was set to f-60. (Figure 2) The ISO speed was set automatically by the phone processor algorithm following the aperture and shutter speed setting. To reduce image distortion, a fixed distance of 100cm with 2.5x zoom was used. Image with minimal soft shadow and distortion was produced within seconds without technical difficulties. (Figure 3)

The versatility of smartphone editing allows the Portrait mode effect removed or added back by a simple tap on the image. High-resolution image saved in the smartphone cloud

system allows easy image storage and retrieval. This method is advantageous by reducing the time taken for data transfer and storage using hardware. Furthermore, storage failure, corrupt data or hardware device malfunction can be avoided. However, to prevent a breach of patient confidentiality, we advocate using specific apps created for medical image storage that incorporates consent taking before imaging. Storage apps allow easy organization and cross-referenced filing system.

A designated area for photography allows correct views for specific procedures, careful patient positioning, consistent light setting and well-contrasted background. A setup of a dedicated area for photography of facial portraits was prepared for our study. A similar setup like this is ideal for pre-procedure and follow-up in the clinical setting for smartphone photography. In our studio, to achieve adequate lighting, we used two 150W 5500K strobe lights, each inside a 50cm x 70cm softbox and with a separate power supply. They were positioned 5-10cm higher from eye level at 45 degrees angle on either side of the patient. We used a neutral white background for our setup. Another popular background used is light blue which reduces distraction and complements all skin complexion.

Participants were placed to sit erect, with a neutral face and head brought to Frankfort horizontal plane. The smartphone was mounted to a tripod for a fixed distance and magnification setting. A ruler was placed beside the patient to help indicate the actual dimensions of the photographed area. We utilized Adobe Photoshop (Adobe System Inc. San Jose, CA, USA), a computer application software, to edit and manipulate digital images for anthropometric measurements. Under the heading of Image and Analysis, a custom measurement scale was set where we measured ruler length to pixel length. Pixel length was set to logical length and unit. We measured one centimetre of the ruler length in pixels corresponding to ten millimetres for logical length. (Figure 4)

Furthermore, with the current ongoing COVID-19 pandemic, we must be vigilant while communicating with patients and minimizing contact duration. Usage of smartphone cameras allows faster image acquisition and allows immediate intra- or interdisciplinary consultation if required. Looking into all the factors mentioned earlier, we should move concurrently with the advancement of technology and simplify the way we work without compromising the quality of clinical photography.



Figure 1: Portrait mode with natural light setting, f/16,2.5x, auto ISO



Figure 2: Portrait mode with studio light setting with exposure of f-60



Figure 3: Image produced in Portrait mode with appropriate studio light setup

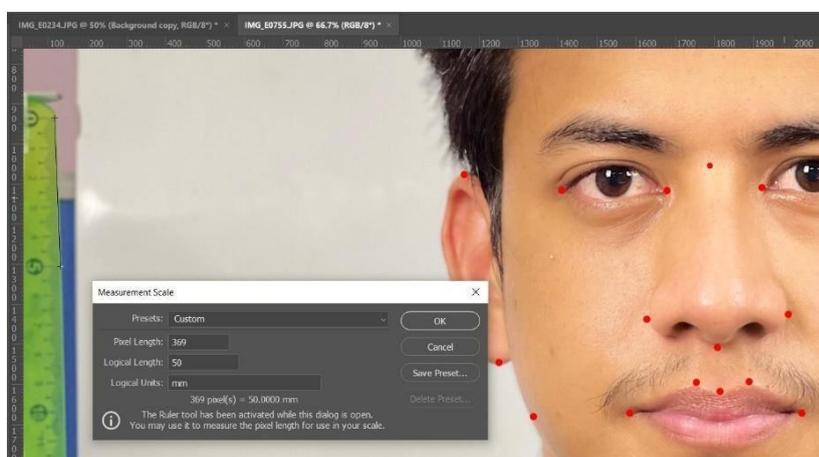


Figure 4: Custom scale measuring pixel length with Adobe Photoshop software.

(Note: Written informed consent was obtained for photos to be included in this letter)

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The Business and Psychological Impact and Barriers of Medical Aesthetics Services in Malaysia During Covid-19 Pandemic

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Abstract

During the outbreak of novel coronavirus disease in December 2019, the aesthetic industry was affected due to the movement control order (MCO) and the spread of the disease in Malaysia. The purpose of this research was to determine the impact of COVID-19 on the aesthetic industry as well as the psychological effect on practitioners and barriers faced by the industry during the pandemic. This was a cross-sectional survey given to registered medical aesthetic practitioners, employers or employees in medical aesthetics and was distributed on social media. The survey showed a significant decrease in the number of patients seeking medical aesthetic procedures during the COVID-19 pandemic. This resulted in substantial reduction in revenue amongst practitioners. The COVID-19 pandemic also limited the services provided in the aesthetic industry and propagated the need to utilize telemedicine services to optimize safe patient care.

Keywords:

Medical aesthetic practice, COVID-19, Malaysia, Aesthetic procedure, Business industry

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The outbreak of a novel coronavirus disease in Wuhan, China, in December 2019 marked the beginning of the unprecedented global spread of the disease, resulting in the near-collapse of the healthcare systems in most affected countries (Wang et al., 2020). Aesthetic practitioners were all successful in the midst of great cosmetics until the pandemic of COVID-19. The worrying spread of the coronavirus infection has affected the world, including the beauty industry in Malaysia. The virus has shown to have a great impact on the world economy which may affect the beauty industries. In most countries, there is a significant decrease in outpatient dermatology visits, both in public hospitals and in private practise offices (Gisondi et al., 2020; Paterlini, 2020).

The small business sector in Malaysia, including new aesthetic clinics, is one of the most directly impacted by the control order of the revolution. The impact of a new aesthetic clinic is more critical than its larger counterpart. Businessmen are experiencing cancellations or closures of businesses and revenue cuts due to the closure of some support sectors such as retail and transportation. There is still a lack of study on the impact of a pandemic outbreak on aesthetic business in Malaysia, especially concerning business continuity and recovery strategy (Hasanat et al., 2020; Fabeil et al., 2020).

During the crisis, registered medical aesthetics have faced the challenge of a lack of resources in the healthcare system, such as personal protective equipment (PPE), and also a lack of guidelines and methods to overcome the hurdles faced while conducting the procedures. As a front-liner, registered medical aesthetics often risk being infected with COVID-19 when operating the procedures and spreading the virus to their families (Galadari et al., 2020; Thakurani & Gupta, 2021). The

aesthetic practise has taken a seat back during the crisis as most cosmetic procedures require close contact with the skin and mucosa that increases the risk of viral transmission. In some countries, there was a recommendation to postpone outpatient visits for non-acute allergic conditions, acne, alopecia, chronic skin conditions, and cosmetic procedures (Tao et al., 2020; Türsen et al., 2020).

The Society of Aesthetic Medicine (MSAM) in Malaysia reported that many aesthetic industries were impacted during the movement control order (MCO). This is because many aesthetic procedures, such as chemical peels, intense pulsed light (IPL), and skin rejuvenation procedures, were unavailable during the COVID-19 crisis. Although the industries are known to be affected, the extent of COVID-19's impact on medical aesthetic services and business has yet to be determined. It is also unknown whether patients continue to demand medical aesthetic services and also the barriers faced by the medical aesthetic practitioners during COVID-19 crisis.

There has been no study in Malaysia to date that has evaluated the impact of COVID-19 on medical aesthetic service and business, as well as the perceived psychological effect on medical aesthetic practitioners. As a result, the purpose of this research is to determine the impact of COVID-19 on the aesthetic business in Malaysia, with a focus on non-surgical medical aesthetic procedures, as well as the impact on practitioner psychology and the barriers faced by the industry during COVID-19.

The findings of the study will provide information on the need for business restructuring as well as the assistance required for the practise during the COVID-19 pandemic to ensure business sustainability while also ensuring patient safety.

Methodology

This study was conducted as a cross-sectional survey of medical aesthetic practitioners' perceptions on the business and psychological impact as well as the barriers faced by the industry during COVID-19 pandemic. A list of registered medical aesthetic practitioner with Letter of Credentialing & Privileging (LCP) in Malaysia was obtained from the Ministry of Health website. Using convenience and snowball sampling methods, the survey link was shared by the practitioners to their contacts in the WhatsApp group, a messaging app that is commonly used to connect between April and October 2021. Information on the study and informed consent was provided to the respondent in the online survey platform. Respondents provide their informed consent by clicking the agreement to participate before answering the survey questions. Respondents received no financial incentive for participation.

The inclusion criteria were registered medical aesthetic practitioners, employer or employee in a medical aesthetic clinic in Malaysia during COVID-19 pandemic, able to give informed consent. They were excluded from the study if they no longer practised medical aesthetics before COVID-19 or practised medical aesthetics as part time or locum doctors. Incomplete surveys of more than 80% were also excluded from this study. Using the sample size calculation by Krejcie & Morgan (1970) with adjustment to the total number of registered medical aesthetic practitioners in Malaysia for 2021 which was 332, the calculated sample size required to obtain 95% confidence level, 5% margin error, and response distribution of 50% was 175.

The survey was self-developed from literature review and expert opinion. It was prepared in English and consists of 4 sections. Section A includes data collection for

demographic and characteristic of respondents and their business settings and orientation. Respondents were asked on their age, gender, ethnicity, highest level of education, employment status whether they were the business owner or an employee at the medical aesthetics clinic, practise size, business location, premises setting and state of practise. Section B evaluates respondents' perspective on the medical aesthetic business impact of COVID-19. This section gathered the information on the number of patients receiving the treatment before and during the COVID-19 pandemic, perceived business revenue following COVID-19 and also the type of treatment provided before and during the COVID-19 pandemic. The latter include questions regarding the number of patients for non-invasive, minimally invasive, and invasive medical aesthetic procedures as defined in the Malaysian guideline of medical aesthetic 2020 (Ministry of Health Malaysia, 2015). Section C consists of 9 items that assess the psychological impact of COVID-19 on registered medical aestheticians, while Section D has 11 items that evaluate the obstacles faced by the registered medical aesthetics during the COVID-19 pandemic.

In sections C and D, respondents were asked to rate the items based on whether they were of minor, moderate, or major concern, or if the items were deemed irrelevant to their context. The content validity of the survey was validated by an expert team member who consists of two academicians and 5 medical aesthetic practitioners. None of the items asked had an item-content validity index (I-CVI) of <0.78 (lynn, 2006) with Scale-content validity index (S-CVI) of section B, C and D were 0.97, 0.98 and 0.94 which is more than acceptable limit of >0.80 (Polit & Beck, 2004). The face validity and reliability were conducted on 26 respondents and the Cronbach's alpha value for section C and D were found to be 0.78 and 0.79, respectively.

The survey was analysed descriptively using Statistical Package for the Social Sciences, version 26. Descriptive analysis using frequency, percentage and mean + standard deviation (SD) was used to present the demographic and characteristics of the respondents, perceived business, psychological impact and barriers faced during COVID-19 pandemic. The ethical approval for this study was obtained from the Medical Research Ethics Committee Universiti Putra Malaysia, Reference number: UPM/TNCPI/RMC/JKEUPM/1.4.18.2 (JKEUPM).

Results and Discussion

Of the total invitation of 175 medical aesthetic practitioners, 108 had agreed to participate in the study giving the response rate of 61.7%. The mean (SD) of respondents' age was 41.8 (8.6) with a range of between 33 and 75 years old. There were more female respondents (n = 56, 51.9%) than male in the study with the majority being of Chinese

ethnicity (n=67, 62%), followed by Malay (n= 27, 25%), Indian (n=12, 11.1%) and others (n=2, 1.9%). Majority of the respondents had undergraduate medical degree as their highest education level (n=85, 75.8%), graduated from overseas college or university (n = 57, 52.8%), were business owners or self-employed (n=84, 77.8%). The mean year (SD) of practise in the medical aesthetic industry was 10.3 (5.8) and ranged between 1 to 35 years. Majority of the respondents practise or own independent clinics of one or two (n=55, 50.9%), followed by the small chain clinic defined as having between 2 and 10 medical aestheticians (n=51, 47.2%). A total of 73 (61.7%) respondents' premises were located in the city area and were of shop lot (n=81, 75%). The highest number of respondents were from Selangor (n=37, 34.3%), followed by Kuala Lumpur (n=36, 33.3%) and Johor (n=9, 8.3%). The summary of respondents' demographic and business characteristics is presented in Table 1.

Table 1: Demographic and business characteristic of medical aesthetic practitioners participated in the study (n = 108)

Variable	Frequency (%)	Mean (SD)(Min-Max)
Age		41.8 (8.6) (33-75)
Gender		
Male	51 (47.2)	
Female	56 (51.9)	
Ethnicity		
Malay	27 (25)	
Chinese	67 (62)	
Indian	12 (11.1)	
Others	2 (1.9)	
Highest level of education		
Degree	85 (78.7)	
Master	18 (16.7)	
PhD/others	5 (4.7)	
Place of graduation		

Local university/college	51 (47.2)
Oversea university/college	57 (52.8)
Employment status	
Self-employed	84 (77.8)
Employee	23 (21.3)
Other	1 (0.9)
Years of experience in medical aesthetic	10.3 (5.8) (0-35)
Practise size	
Independent clinic (2 clinics)	55 (50.9)
Small chain clinic (2-10 aestheticians)	51 (47.2)
Medium chain clinic (11- 30 aestheticians)	1 (0.9)
Large chain clinic (>30 aestheticians)	1 (0.9)
Clinic location	
Suburb	8 (7.4)
Town	25 (23.1)
City	73 (67.6)
Rural	2 (1.9)
Premise setting	
Shop lot	81 (75)
Shopping mall	16 (14.8)
Office tower	5 (4.6)
Others	6 (5.6)
State of practise	
Kedah	1 (0.9)
Perak	5 (4.6)
Kuala Lumpur	36 (33.2)
Selangor	37 (34.3)
Negeri Sembilan	2 (1.9)
Melaka	2 (1.9)
Johor	9 (8.3)
Pahang	1 (0.9)
Terengganu	1 (0.9)
Kelantan	1 (0.9)
Sabah	3 (2.8)
Sarawak	2 (1.9)

Sub-analysis: Practise size according to premise setting

Practise size	Type of premise setting			
	Shop lot (n, %)	Shopping Mall (n, %)	Office tower (n, %)	Others (n, %)
Independent clinic (2 clinics)	37 (34.3)	12 (11.1)	3 (2.8)	3 (2.8)
Small chain clinic (2-10 aestheticians)	42 (38.9)	4 (3.7)	2 (1.9)	3 (2.8)
Medium chain clinic (11- 30 aestheticians)	1 (0.9)	0	0	0
Large chain clinic (>30 aestheticians)	1 (0.9)	0	0	0

During COVID-19, the mean (SD) number of patients per month decreased from 132.2 (153) to 56.5 (88.5), a decrease of more than 50%. When the data was analysed by type of practise, the majority of clinics, with the exception of a large chain clinic with more than 30 medical aesthetics practitioners, saw a decrease in the number of patients. The small chain clinics with between 2 and 10 medical aesthetic practitioners were the most affected, with the number of patients dropping by 61 percent. According to the respondents' reported business revenue, the majority had decreased in sales, with the greatest impact having decreased in revenue by 51-75 percent (n=25, 23.1 %). Less than 10% of the respondents (n=10, 9.6%) reported increased business revenue during the COVID-19 pandemic. Majority of the respondents perceived the reduction in number of patients visiting their practise during COVID-19 pandemic because of the government's Movement Controlled Order (n=41, 37.9%), followed by the perception that the services are non-essential and that the treatment can wait (n=39, 36.1%). The majority of respondents in this study reported using clinics saving money (n=60, 56.5%), followed by reducing the salary of staff (n=28, 25.9%) and

number of staff (n=25, 23.1%) to sustain the operational cost during COVID-19 pandemic.

During the pandemic, more than half of the respondents used Messaging Apps (e.g. WhatsApp) (n=66, 61.1%) and social media (e.g., FB, IG) (n=62, 57.4%) to connect with their patients. Only a small number of respondents utilize video call for teleconference with their customer (n=15, 3.9%). The summary of the business impact on medical aesthetics services is presented in Table 2.

Table 2: Perceived medical aesthetic business impact during COVID-19

Items	Before COVID-19 pandemic, Mean (SD)	During COVID-19 pandemic, Mean (SD)
Overall number of patients per month	132.2 (153)	56.5 (88.5)
Number of patients according to type of practise per month		
Independent clinic (2 clinics) (n = 25)	87 (84.5)	34.1 (35)
Small chain clinic (2-10 aestheticians) (n= 28)	155.2 (180.3)	60.5 (95.8)
Medium chain clinic (11- 30 aestheticians) (n=1)	500	200
Large chain clinic (>30 aestheticians) (n =1)	250	400
Business revenue during COVID-19		
	Frequency (%)	
Unable to disclose	5 (4.6)	
Decreased in revenue \leq 25%	12 (11.1)	
Decreased in revenue 26-50%	15 (13.9)	
Decreased in revenue 51-74%	25 (23.1)	
Decreased in revenue \geq 75%	15 (13.9)	
Increased in revenue \leq 25%	5 (4.6)	
Increased in revenue 26-50%	5 (4.6)	
Increased in revenue 51-74%	0 (0)	
Increased in revenue \geq 75%	0 (0)	
No change in revenue	1 (0.9)	
Perceived reasons or patient not going to clinics		
MCO regulation restriction	41 (37.9)	
The service is considered non-essential that the treatment can wait	39 (36.1)	
Financial burden	28 (25.9)	
Worried about the possibility to get infected at the clinic	27 (25)	
How clinic operational costs were sustained during this pandemic?		
Use clinic saving	60 (56.5)	
Terminate staff	6 (5.6)	
Reduce the number of staff	25 (23.1)	
Reduce salary for staff	28 (25.9)	
Get government financial support	23 (21.3)	
Close the clinic temporarily	21 (19.4)	
Close the clinic for good	0 (0)	
Platform use to connect with patients during COVID-19 pandemic		
Phone call	37 (34.3)	
Social Media (e.g., FB, IG)	62 (57.4)	
Messaging Apps (e.g., WhatsApp)	66 (61.1)	
Video-call	15 (13.9)	
Email	13 (12)	

In terms of types of medical aesthetic treatment provided before and during COVID-19 pandemic, the treatment service that was most affected was the treatment for pigmentation disorder with reduction in the

number of patients by 32.2%. This is followed by skin rejuvenation treatment with a drop of number of patients by 28.4% and microdermabrasion with estimated percentage of reduced number of patients of 21.3%. Other esthetic

treatments were also shown to be impacted during COVID-19 pandemic, with a reduced number of patients seeking the procedures. The summary of information regarding business

impact of COVID-19 on medical aesthetic number of practise according to type of treatment provided is summarized in Table 3.

Table 3: Information on frequency of common medical aesthetic treatment provided before and during COVID-19 pandemic

Type of medical aesthetic treatment provided by medical aesthetician in Malaysia	Number of practises offering the service frequency (%)	Number of patients before COVID-19	Number of patents during COVID-19
		Mean (SD) (min-max)	Mean (SD)(min-max)
Superficial chemical skin peeling	73 (68)	34.1 (69) (0-550)	17.6 (59) (0-500)
Medium chemical skin peeling	74 (69)	17.6 (39.9) (0-500)	9.7 (35.6) (0-300)
Microdermabrasion	72 (67)	36.7 (55.5) (0-300)	15.4 (27.5) (0-150)
Intense Pulsed Light therapy	67 (62)	14.8 (34.6) (0-220)	6.7 (20.2) (0-150)
Botulinum Toxin type A (BTA) injection	73 (68)	25.9 (30.1) (0-150)	9.6 (10.9) (0-60)
Dermal Fillers	75 (69)	29.7 (39.2) (0-200)	9.9 (12.8) (0-80)
Pigmentation disorder treatment	74 (69)	58.1 (74.3) (0-400)	25.9 (50.2) (0-400)
Vascular disorders treatment	66 (61)	8.8 (16.3) (0-80)	3.7 (8.50) (0-55)
Laser Hair Epilation	68 (63)	23.2 (52.8) (0-360)	9.7 (20.4) (0-100)
Skin Rejuvenation	72 (67)	49.6 (73.8) (0-400)	21.2 (50.4) (0-400)
Non-invasive skin tightening	69 (64)	28.4 (54.4)	10.5 (26.6)

In terms of psychological impact of COVID-19 on medical aesthetic practitioners, the majority of respondents perceived to feel a “little” (n=47, 43.5%) followed by “considerably anxious” (n=32, 29.6%) or worried in providing the services to patients during the pandemic. The highest score for items that were of major concern were they afraid that they would get themselves (n=21, 19.4%) or their family member or friends infected with COVID-19 (n=25, 23.1%). Quite a number of respondents had moderate concern

related to stress with the additional workload for COVID-19 precautionary measures (n=29, 26.9%), in changing working hours (n=22, 20.4%), the inappropriate behavior of customers (n=48, 44.1%) and staff in the clinic are not taking necessary precautions (n=25, 23.1%). Table 4 shows the summary of respondents' response on perceived psychological impact or concern of COVID-19 on medical aesthetics practise and their own well-being.

Table 4: Perceived psychological impact of COVID-19 on medical aesthetic practise and practitioners (n = 97)

How do you emotionally feel as a medical aesthetic practitioner in providing medical aesthetic services to patients during the COVID-19 outbreak?	Frequency (%)
No change, I feel the same	12 (11.1)
I feel a little anxious or worried	47 (43.5)
I feel considerably anxious or worried	32 (29.6)
I feel extremely anxious or worried	6 (5.6)

Level of concern related to medical aesthetic services during COVID-19 outbreak	Number of respondents, n (%)			
	Not applicable to me	Minor concern	Moderate concern	Major concern
I will get infected with COVID-19	1 (0.9)	41 (38)	34 (31.5)	21 (19.4)
I will get my family or friends infected with COVID-19	5 (4.6)	30 (27.8)	37 (34.3)	25 (23.1)
I have comorbid conditions that putting me at high risk of getting COVID-19 (e.g., asthma, diabetes)	56 (51.9)	25 (23.1)	11 (10.2)	5 (4.6)
I feel stress with the additional workload for COVID-19 precautionary measure (e.g., PPE, regular sanitizing)	2 (1.9)	54 (50)	29 (26.9)	12 (11.1)
I feel stress with the change in working hours	10 (9.3)	52 (48.1)	22 (20.4)	13 (12)
The inappropriate behavior of customers due to COVID-19 related to panic	5 (4.6)	26 (24.1)	48 (44.1)	18 (16.7)
Other staff in the clinic are not taking necessary precautions	19 (17.6)	37 (34.3)	25 (23.1)	16 (14.8)
The layout of my aesthetic clinic prevents me from taking the necessary precautions to prevent myself from COVID-19.	30 (27.8)	42 (38.9)	16 (14.8)	8 (7.4)

When barriers and challenges faced by the medical aesthetics business were evaluated, the most barriers items rated with major concerns include perceived impact of the COVID-19 pandemic on business causing financial implication (n=60, 55.6%), increased in price of aesthetic equipment from the wholesalers (n=37, 34.3%) and patient's pandemic related panic behaviour (n=34, 31.5%). Other

challenges with moderate concern include perceived patients' perception and belief towards medical aesthetic services (n=39, 36.1%) and lack of staff in the aesthetic clinic (n=35, 32.4%). The summary of perceived barriers and challenges faced by the medical aesthetic services during COVID-19 pandemic is presented in Table 5.

Table 5: Perceived barriers and challenges faced by medical aesthetic services during COVID-19 pandemic (n =96)

Level of concern about working in medical aesthetic services during the COVID 19 outbreak	Number of respondents, n (%)			
	Not applicable to me	Minor concern	Moderate concern	Major concern
• Price of aesthetic equipment increases from wholesalers.	2 (1.9)	15 (13.9)	42 (38.9)	37 (34.3)
• PPE or medical shortage issue from wholesalers.	3 (2.8)	29 (26.9)	41 (38)	23 (21.3)
• Patient's pandemic related panic.	0 (0)	14 (13)	48 (44.4)	34 (31.5)
• Patients buying unnecessary and excessive products.	20 (18.5)	47 (43.5)	22 (20.4)	7 (6.5)
• Patients' perception and belief towards medical aesthetic services	1 (0.9)	27 (25)	39 (36.1)	28 (25.9)
• Frequent aesthetic clinic inspection by authorities.	5 (4.6)	32 (29.6)	28 (25.9)	31(28.7)

• Lack of staff in the aesthetic clinic.	10 (9.3)	39 (36.1)	35 (32.4)	12 (11.1)
• Aesthetic clinic's reduced working hours.	5 (4.6)	30 (27.8)	32 (29.6)	29 (26.9)
• Impact on business causing financial implication.	9 (8.3)	27 (25)	60 (55.6)	60 (55.6)
• Lack of adequate reliable sources of information on COVID-19.	8 (7.4)	34 (31.5)	32 (29.6)	21 (19.4)
• Misinformation around COVID-19 potential treatment option	5 (4.6)	27 (25)	34 (31.5)	30 (27.8)

During the current COVID-19 pandemic, all non-essential aesthetic procedures have been temporarily banned worldwide, including in Malaysia (Bhargava et al., 2021; Shah et al., 2020). This could be due to the fact that aesthetics procedures are frequently regarded as optional rather than mandatory. Furthermore, because the majority of cosmetic procedures involve direct contact with the skin and mucosa, the risk of viral transmission is increased (Kaye et al., 2020). As a result, the medical aesthetic practise has taken a back seat, rendering in-office consultations and surgeries impractical. Outpatient appointments for non-acute allergic disorders, acne, alopecia, chronic skin conditions, and aesthetic procedures were recommended to be postponed in various countries which is similar to Malaysia (Tao et al., 2020; Türsen et al., 2020). It was obvious from this study that there was a significant decrease in the mean number of patients seeking medical aesthetic procedures during the COVID-19 pandemic. The dramatic decline in these treatments has most likely resulted in substantial financial hardship for Malaysian aesthetic practitioners. During this pandemic, distinguishing between non-invasive and invasive procedures is less relevant than assessing the hazards of COVID-19 infection or transmission, which vary according to the type of the procedure.

The current study found that before COVID-19, Malaysians were more interested in aesthetic procedures such as pigmentation treatment, skin rejuvenation, microdermabrasion, and superficial chemical peels.

However, following the COVID-19 pandemic, the patient's interest towards the procedures were shown to be reduced. In a twitter survey by Pang et al., pandemic dissemination of COVID-19 was reported to influence customer's preference differently. For example, in their study which investigated the twitter trend related to facial rejuvenation during COVID-19 pandemic found that customer's preference had changed with more interest were put on less-invasive procedures such as botox, hyaluronic acid and platelet-rich-plasma (PRP) (Pang et al., 2020).

There were several reasons that may explain the reduced number of procedures during COVID-19 and one of them includes that patient may be concerned that they will contract the virus as a result of the close-contact aesthetic procedures. This was also noted as a barrier to medical aesthetic practise in Malaysia as patients' perception and belief towards medical aesthetic services may be affected due to fear of COVID-19 transmission in health facilities (Elsaie & Youssef, 2021). While others may be concerned about financial insecurity as a result of job and income loss during the pandemic (Duggan et al., 2020). The economic impact of the pandemic caused losses in the cosmetic market as reported by Guzman et al. (Guzman & Barbieri, 2020). During the pandemic, people were reported to have changed their spending priorities and focusing on other aspects of health (Jenny et al., 2021). People's desire to seek cosmetic treatments was also reported to be negatively affected by a lack of social communication during quarantine

periods (Azzam et al., 2021). In the current study, aesthetic procedures that are less popular such as vascular disorder, intense pulsed light therapy, and medium chemical peel, were more affected by the pandemic.

In terms of the psychological impact of COVID-19 pandemic on medical aesthetic practitioners, the majority of respondents in the current study had a little or considerable amount of anxiety related to providing the service during COVID-19 pandemic. The major concern faced by the practitioners includes whether they will get themselves or their family members or friends infected with the disease following their professional practise. Fear of contracting the virus is reported to be common among health care workers worldwide. This is due to the fact that COVID-19 transmission through the healthcare system puts healthcare workers at a higher risk of infection than community transmission (Heneghan et al., 2020). An increased level of fear related to COVID-19 infection was reported in a survey study conducted by Alnazly et al. among Jordanian health care workers. During the pandemic, 40% of participants in their study had extremely severe depression, 60% had extremely severe anxiety, and 35% were severely distressed (Alnazly et al., 2021). This highlights the importance of providing psychological support for health-care workers, such as by implementing occupational health surveillance programmes that train and educate health-care workers on how to address infectious disease and associated psychological distress (Chirico & Magnavita, 2021).

The barriers to medical aesthetic practise in Malaysia were similar to those reported in other countries. One of the barriers faced by medical aesthetic practitioners in the current study is industry uncertainty, which may result in financial ramifications that lead to aesthetic business non-survival. This was not limited to Malaysia, as medical aesthetic practises, which had been growing at a rapid

pace and had a product market worth billions of dollars, have now essentially stalled (Sergio & Marina, 2020). Some of the recommendations made to ensure business survival includes prioritizing talent, investing in sales force retention and finding ways to upskill digitally (Sergio & Marina, 2020). Since interest in aesthetics remains to continue at times of the pandemic (Elsaie & Youssef, 2021), finding a way to stay connected with the patient through online consultation may help to keep the business going. In the current study, despite the pandemic the medical aesthetics practitioner maintains to connect or contact their customer through various communication platforms such as WhatsApps Messenger and social media. Nevertheless, many were still unfamiliar with telemedicine consultation which has been reported to be a potential in represents an invaluable tool for facilitating safe and timely patient communication and delivery of health care services (Shokri & Lighthall, 2020). Besides that, other challenges faced by medical aesthetic practise include the limitation of resources (supplies of imported cosmetic products) which may cause product prices to be high (Elsaie & Youssef, 2021).

The study has several drawbacks. First, the survey's cross-sectional design which was limited to the time point. Thus, it may not reflect the changes or predict the future effect of COVID-19 on the medical aesthetic business experiences. Second, the survey was delivered online via social media platforms, which may have resulted in a selection bias by eliminating those who did not have access to the survey at the time. Furthermore, this is the first time the survey has been conducted among registered medical aestheticians, and they may be unfamiliar with the task at hand. Finally, this survey may not be able to reach the medical aesthetic practitioners who already had their business closed down because of the COVID-19 pandemic.

Conclusion

Medical aesthetic practises were drastically reduced during the COVID-19 pandemic causing serious financial impact to the business owner and practitioners. The aesthetician's ability to continue providing the services during COVID-19 pandemic is limited by the authority's enforcement, for example the Movement Control Order and perception of the service as non-essential that it could wait. To limit the spread of COVID-19 infection, the government has granted authorization to continue the non-surgical aesthetic procedures under tight standard operating procedures (SOP). Nevertheless, the medical aesthetic industry in Malaysia should also consider providing the service through digital health which is increasingly in demand during the pandemic. More research is needed to determine whether the non-surgical medical aesthetics procedures will resume growth once COVID-19 enters the endemic phase.

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Conflict of interest

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Non-Surgical Medical Aesthetic Treatment Algorithm for General Practitioners in Malaysia

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Abstract

The aesthetic patient is different from medical patients in many ways. From patient history taking, assessment and treatment method depends on several factors. Initially, USBC (Ungku Shahrin Beauty Concept) explained how we could assess aesthetic patient structurally. Moving forward, USATA (Ungku Shahrin Aesthetic Treatment Algorithm) will enlighten medical aesthetic practitioners on how to treat aesthetic patients in a well-organized manner. With varieties of treatment modalities offered in this field, it is paramount for medical aesthetic practitioners to choose the right treatment for suitable patients and use the right devices. Among factors need to be considered, such as skin type, psychological motivation, financial support, regulation issues, etc. This article will give an overview of the aesthetic patient treatment algorithm, especially for Malaysian medical aesthetic practitioners.

Keywords:

Aesthetic Medical Practice, Aesthetic Medicine, Aesthetic Treatment Algorithm, Non-Surgical, Minimally Invasive Treatment, Non-Invasive Treatment

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People generally believe that more attractive people are more competent, likeable, and, in general, "better" than less attractive people: a "beauty-is-good" stereotype. Those physically or facially attractive appear to foster positive expectations and impressions and gain various interpersonal advantages (Alley & Hildebrandt, 1988). Patients frequently wish for more significant overall improvement, anticipating a more cheerful, relaxed, or less tired appearance following treatment (de Maio, 2021). The ability to differentiate between patient complaints and requests are crucial. One is clinically presented, i.e., pigmentary disorder, acne, cellulite, and the latter is to satisfy the patient's goals, i.e., increase the nasal bridge height, thicker lip. They may also present with both complaints and requests at the same time. There are difficulties in prescribing a standard treatment algorithm by medical aesthetic practitioners. It is influenced by the aetiology, underlying medical or psychiatric comorbidities (hypochondriac, body dysmorphic syndrome), availability of treatment, practitioners' skills, patient financial capabilities and complications from treatment. External factors such as specific regulations of the country governing bodies, insurance coverage and medical indemnity need consideration.

There have been no well-designed clinical trials examining the pan facial (i.e., global) approach to aesthetic treatment that employs a combination of treatment modalities (Kalashnikova et al., 2021). Although individualized combination therapy impacts modern aesthetic practice—in 2014, nearly half of all cosmetic patients in the United States seeking noninvasive or minimally invasive interventions received multiple cosmetic procedures at the same time. There are no guidelines for a combination approach that have been published (Carruthers et al., 2016). Most aesthetic treatment algorithms or approaches are being segmented into different parts, such as facial areas or bodies, and mostly, they are limited to specific treatment modalities. A previous study by de Maio M (2021) on the

methodological approach to facial aesthetic treatment only suggested the usage of injectables hyaluronic acid (HA) dermal fillers. Another study by (Narurkar et al., 2016) provide helpful guidance for a multimodal approach to facial aesthetic treatment; however, this study focusses on subjects who received onabotulinum toxin A for glabellar lines and crow's feet lines, and dermal fillers for nasolabial folds, oral commissures, marionette lines, perioral lines, or radial cheek lines.

In Malaysia, the treatment modalities are divided into three categories, i.e., Noninvasive, minimally invasive and invasive, whereby noninvasive and minimally invasive are considered non-surgical medical aesthetic procedures (Aesthetic Medical Practice Guidelines MOH Malaysia, 2013). However, the guidelines do not provide any treatment algorithm to Malaysian medical aesthetic practitioners, leaving the practitioners with a myriad of treatment options without a standardized treatment approach. This article aims to suggest the best and effective medical aesthetic treatment algorithm using allowable non-surgical treatment modalities by the Ministry of Health, Malaysia.

Areas covered

Consideration in the treatment algorithm

1. Underlying medical illness and conservative treatment approach

Like other medical fields, history taking, clinical assessment and investigation are crucial in aesthetic medical practice. In utilizing the algorithm, practitioners must eliminate any underlying diseases that may portray as an aesthetic concern. For example, excessive facial hair could be due to untreated polycystic ovarian syndrome, and melanoma can easily be misdiagnosed with Nevus of Ito. According to a retrospective study conducted at the University Hospital of Zurich in 2010, a misdiagnosed pigmentary lesion can cause the possibility of

melanoma induction by laser treatment. Based on the observations, together with published information, biologically relevant delay in melanoma diagnosis due to laser treatment may retard appropriate staging and therapy (Zipser et al., 2010). It is vital to start the treatment conservatively before moving to more advanced medical aesthetic modalities.

2. Aesthetic patient assessment concept

Treatment options in medical aesthetics are often based on meticulous judgement by the practitioners after considering patients complaints and requests. The treatment algorithm approach in this article is based on Ungku Shahrin Beauty Concept (USBC)TM aesthetic

patient assessment. According to USBC, beauty can be divided into two major components: face and body beauty. Both categories are subdivided into complexion and structure (Mohd Shahrin U, 2020). For example, the perfect complexion for face beauty is those without pimples/acne or blemishes due to pigmentary disorder.

On the other hand, idyllic structural face beauty is when your face nicely contours according to the liking of the patient (i.e., oval shape, high nasal bridge, double eyelid). Like body beauty, the complexion element should not have a stretch mark, striae, or noticeable scar. For body structure, it would be preferably shaped (i.e., Waist and Hip ratio < 0.85 for males and 0.75 for females) (Mohd Shahrin U, 2020) (fig. 1).

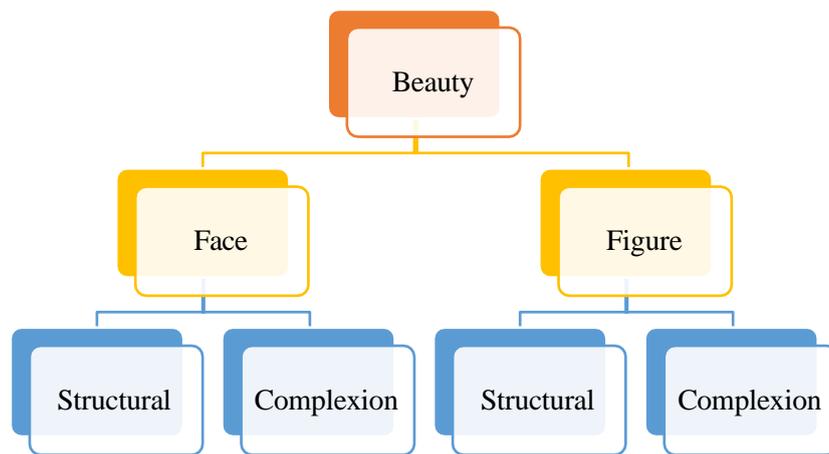


Figure 1: Ungku Shahrin Beauty Concept (USBC)

3. In accordance with Malaysia Aesthetic Medical Practice Guidelines

There have been allegations of severe consequences such as deformity and even death in Malaysia due to cosmetic operations performed by unskilled medical and non-medical practitioners. Because safety is of the utmost significance, this activity must be controlled by developing a set of current and appropriate rules. A guideline was created by gathering expert views from many stakeholders in the Ministry of Health, universities, professional organisations, and private practice. It would serve as the national aesthetic medical practice guidelines for

general practitioners, medical specialists, and surgical specialists (Aesthetic Medical Practice Guidelines MOH Malaysia, 2013). Even though there is a vast option for non-surgical medical aesthetic treatment globally, the development of this algorithm is only based on medical aesthetic procedures approved by the Ministry of Health Malaysia.

4. All patients are assumed to be in a healthy mental state

Numerous studies have been conducted to investigate the psychological functioning of cosmetic surgery patients. Sarwer and colleagues have suggested that these studies were

designed with two primary goals in mind: (1) to identify psychological characteristics or traits that would contraindicate cosmetic surgery and (2) to assess postoperative psychological changes (Fedok et al., 2003). A study by Crerand et al. shows that 7% to 15% of people appearing for aesthetic procedures may have Body Dysmorphic Disorder (BDD) (Crerand et al., 2006). To obtain better outcomes in individuals undergoing cosmetic surgery with psychiatric problems, it is helpful to prioritise psychiatric care first rather than going straight for surgical treatment. Preoperative mental assessment should be standard practice in cosmetic surgery (Kazuhiro Hayashi, 2007). This algorithm is applicable for the patient with normal psychology and psychiatric mental status.

5. Well trained and certified medical aesthetic practitioners

There is a need for the medical profession to adopt guiding principles for the practice of aesthetic medicine. The best method is undoubtedly evidence-based practice. Before conducting any treatment on a patient, doctors must ensure that they are competent and sufficiently trained. He or she should stay current on medical information and maintain clinical and technical skills (Goh, 2009). Aesthetic medicine emphasises form and function, and both learning and practising medicine involves formal and content elements (Bleakley et al., 2006). In Malaysia, any doctor who wishes to embark in this field must have a Letter of Credentialing and Privileging (LCP) for the aesthetic procedure(s) he/she intends to perform. Upon recommendation by the Main Credentialing and Privileging Committee of Aesthetic Medical Practice, the LCP shall be issued to the doctors by the Medical Practice Division, Ministry of Health Malaysia. With the LCP, they are eligible for registration with the National Registry of Registered Medical Practitioners Practicing Aesthetic Medical Practice (Aesthetic Medical Practice Guidelines MOH Malaysia, 2013).

6. Scientific approach

Research conducted in 1985 shows that only 15% of physician judgments were based on data from verified clinical trials. This disparity prompted the notion of formally approving EBM and teaching physicians how to utilise it—that is, how to participate in "the conscious, explicit, and prudent use of current best evidence in making choices regarding the care of individual patients" (Nahai, 2011). Although the aesthetic medical practice has not been recognised as a medical speciality in Malaysia, it is scientific in its approach and practice (Aesthetic Medical Practice Guidelines MOH Malaysia, 2013). In preparing the algorithm, references are made from various journals and aesthetic medicine related books to ensure it aligns with evidence-based medicine.

7. Marketing hype and baseless claims by the manufacturer

It is well known that an established manufacturer will spend up to 60% of their annual budget on marketing, and they are not afraid to use every available platform to creatively promote their product, such as magazines, television, social media platform, billboard. Sadly, few decent manufacturers can back it up with scientific evidence (Mohd Shahrin U, 2020). This algorithm will only use the generic term is describing treatment modalities and refrain from proposing baseless, non-scientific treatment claims.

Medical aesthetic treatment algorithm

The spectrum of facial aesthetics is constantly evolving as we better understand facial anatomy and discover new and refined applications for various aesthetic tools, thus acknowledging that combination treatments are necessary to address aesthetic concerns (Fabi et al., 2017). Apart from all the considerations discussed earlier, the algorithm is not limited to a single approach modality. Practitioners can perform multiple treatment approaches to achieve patients' goals according to their sound judgement.

A) Face area - Structural

While most of the structural improvements for facial structure are suitable for surgical intervention, the non-surgical treatment approach can help achieve structural improvement with

realistic expectations. Restricted with the Malaysia Aesthetic Medical Practice Guidelines, treatment modalities are limited to the application of Botulinum toxin, dermal fillers, Radiofrequency (RF) and High-Intensity Focus Ultrasound (HIFU) (*tab. 1*).

Table 1: Medical Aesthetic Treatment Algorithm for Face Structure

Complaints / Requests	Treatment Options	Notes
1. Overdeveloped masseter muscle, Achieve V-Shape jawline	BTA injection	<i>Injecting masseter muscle to relax and eventually reduce muscle size and give the slimmer jawline shape (Chan et al., 2019), (Kwon et al., 2019).</i>
2. Deep tear trough, hollow cheek/temple, concave forehead, NFL / Marionette line, scar, thin lips, "static" rhytids	Dermal Fillers, i.e., HA fillers, depending on the viscosity and concentration	<i>To "fill-up" depleting soft tissue, typically at dermal, subdermal layer or supra-ostium with a clinical tightening impact on the dermis (Percec et al., 2020).</i>
3. Enhance Chin length, nasal bridge/nasal tip, thicker lips/ enhance vermilion line, philtrum	Dermal Fillers, i.e., HA fillers, depending on the viscosity and concentration	<i>Volumizing using dermal fillers according to requirement and suggestion. The safest method may be to use a large diameter cannula and inject the filler into the pre-periosteal layer with a careful approach (Lee et al., 2019).</i>
4. "Dynamic" rhytids (forehead, crow feet, glabellar, bunny line)	BTA injection on specific facial muscles, e.g., Orbicularis Oculi, Frontalis, Corrugator etc.)	<i>BTA reduce expression muscles contraction capabilities that produce the "dynamic" rhytids It is a safe and effective therapy that temporarily improves face wrinkles and dynamic rhytids in specific anatomic areas (Niamtu, 2003).</i>
5. Droopy Brow/Eye	BTA injection on suprolateral portion of Orbicularis Oculi muscle	<i>Applications of 6U BTX-A to the superolateral portion of orbicularis oculi provide brow elevation and increased interpalpebral distance and upper eyelid distance (Uygur et al., 2013)</i>
	Periorbital RF treatment	<i>RF will produce new collagen to give the lifting effect for loose skin around eye area with a statistically significant increase in the mean of collagen types I and III, as well as freshly produced collagen, compared to the baseline (El-Domyati et al., 2011).</i>
6. "Chubby" face, Double Chin	HIFU	<i>HIFU target the subdermal fat layer to lipolyse adipose tissue. This is due to cavitation bubbles that increase in size and oscillate until they finally collapse (Mohd Shahrin U, 2019).</i>
7. Eye bags	RF or HIFU	<i>HIFU penetration depth should be below 1.5mm to target superficial skin layer (Mohd Shahrin U, 2019). RF will only</i>

		<i>target superficial skin and promote neo-collagenases (Rousseaux, 2015).</i>
8. Jowl / loose facial skin	RF or HIFU	<i>HIFU and RF with specific thermal injury zone (TIZ) will initiate wound healing process that eventually promote neo-collagenases (Mohd Shahrin U, 2019; Rousseaux, 2015)</i>
	Fractional Laser, e.g., CO ₂ , Erbium Yag	<i>Non-ablative laser creating a micro-column wound, promoting neo-collagenases (Preissig et al., 2012).</i>
	Long pulse laser, e.g., Nd Yag, Alexandrite	<i>Longer pulse duration cause heat generation to coagulate the dermal layer, promote neo-collagenases (Polnikorn et al., 2016).</i>

B) Face area- Complexion

Most non-surgical medical aesthetic treatment focuses on skin complexion complaints or requests such as pigmentary disorder, vascular lesion, acne lesion etc. Understanding patient skin colour, aetiology, physics principles, mechanism of action, endpoint and biological

changes of the aesthetic problem are essential to ensure safe and effective treatment. The application of the face complexion treatment algorithm should be supported by rigorous training and experience in performing the procedures (*tab. 2*).

Table 2: Medical Aesthetic Treatment Algorithm for Face Complexion

Complaints /Requests	Treatment Options	Notes
1. Epidermal pigmentary disorder: Lentigines, Ephelides, Café au lait, Seborrheic keratoses etc.	Skin type I – III: Argon (488nm), Ruby (694nm), Alexandrite (755nm), *KTP (532nm)	<i>Choose a shorter wavelength with a higher affinity to melanin (Anderson et al., 1989; Welch et al., 1989). *Use cautiously due to competing chromophores</i>
	Skin type IV – V: Nd Yag (1064nm), Diode (810nm)	
	Superficial and Medium Chemical Peels: AHA, BHA peels with suitable concentration and pH	<i>Inhibit melanin production, exfoliate superficial skin (Ds et al., 2009).</i>
2. Dermal/Mixed pigmentary disorder: Melanocytic nevi, Nevus of Ota, Hori's nevus, Melasma, PIH, Tattoo etc.	Skin type I – III: Alexandrite (755nm)	<i>Choose longer wavelength for deeper penetration with affinity to melanin. (Kim et al., 2016; Polnikorn et al., 2016; Sarkar et al., 2012)</i>
	Skin type IV – V: Nd Yag (1064nm), Diode (810nm)	
	Superficial and Medium Chemical Peels: AHA, BHA peels with suitable concentration and pH	<i>Inhibit melanin production, exfoliate superficial skin. Deeper peels yielding more dramatic outcomes but with a higher risk of complications (Nikalji et al., 2012).</i>
3. Vascular lesion: Hemangiomas, Port Wine Stain, Telangiectasis etc.	KTP (532nm), Pulse Dye (585nm), Alexandrite (755nm), Nd Yag (1064nm)	<i>Longer pulsed duration to dissipate heat to vessel wall. Use laser with multi pulses with delay time > epidermal TRT</i>

		<i>(Ims) for darker skin (Adamič et al., 2015; Kumaresan & Srinivas, 2011; Wall, 2007)</i>
	IPL	<i>Use >700nm filter, IPL suitable for vascular lesion treatment due to the long pulse nature of the device (Angermeier, 1999; Kalil et al., 2017)</i>
4. Acne	IPL	<i>Reduce sebum production and inflammation, destroy P.Acnes (Hi et al., 2021)</i>
	Superficial and Medium Chemical Peels: AHA, BHA peels with suitable concentration and pH	<i>Reduce sebum production and inflammation (Castillo & Keri, 2018)</i>
	Laser, e.g., Nd Yag (1064nm)	<i>Using long pulse duration laser to reduce sebum production and inflammation (Mohd Shahrin, 2019)</i>
5. Large pores, Scar, Acne Scar	Superficial and Medium Chemical Peels: e.g., AHA, BHA peels with suitable concentration and pH	<i>Exfoliate epidermal/dermal layer, promote collagen production (Ds et al., 2009; Nikalji et al., 2012)</i>
	Fractional laser, e.g., CO2, Erbium Yag	<i>Non-ablative laser removing epidermal layer for neo-collagenases (Kang et al., 2009)</i>
6. Hair removal	Long pulsed laser, e.g., Nd Yag	<i>Long pulse duration ensure heat destroy hair stem cell (Alster et al., 2001; Welch et al., 1989)</i>
	IPL	<i>Use >700nm filter, Suitable for hair removal due to the long pulse nature of the device (Babilas et al., 2010; Dieter Manstein, Mehran Pourshagh & Altshuler, R. Rox Anderson Ilya Yaroslavsky, n.d.; Goldberg, 2012)</i>
7. Rejuvenation	Superficial and Medium Chemical Peels: e.g., AHA, BHA peels with suitable concentration and pH	<i>Exfoliate epidermal/dermal layer, promote collagen production (Ds et al., 2009; Nikalji et al., 2012)</i>
	Microdermabrasion	<i>Exfoliate stratum corneum, hasten skin cycle (Karimipour et al., 2010)</i>
	Fractional laser, e.g., CO2, Erbium Yag	<i>Non-ablative laser removing epidermal layer for neo-collagenases (Lecocq et al., 2013; Preissig et al., 2012)</i>

C) Body area- Structure

Body structure treatments are the least available in this algorithm. Even though the manufacturer

made several attempts, they have the least scientific evidence to justify their claims. Treatment modalities only focused on Radiofrequency (RF), High-Intensity Focus

Ultrasound (HIFU) and fat freezing technologies (*tab. 3*).

Table 3: Medical Aesthetic Treatment Algorithm for Body Structure

Complaints /Requests	Treatment Options	Notes
1. Localise fat	HIFU	<i>HIFU can target the subcutaneous fat layer causing the lysis of adipose cells</i> (Jewell et al., 2012; Shek et al., 2009; SousH et al., n.d.) .
	Fat Freezing	<i>Freezing the pocket of the fat layer can cause apoptosis of the adipose cells</i> (Avram & Harry, 2009; Putra et al., 2019).
2. Skin redundancy, Loose skin	RF or HIFU	<i>Tighten superficial skin, promote neo-collagenases</i> (Access, 2002; Slayton & Gliklich, 2007)

D) Body area- Complexion

Similar to face complexion, complaints and requests by the patients commonly on the pigmentary disorder, vascular lesion, acne of

their body, scar, unwanted tattoo, striae and stretchmark. Body hair removal also becoming popular with the introduction of a long-pulsed laser to the market (*tab. 4*).

Table 4: Medical Aesthetic Treatment Algorithm for Body Complexion

Complaints /Requests	Treatment Options	Notes
1. Epidermal pigmentary disorder: Lentiginous, Seborrheic keratoses etc.	Skin type I – III: Argon (488nm), Ruby (694nm), Alexandrite (755nm), *KTP (532nm). Skin type IV – V: Nd Yag (1064nm), Diode (810nm)	<i>Choose a shorter wavelength with a higher affinity to melanin</i> (Anderson et al., 1989; Welch et al., 1989). <i>*Use cautiously due to competing chromophores</i>
	Superficial and Medium Chemical Peels: AHA, BHA peels with suitable pH	<i>Inhibit melanin production, exfoliate superficial skin</i> (Ds et al., 2009).
2. Dermal/Mixed pigmentary disorder: Melanocytic nevi, PIH, Tattoo etc.	Skin type I – III: Alexandrite (755nm) Skin type IV – V: Nd Yag (1064nm), Diode (810nm)	<i>Choose longer wavelength for deeper penetration with affinity to melanin.</i> (Kim et al., 2016; Polnikorn et al., 2016; Sarkar et al., 2012)
	Superficial and Medium Chemical Peels: AHA, BHA peels with suitable concentration and pH	<i>Inhibit melanin production, exfoliate superficial skin. Deeper peels yielding more dramatic outcomes but with a higher risk of complications</i> (Nikalji et al., 2012).
3. Vascular lesion: Hemangiomas, Telangiectasis etc.	KTP (532nm), Pulse Dye (585nm), Alexandrite (755nm), Nd Yag (1064nm)	<i>Longer pulsed duration to dissipate heat to vessel wall. Use laser with multi pulses with delay time > epidermal TRT (1ms) for darker skin</i> (Adamič et al., 2015; Kumaresan & Srinivas, 2011; Wall, 2007)

	IPL	<i>Use >700nm filter, IPL suitable for vascular lesion treatment due to the long pulse nature of the device (Angermeier, 1999; Kalil et al., 2017)</i>
4. Acne	IPL	<i>Reduce sebum production and inflammation, destroy P.Acnes (Hi et al., 2021)</i>
	Superficial and Medium Chemical Peels: AHA, BHA peels with suitable concentration and pH	<i>Reduce sebum production and inflammation (Castillo & Keri, 2018)</i>
	Laser, e.g., Nd Yag (1064nm)	<i>Using long pulse duration laser to reduce sebum production and inflammation (Mohd Shahrin, 2019)</i>
5. Scar, Stretchmark	Superficial and Medium Chemical Peels: e.g., AHA, BHA peels with suitable concentration and pH	<i>Exfoliate epidermal/dermal layer, promote collagen production (Ds et al., 2009; Nikalji et al., 2012)</i>
	Fractional laser, e.g., CO2, Erbium Yag	<i>Non-ablative laser removing epidermal layer for neo-collagenases (Kang et al., 2009)</i>
6. Hair removal	Long pulsed laser, e.g., Nd Yag	<i>Long pulse duration ensure heat destroy hair stem cell (Alster et al., 2001; Welch et al., 1989)</i>
	IPL	<i>Use >700nm filter, Suitable for hair removal due to the long pulse nature of the device (Babilas et al., 2010; Dieter Manstein, Mehran Pourshagh & Altshuler, R. Rox Anderson1 Ilya Yaroslavsky, n.d.; Goldberg, 2012)</i>

Conclusion

Developing a treatment algorithm is a rigorous task, especially when the aesthetic medical field evolves significantly. Challenges lie in various factors (not limited to) such as patients' unrealistic complaints or requests, regulation restriction, beauty trend, marketing hype, treatment availability, and practitioners' capabilities. This algorithm will cover all aspects of allowable treatment modalities by Malaysian governing bodies and hopefully can become a guide to all general practitioners who provide

aesthetic medical services in their clinics. However, in the future, more treatment options can be included to have a holistic approach to treating patients for Malaysian and throughout the world.

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Iatrogenic Dyschromia: A Preliminary Report on 6 Cases on The Clinical, Dermoscopy and Histopathology Findings

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Abstract

In the Philippines and other Asian countries, “bleaching creams” containing various concentrations and mixtures of hydroquinone, steroids and retinoids are often used without regulation. With immediate improvement, most patients lack follow-up and continue to self-medicate without knowing the complications of long-term use. Iatrogenic dyschromia refers to skin color alteration induced by medical treatment or inadvertently by physicians. To the best of our knowledge, the clinical and histopathologic characteristics have not been fully elucidated yet.

We have identified 6 females with Fitzpatrick skin phototype IV with mottled pigmentation on the forehead, nose and cheeks initially diagnosed as exogenous ochronosis. Dermoscopy revealed intervening white and light brown areas, visible follicular openings and extensive network of vessels. Histopathology showed basal cell layer hyperpigmentation of the epidermis. The dermis revealed telangiectasias, solar elastosis and focal degeneration of collagen fibers. Masson’s trichrome revealed thinning of collagen bundles. Melan-A stain revealed melanocytopenia.

The dermatologist should be able to recognize iatrogenic dyschromias as they differ from melasma and ochronosis in clinical, histopathologic and dermoscopy findings. Continuous application of skin lightening agents without sun protection is most likely the major predisposing factor in the development of this condition. A larger study is warranted to fully define this condition.

Keywords:

iatrogenic dyschromia, facial hyperpigmentation, hypermelanoses, hypomelanoses

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In the Philippines and other Asian countries, “bleaching creams” containing various concentrations and mixtures of hydroquinone, topical corticosteroids and retinoids are being prescribed or used often without regulation (Republic of the Philippines Department of Health, 1999). The pursuit of fairer skin in the Philippines is rampant due to social pressures. The desire to have fairer and lighter skin dates back to the Philippines having an extensive history of colonial occupations. The colonizers may have instilled the idea of social hierarchy based on skin color and lighter skin means higher social status. However, this desire for a “fairer” or “whiter” skin had health repercussions physically and psychologically (Singson, 2017). With immediate improvement in the condition, most patients lack follow-up and continue to self-medicate without knowing the complications of long-term use. Iatrogenic dyschromia refers to alteration in skin color induced by medical treatment or inadvertently by physicians. In an unpublished manuscript done by one of the authors in Cavite Philippines where 82 female patients were diagnosed with facial hyperpigmentation, 57/82 (70%) had melasma, 10/82 (12%) had iatrogenic dyschromia, 7/82 (9%) had exoge-

nous ochronosis and 7/82 (9%) had post-inflammatory hyperpigmentation based on dermoscopy findings (Dayrit, 2021). The term “iatrogenic dyschromia” has been used to describe the mottled pigmentation observed after repeated pigment laser procedures. The condition has been mentioned in very few case reports but the clinical, dermoscopic and histopathologic features have not been fully elucidated yet (Passeron & Ortonne, 1998). “Dyschromatoses” involve both hyperpigmented and hypopigmented macules. Topical medication induced dyschromia refers to the iatrogenic hyperpigmentation and hypopigmentation due to the excessive use of unregulated and banned by FDA topical lightening agents containing steroids, mercury, hydroquinone and hydroquinone-derivatives (Passeron & Ortonne, 1998). This condition is clinically characterized by mottled pigmentation on malar areas. Although the clinical diagnosis of such condition is straightforward based on the chronic use of lightening agents and based on its distribution and age of onset, sometimes it can be mistaken for other pigmentary disorders such as melasma or exogenous ochronosis. The authors aim to characterize for the first time the dermoscopic and histopa-

Age in years	Gender	Name of individual components with concentration	Duration of use(in months)	Frequency of use
44	F	Tretinoin 0.025%, Hydroquinone 2%	12	Regular
56	F	Tretinoin 0.05%, Hydroquinone 2%, Clobetasolpropionate cream	24	Intermittent
52	F	Hydroquinone 2%, Tretinoin 0.025%	12	Intermittent
53	F	Hydroquinone 4%, Clobetasol propionate cream	12	Regular
49	F	Clobetasol propionate cream, Niacinamide, Tretinoin0.025% cream, Hydroquinone 2%	10	Intermittent
39	F	Hydroquinone 2%, Tretinoin 0.025%, Vitamin C	12	Regular

Table 1: Summary of Patients

thological features of iatrogenic dyschromia and be able to differentiate it from melasma and ochronosis in terms of clinical, histopathologic and dermoscopy findings.

Case Presentation

A total of 6 patients were included in this case series. All of them are females with Fitzpatrick skin phototype IV, with mean age of 48.8 ± 5.8 years old. 1 out of 6 (16.67%) had a history of oral contraceptive use. Number of pregnancies ranges from no child to 4 children with 5 out of 6 (83.33%) had more than one pregnancy. All patients complained of mottled pigmentation on the malar areas and had a history of application of over-the-counter topical lightening agents that contains hydroquinone, tretinoin and other actives including clobetasol propionate cream, niacinamide cream and Vitamin C (Table 1) with intermittent use of sunscreen. Details regarding the SPF and type of sunscreen (physical, chemical or mixed) were unavailable. No pre-existing medical conditions for all of the patients were noted based on their clinical history. No aesthetic treatments were performed in any of the patients before they used the lightening agents. These patients applied the combination topical lightening agents for a mean duration of 13.7 ± 4.7 months.



Figure 1: Mottled pigmentation on the forehead, nose and cheeks on all 6 patients.

Dermoscopic evaluation was performed using the features and common findings in dermoscopy of pigmentary disorders by Khopkar and Barti (2018). In all cases, the authors used a manual polarized light device (Dermlite DL2x10; 3Gen, San Juan Capistrano, CA). Dermoscopic findings for all cases include intervening light brown areas with areas of exaggerated pseudonetwork and whitish area containing uniform pigment network and feathery margins and, extensive network of vessels and visible follicular opening in all instances (6/6; 100.0%). The whitish areas show similarities to the depigmented macules and patches of vitiligo but with absence of follicular repigmentation (Figure 2).

4- mm skin punch biopsy was performed on all cases. On histopathology, apoptotic melanocytes (Figure 3a) and sunburn cells (Figure 3b) observed in 6/6 of the cases. The dermis showed loosely arranged and fragmented collagen fibers, as well as dilated blood vessels (Figure 4a). Solar elastosis and pigment-laden macrophages were prominent (Figure 4b). Serial sections were performed,

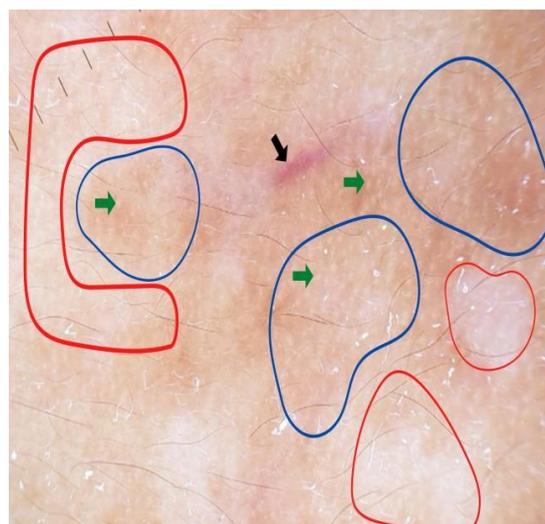


Figure 2: Representative photos of the dermoscopy of iatrogenic dyschromia. Intervening light brown areas with areas of exaggerated pseudonetwork (blue outline) and whitish area containing uniform pigment network and feathery margins (red outline), extensive network of vessels (black arrow) and visible follicular opening (green arrow).

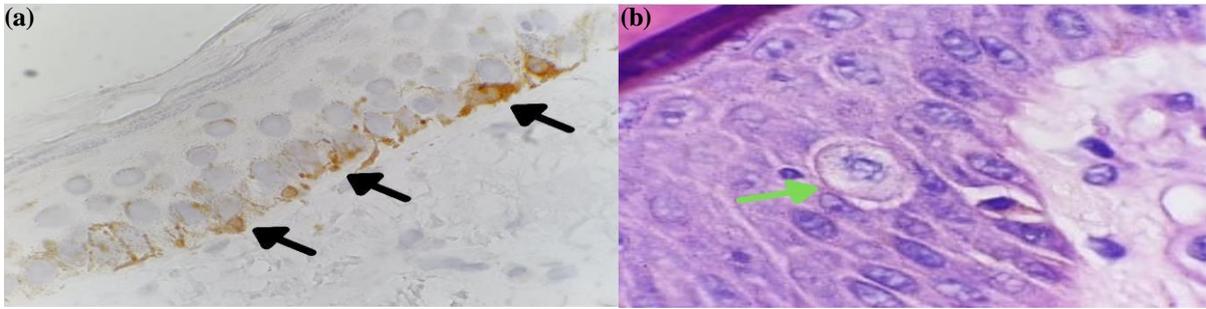


Figure 3: Melan-A shows deformed and apoptotic melanocytes in the basal cell layer (black arrow). H&E shows a sunburn cell (green arrow), and apoptotic (a. Melan-A, 1000x (OIO); b. H&E, 1000x (OIO))

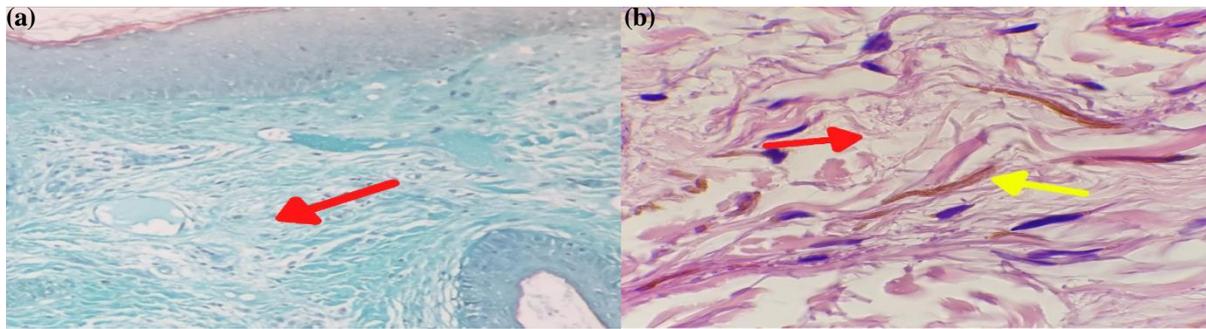


Figure 4: The dermis reveals (a) loosely arranged and fragmented collagen fibers (red arrow) and dilated blood vessels (Masson's Trichrome, 100x) and (b) pigment-laden macrophages (yellow arrow) and prominent solar elastosis (red arrow) (H&E, 400x)

and ochre bodies were not identified in all of the specimens. All 6 cases presented with the same histopathologic findings in the dermis.

Management And Outcome

Iatrogenic dyschromia is a condition caused by the excessive use of unregulated and banned by FDA topical lightening agents containing steroids, mercury, hydroquinone and hydroquinone-derivatives. A multi-disciplinary approach which includes discontinuation of the offending agent, adequate skin care, topical and/or systemic therapy as well as physical modalities.

In approaching patients with iatrogenic dyschromia, patient education is very essential. Chronicity of the disease and its long-term treatment. Proper selection of therapeutic agents and laser treatments which would not aggravate their current condition is also necessary.

In our patients, laser treatments with at least 2 sessions of 1064 Nd:Yag laser and Co2 laser was combined with mild cleanser, lightweight moisturizer containing 2ppm of

medical grade epidermal growth factor, sunscreen and low dose oral isotretinoin with marginal improvement.

Discussion

Melasma, iatrogenic dyschromia and exogenous ochronosis manifest clinically with light brown to hyperpigmented macules and patches. The authors believe that these diseases belong to a spectrum based on the published studies on their clinical manifestation, dermoscopy and histopathological features. There is an urgent need to fully understand and properly define these skin conditions to prevent significant worsening of pigmentation and psychological distress afflicted with these skin conditions. Due to the striking and overlapping similarities between these conditions clinically, the use of dermoscopy may aid in differentiating these spectrums.

Iatrogenic dyschromia pathogenesis remains to be enigmatic but can be attributed to the excessive use of unregulated and banned by FDA topical lightening agents containing steroids, mercury, hydroquinone and hydroquinone-derivatives.

In this case series, the group investigated the dermoscopic and histopathological correlation of iatrogenic dyschromia in order to differentiate it from recalcitrant melasma and exogenous ochronosis. For the dermoscopic findings, our group found the appearance of intervening light brown areas with areas of exaggerated pseudonetwork and whitish area containing uniform and faint pigment network and feathery margins along with extensive network of vessels and visible follicular opening in the dermoscopy of all the six cases. Some of the white areas show similarities to the depigmented areas observed in vitiligo but with the absence of follicular repigmentation. The appearance of these dermoscopic features altogether has not been fully described in published studies.

It is important to note that facial skin is devoid of rete ridges and characterized by closely follicular infundibula. The diffuse pigmentation of the epidermis or the papillary dermis in facial skin is what we term as pseudonetwork of the face (Malvey et al., 2006). Histopathologically, it corresponds to the pigmented cells located in the epidermis and dermo-epidermal junction interrupted by follicular openings. (Yélamos et al., 2019).

In our study, the findings of the whitish areas containing uniform pigment network and feathery margins similar with nevus depigmentosus (Vinay & Ankad, 2021) may be attributed to the prolonged application of lightening agents such as hydroquinone [tyrosinase inhibition], retinoids, [downregulation of tyrosinase and increased epidermal turnover], niacinamide [inhibition of melanosome transfer] and corticosteroids [nonselective inhibition of melanogenesis] (Grimes et al., 2019). These whitish areas correspond to reduced melanin in the epidermal keratinocytes while the faint and uniform reticular pigment network correspond to the melanin remaining in the melanocytes. Dermoscopic pattern in melasma shows diffuse brown reticular pigmentation with sparing of

follicular openings producing an exaggerated pseudonetwork pattern and prominent vessels. On histopathology, the findings of brown reticular pigmentation on dermoscopy corresponds to increased melanin in the epidermis & increased free melanin in the dermis. The presence of prominent vessels or telangiectasias correspond to increased vascularity histopathologically (Khopkar, 2018). Dermoscopy criteria of exogenous ochronosis on the other hand shows blue-gray amorphous areas obliterating the follicular openings. These blue-gray amorphous areas correspond to the brownish-yellow (ochre) banana-shaped fibers in the papillary dermis (Khunger, 2013).

The extensive network of vessels found in all 6 cases in our study are similar to the findings of Khopkar et al. They described the presence of prominent vessels or telangiectasias in melasma may have been due to topical steroid abuse which correspond to increased vascularity histopathologically. Furthermore, taking into consideration that topical treatments containing retinoids and steroids may induce telangiectasias, a study by Kim et al demonstrated through immuno-histological evaluation by factor VIIIa - related antigen that increased numbers of enlarged blood vessels are found in melasma (E. H. Kim et al., 2007). The number of vessels is directly correlated to the degree of pigmentation and can be attributed to the fact that the presence of deoxyhemoglobin contributes to the color of the skin (Stamatas & Kollias, 2004).

The anatomy of the facial skin is different than the rest of the body because it has a flattened dermo-epidermal junction interrupted by numerous adnexal openings. In the dermoscopy of iatrogenic dyschromia, visible follicular openings were observed in all of our cases. This is similar to findings in Melasma by Niti Khunger et al, where there is sparing of the follicular openings. In contradistinction with Exogenous ochronosis where in amorphous and globular structures obliterate the hair follicle openings as described

by Khunger et al in their study (Khunger, 2013).

To visualize the amount of collagen fibers in all of our cases, a Masson's trichrome stain was requested and revealed degeneration of collagen fibers. This study is similar with the findings of Nan-Hyung et al in which they evaluated eleven female melasma patients with CDH11 upregulation. The hyperpigmented skin and the adjacent normally pigmented skin were biopsied and sent for Masson's trichrome. Their results revealed that areas from the paired hyperpigmented and normally pigmented dermis showed a decreased collagen level but an increased elastotic material content in the hyperpigmented dermis in Verhoeff Van Gieson (N. H. Kim et al., 2016). This result is in contradistinction with exogenous ochronosis where in there is appearance of a green contour surrounding the brown-black materials in between the collagenous fibers (Gönül et al., 2006).

To determine the characteristic of melanocytes, Melan-A stain was requested. Our study revealed presence of injured melanocytes and apoptotic sunburn cells. In a study by Caelen and Cerroni, Melan-A is a more sensitive marker for intraepidermal melanocytes of normal skin than S-100 or HMB-45. This stain can also be sensitive in keratinocytes and other non-melanocytic cells damaged by an inflammatory process (el Shabrawi-Caelen et al., 2004).

The dermatologist should be able to recognize iatrogenic dyschromias as they differ from melasma and ochronosis in terms of clinical, histopathologic and dermoscopy findings. Continuous application of skin lightening agents without sun protection is most likely the major predisposing factor in the development of this condition. The authors believe that iatrogenic dyschromia is now very prevalent among women of skin of color but most of those who are affected are hesitant to seek professional consultation. A larger study is further recommended to fully define this skin condition.

Being able to differentiate these conditions clinically, dermoscopically and histopatho-logically will have a huge impact on the treatment and prognosis of patients. Facial hyper-pigmentation remains to be a very difficult condition to treat be it Melasma, Iatrogenic dyschromia or Exogenous ochronosis. To provide the improved outcome for our patients afflicted with these conditions, early differentiation and prompt diagnosis by a dermatologist is essential.

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Extended Abstract from the International Medical Aesthetic Conference and Exhibition 2021

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01

Long Pulsed Nd: YAG Laser Treatment for Hair Removal in Healthy Subject

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02

Scalp Micropigmentation Corrective Treatment with Hair Transplant

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03

Transient Hypopigmentation Induced by Q-switched Nd:YAG Laser

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04

Utilization of Lyophilized Platelet-Rich-Plasma In Aesthetic Facial Treatment

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05

PROTOCOL: Safety and Efficacy of Topical Agent, Oral Antioxidant, Laser Therapy and the Combination of Such for Melasma among Malaysians with Fitzpatrick Skin Type III-IV (STALCMA)

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Long Pulsed Nd: YAG Laser Treatment for Hair Removal in Healthy Subject

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Abstract

Laser hair removal is a common aesthetic treatment that is safe and effective. Pulses of laser light facilitate the destruction of hair follicles, thus removing hair temporarily and permanently. Here, we reported a case of laser hair removal in a healthy male for aesthetic concern. Our patient was a 33-year-old man of Asian origin, presenting Fitzpatrick facial skin type IV with coarse facial hairs of the moustache. We successfully removed 80% of facial hairs of the moustache on the cutaneous upper lip in the patient using 1064 nm Nd:YAG laser treatment in combination with the cooling system over 12 sessions with a four-week interval. His facial condition was excellent without hair re-growth evidence with the absence of terminal hairs and had no adverse skin effect over 12-month laser treatment. In conclusion, Nd:YAG laser treatment provides an effective treatment for the persistent reduction of unwanted hair growth.

Keywords:

Laser hair removal, Nd:YAG laser, Asian skin, facial hair

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While hair loss is a typical cosmetic issue among men, unsightly hair growth on body regions from the face, chin, underarm, back, leg, and other parts is a common aesthetic concern among males as their desire for neat looking grows. Hair removal procedures include shaving, tweezing, waxing, depilation, laser, and electrolysis procedure. Nevertheless, laser treatment is a favourable option due to its procedure that is less painful and can provide permanent hair removal in the large surface area (Bhat et al., 2020). To date, laser hair removal is now available in various methods, including the alexandrite (755 nm), diode (800–1000 nm), ruby laser (694 nm), and intense pulsed light (550–1200 nm) as well as long-pulsed neodymium yttrium-aluminum-garnet (Nd:YAG) (1064 nm) laser (Naik, 2021). Specifically, Asian skin is prone to pigmentary; therefore, the choice of laser and operator's technique are important factors for the success of laser hair removal without adverse effects. Here, we presented a case report of laser hair removal in Asian skin of a healthy male using 1064 nm Nd:YAG laser treatment.

Case presentation

A 33-year-old healthy gentleman who was a salesman in Singapore came to our clinic presenting with a Fitzpatrick facial skin type IV without a tan, had an aesthetic concern to remove unwanted facial hairs on the moustache area for neat looking. He was vitally stable. He had not shown clinical signs indicating hormonal disorder and was not on medications. He never had a history of skin eruptions because of laser treatments. Following medical consultation, he underwent a laser hair removal on the moustache of the cutaneous upper lip region using a long-pulsed 1064 nm Nd:YAG laser device to obtain a high-performance hair

removal via the GentleMax Pro System (GPro System) over 12-course of treatments at a four-week interval from February 2019 until February 2020.

Pre-treatment, the patient had shaved the moustache to expose the hair follicle area of the cutaneous upper lip (**Fig. 1a**). Specifically, the anatomical landmarks of the upper line of the moustache were marked in red line as the superior outer line of the moustache (S) continues with the horizontal line between the alar base (A). The hairless moustache region was between the philtrum and columella. The moustache showed a bow-shaped convexity in the middle of the nostril. The lower line of the moustache was marked in a yellow line as it continues on the upper vermilion border to the level of oral commissure (O). The upper and lower line of the moustache continues symmetrically on the opposite side (Durgun et al., 2021). Post-treatment, we observed a significant hair removal of approximately more than 80% with the absence of terminal hairs of a moustache on the cutaneous upper lip region (**Fig. 1b**) after 12 sessions at four-week-interval of the 1064 nm Nd:YAG laser treatments combined with the cooling system of cryogen.

Management and outcome

The parameters of the laser procedure were consistent over the 12-month study as outlined in Table 1, including 12 mm of spot size, pulse duration of 10 ms, 30 J/cm³ in fluence at 1 Hz frequency. For the outcome, we observed on the percentage growth of terminal hairs. We have seen approximately 80% reduction of terminal hairs of the moustache in our patient following laser treatment using 1064 nm Nd:YAG laser over 12 sessions with four weeks intervals. Laser treatment is an aesthetic procedure for



Fig. 1 The photographs of the anterior view of the patient's face. Anatomical landmarks of moustache region for hair removal before the laser treatment (a) and the absence of terminal hairs in the moustache area post-treatment of 1064 nm Nd:YAG laser treatment after 12 sessions over 12 months (b).

hair removal that uses light amplification by stimulated emission of radiation based on photothermolysis, in which energy provided at a particular wavelength is absorbed by the hair structure in a time that is less than or equal to the thermal relaxation time. In particular, the 1064 nm Nd:YAG laser provides cutting-edge laser technology that can specifically tailor for dark and coarse hair without damaging the surrounding skin. The laser with a 1064 nm wavelength passes through the skin deeply, where the laser light pulses facilitate the destruction of hair follicles in the dermis of the skin (Naik, 2021). It is suggested that targeting follicles in the early anagen phase of hair development is more receptive to laser

treatment due to the melanin is present in anagen hairs (Bhat et al., 2020). Herein, we recommended that the patient shave the moustache, leaving a small amount of hair inside the follicles before undergoing laser treatment for a better outcome of hair removal. In addition, the 1064 nm laser is safe for Fitzpatrick facial skin type IV due to the unique feature of epidermal melanin to poorly absorb light at this wavelength. The laser treatment is commonly combined with an additional cooling system such as cryogen to protect the epidermis layer of skin (Lim & Regina, 2011). Thus, our patient had shown no adverse effect following the 1064 nm Nd:YAG laser treatment.

Table 1. The setting of parameters in GentleMax Pro System prior to the laser procedure.

Parameters	1064 nm Nd:YAG laser + Cryogen (1,1,1,2 tetrafluoroethene)
Spot size (mm)	12
Pulse duration (ms)	10
Fluence (J/cm ³)	30
Frequency (Hz)	1

Discussion

The patient had shown the absence of terminal hairs of moustache in the cutaneous upper lip region following 1064 nm Nd:YAG laser treatment in one year. Our observation suggests that laser treatment is an effective procedure for

removing unwanted hair and preventing persistent hair re-growth in a healthy subject.

Acknowledgements

We acknowledge our patient for permission to publish his case in this report.

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Scalp Micropigmentation Corrective Treatment with Hair Transplant

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Abstract

This is the case of a 31-year-old Malaysian-Chinese man who was suffering from androgenic alopecia, Norwood stage 4. Seeking to treat the condition, he went to seek a Scalp Micropigmentation (SMP) treatment to conceal the baldness. Unfortunately, without being thoroughly informed of the intricacy of the procedure, the patient went to get the treatment from a tattoo parlour, which is not specialized in performing an actual SMP treatment for hair loss. As a result, he is left with a noticeably unnatural-looking hairline. To address this issue, patient was advised to undergo a proper hair restoration (specifically FUE procedure) to cover the inked area, thus, delivering a tangible result and solution to his hair loss. A new hairline was constructed and 2000 hair grafts were harvested from the donor area and implanted; 30FU/cm² on the frontotemporal recess areas and 40FU/cm² on both the frontal part and a part of the mid-scalp region.

Keywords:

Scalp Micropigmentation, SMP, Male Pattern Baldness, FUE

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Often referred to as a scalp tattoo or hair tattoo, Scalp Micropigmentation (SMP) is a non-surgical procedure that creates the illusion of higher hair density by camouflaging the surface area of the scalp where hair loss has already occurred, in addition to giving a more defined hairline. It's an increasingly popular solution for people wanting to duplicate the natural look, imitating hair follicles in close proximity to the scalp. SMP is used to address male's concerns of hair loss including Male Pattern Baldness, alopecia and hair thinning. It is important to note that SMP, despite its bynames, is neither a scalp tattoo nor a hair tattoo. However, not all cases of SMP came out the way intended. Some amateur-level SMP procedures deliver comically unnatural-looking results, causing the patient a humiliating experience when socializing or when in public.

Main Cause of Bad Results of SMP

One of the most common problems with SMP is having it done by unlicensed or unqualified technicians who are lacking in experience and exposure. This often results in a serious misunderstanding on how it works, which leads them to treat the procedure as a tattoo or permanent makeup, a different procedure relying on different techniques. Such is the case of our patient who was not thoroughly informed of the procedure and its predicted results.

Case Presentation

On April 1, 2019, a Malaysian-Chinese patient, aged 31, presented with a badly done hair follicle replication. The patient was suffering from Male Pattern Baldness predominantly across the frontal region. According to the patient, when he started to suffer from hair loss, he intended to conceal the baldness with a

micropigmentation treatment. Instead of consulting an actual doctor or specialist, he went to get his 'SMP' at a tattoo parlour. The result left him devastated and highly insecure with his own look that he had to don headwears all the time.

Hairline

The scalp tattoo has caused an unnatural-looking result, which does not remotely resemble hair follicles. In addition, the way the hairline was drawn is highly unrealistic with no macro- and micro-irregularities, giving off an overly accentuated structure, as seen in **Figure 1**.

Pigment

For the inks used, specific pigment grades are formulated just for the procedure. Inks of inferior quality tend to deliver an unnatural finish. The standard SMP procedure requires the inks to be injected as tiny, layered dots in different shades of black to replicate a natural-looking depth of hair follicles and to add hair density.

Size and Penetration

When injected, the fine needle should penetrate with precision into the Dermis layer, which is a different depth than that of a tattoo. This very meticulous technique is what sets SMP apart from a tattoo or permanent makeup procedure. Going too deep will cause ink migration, due to the denser nature of the collagen. This phenomenon explains why the ink changes colour or stretches in shape and size. Besides that, the best application is to employ the appropriate needle stroke and pressure so as not to create an unrealistic size of dots in imitating the hair follicles.



Figure 1: The hairline was drawn is highly unrealistic with no macro- and micro-irregularities, giving off an overly accentuated structure



Figure 2: The head was shaved off to prepare for a Follicular Unit Excision (FUE) procedure

Other Important Factors to Consider

Due to its minuscule and extremely sensitive nature, SMP requires a very specific technique which accounts for several factors to ensure the best outcome. Those factors include duration of the needle in contact with the scalp, pigment colour, compatibility of the scalp, consistency of ink, degrees of pressure, angle of the needle against the scalp, number of needles, needle thickness and pattern of dot placement.

Management and Outcome

SMP Repair Treatment

When consulted, the patient was advised to go for a tangible result as he was genuinely interested to have a hair restoration. In addition to that, he was not keen to go through a tattoo removal laser treatment and rather had his tattooed scalp covered with actual hair. Consequently, his head was shaved off [Figure 2] to prepare for a Follicular Unit Excision (FUE) procedure.

Prior to the FUE, his hairline was constructed and outlined, which covers the entire frontal part, a part of the mid-scalp region and both the frontotemporal recess areas. The hairline extends slightly over the inked area, covering the pigment, and broadly spreads across the frontal part to create smoother frontotemporal corners (apex). This designed [Figure 3] was particularly requested by the patient.

To cover the inked area properly within the newly constructed hairline, around 2000 hair grafts were harvested from the donor area and implanted, 30FU/cm² on the frontotemporal recess areas and 40FU/cm² on both the frontal part and a part of the mid-scalp region [Figure 3].

Results

Four months following the procedure, the patient returned for a follow-up. He was very satisfied with how it turns out. The entire site is covered with a hair density great enough to render his scalp tattoo unnoticeable. From the oblique views, the hair near the hairline gradually increases in density towards the frontal part [Figure 4].

Even from the frontal view, the hair distribution conceals the inked area by a considerable amount and makes the badly done SMP looks diminished [Figure 4]. Since the SMP was not removed but merely camouflaged, it is left as it is, thickening the specific areas suffering from the hair loss (the frontal and the frontotemporal recess areas). As the transplanted hair growth just started four months prior, this is not the end result. As time passes, the hair will grow at an increased density.

Discussion

Depending on the objective, SMP is an excellent option for people opting for a subtle look; whether it is to have a “buzz cut” look, or to replicate the stubble look instead of the shiny

baldness or even to increase the density of a full head of hair. However, it depends on both the techniques and experience in delivering the results. A qualified technician should be familiar with the best application and be able to demonstrate it practically. It is advisable for potential patients to do thorough researches into

finding the best and trusted hair expert to administer the SMP treatment so as to not leave unrealistic effects on the scalp. It is worth noting that SMP is not similar to a tattoo or permanent makeup process, thus, finding a practice that specializes in this treatment is important.



Figure 3: The frontal part and a part of the mid-scalp



Figure 4: The hair near the hairline gradually increases in density towards the frontal part



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Transient Hypopigmentation Induced by Q-switched Nd:YAG Laser

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Abstract

Laser Facials or laser toning has become increasingly popular in Asia. Q-switched Nd:YAG laser is the most commonly used laser for skin rejuvenation because of its deeper penetrating properties and safety in pigmented skin. However, as with any laser procedure, laser toning is associated with adverse effects. Most dreaded complications is laser toning induced hypopigmentation as they generally do not respond well to treatment (Wong et al., 2015). From our clinical experience using lower fluence (0.8-2 j/cm²), large spot size (6-10mm), sufficient treatment intervals (3-4 weeks) and less tissue response can prevent such complications. We report a case of laser-induced hypopigmentation in an Indian patient who developed hypopigmentation after laser toning despite using fluence less than 1 J/cm², 6mm spot size and 3 weeks treatment intervals. Surprisingly hypopigmentation recovered with steroid cream within few days.

Keywords:

Q-switched Nd:YAG laser, hypopigmentation, laser toning, steroid cream

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The Q-switched Nd:YAG laser is the most widely used laser for the treatment of melasma and non-ablative skin rejuvenation in darker skin types. Recently laser toning or low fluence, large spot size, multiple pass technique has been used in the treatment of melasma and skin rejuvenation. There is improvement in the skin tone as a result of this technique hence the term 'laser toning' (Shah & Aurangabadkar, 2019). The rate of complications after Q-switched laser is significantly lower than other lasers. The most frequently encountered adverse reactions are hyperpigmentation and hypopigmentation. Hypopigmentation in a dark skin patient causes much anxiety and is the most difficult to treat adverse effect.

The incidence of hypopigmentation following laser toning in Asian population is as high as 10% (Park & Yeo, 2016). Few cases of mottled pigmentation and confetti-like hypopigmentation have been reported following laser toning but most of the patients did not have re-pigmentation even after few months of stopping the laser treatment (Chan et al., 2010; Jang et al., 2015; Park & Yeo, 2015; Polnikorn, 2008; Wattanakrai et al., 2010; Wong et al., 2015). We are presenting a case report of Q-switched 1064nm Nd:YAG laser-induced transient hypopigmentation which resolved completely with topical steroid treatment in few days

Case presentation

A 29-year-old male patient of Fitzpatrick skin type V approached us for uneven skin tone and skin rejuvenation. On



Figure 1: 3 days after the 2nd session of laser toning



Figure 2: 2nd week after the 2nd session

examination, he had hyperpigmented macules over his forehead, nose, and lower lips. He used sunblock and glycolic acid cream 10% as his daily skin care. He was treated with Q-switched 1064nm Nd:YAG laser (Tribeam, Jeisys). The parameters used for the first session for the whole face were 2 passes of 6mm spot size, 1.5 J/cm² Fluence, frequency of 6 Hz and 2 passes of 4mm spot size, 1.5 J/cm² Fluence, frequency of 6 Hz using top-hat beam mode. The endpoint was mild erythema.

The subsequent session was scheduled after 3 weeks. During the second session patient didn't want to shave his beard but insisted on laser treatment for melasma. After discussing about the possibility of pigmentary complications, laser toning was done. The parameters used for the upper face were 2 passes of 6mm spot size, 1.8 J Fluence, 6 Hz of frequency, and 2 passes of 4mm spot size 1.5J Fluence, 6 Hz frequency avoiding the beard area. Area below the lower lips where there was no hair was treated with 2 passes of 6mm spot size, 6 Hz frequency and 0.7 J Fluence. As much as possible the area of the face with hair was avoided. Clinical endpoint of mild erythema was achieved. The patient was given an appointment after 3 weeks for next treatment. The patient noticed hypopigmented macules below the lower lip 3 days after the 2nd session. There was no family history of vitiligo. The patient was advised to apply mometasone 0.1% ointment and visit the clinic as early as possible for further evaluation. The patient visited the clinic after 2 weeks and noticed the hypopigmentation has completely re-pigmented.

Discussion

Traditional Q-switched Laser treatment is based on the principle of selective photothermolysis which uses a high fluence to destroy the pigment containing cells (melanocytes), because of cell death there will be a release of prostaglandins and cytokines which results in an inflammatory state and damage to the basement membrane. In laser toning due to the use of low frequency and large spot size Q-switched laser, subcellular selective photothermolysis takes place (Kang et al., 2011; Kim et al., 2010; Mun et al., 2011). This causes minimal damage to the melanocytes but destroys the melanosomes and melanin granules within the melanocytes and keratinocytes but keeping the cell membrane and nucleus intact thus avoiding cell death. The long dendritic process of hyperactive melanocytes is cut off (dendrectomy) and there is functional downregulation of melanocytes which results in the production of a reduced number of melanosomes (Kang et al., 2011; Shah & Aurangabadkar, 2019).

Laser toning parameters and techniques have the biggest impact on the development of hypopigmentation. Laser-induced hypopigmentation was thought to be associated with skin inflammation and epidermal disruption caused by excessive thermal damage with high fluences. Most of the published studies emphasized the use of lower fluences (0.8-2.0 j/cm²), larger spot size (6-10mm), longer treatment intervals (2-4 weeks), and mild tissue response (faint erythema or 3-4 passes) to prevent the complication of hypopigmentation and close monitoring of signs of complications and immediate discontinuation once hypopigmentation appears to optimize the outcome and avoid irreversible hypopigmentation (Park & Yeo, 2015; Shah & Aurangabadkar, 2019).

Ideally beard and mustache have to be shaved in male patients before performing the procedure. But this patient had a video shoot the following week and his hyperpigmentation has

reduced after the first session and so insisted on continuing laser treatment avoiding the hairy areas. We assume our patient developed hypopigmentation in spite of using lower fluence of 0.7J/cm² and larger spot size (6mm) due to more energy absorption by thick hair follicles and darker skin tone. Hypopigmentation resolved once the skin inflammation was treated with steroids.

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Utilization of Lyophilized Platelet-Rich-Plasma in Aesthetic Facial Treatment

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Introduction

Platelets are important for hemostasis and wound healing. Several growth factors have been discovered in alpha granules [Tsay, et al., 2005]. Platelet-rich plasma (PRP) is obtained by centrifuging autologous blood and isolating the platelets. As a result, PRP devices are generally divided into two concentration systems: lower (2.5–3 times baseline concentration) and higher (5–9 times baseline concentration) [Dhurat,&Sukesh, 2014].

Conventionally, PRP is prepared either through commercial kits or a specialized ‘table top cold centrifuge’ device in the clinic set-up. 30 ml of venous blood draw will yield approximately 3-5 cc of PRP depending on the baseline platelet count of an individual, the device used, and the technique employed such as using citrate dextrose A to prevent platelet activation prior to its use. However, in clinical practice, the platelet levels are not measured in the aforementioned conventional method. Lyophilized platelet-rich plasma is a technology where isolated and purified PRP are stored for a prolonged period. Generally, they are sent to the central laboratory with proper environment control for centrifugation and further processing. The lyophilized PRP is then checked for sterility and sent back to the medical facility for administration. Before each treatment session, the lyophilized PRP can be simply reconstituted with normal saline or other activator such as collagen [Murdiastuti, et al., 2019]. PRP has been employed in a variety of medical applications, including tendon repair, reconstructive medicine, wound healing, hair loss, and aesthetic medicine. Furthermore, application of PRP in medical aesthetic also indicate improvement for skin texture, wrinkles, mild collagen loss, skin tightening and toning, acne scars, and face volume in previous studies [Frautschi, et al., 2017; Peng, 2019; Samadi. Et al., 2019].

We report a case study of lyophilized PRP usage in facial esthetic treatment. Clinical photo comparisons were used as result to observe the efficacy of lyophilized PRP.

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Case Report

Case Design and Subject

Patient gave her formal consents for the use of their personal and medical information as well as photos and laboratory data in the publication of this case report.

Lyophilized PRP preparation

The preparation of lyophilized PRP (Biolpyh™) was performed in the central laboratory of Hope Cell Sdn. Bhd. (KL, Malaysia). For each patient, 100 ml of autologous blood was collected at once into a blood tube containing ACD. Upon receiving the sample, a series of separations and

concentrations of platelets was performed. They were partially activated before the vacuum freeze-drying process. Using a single procedure, 10 vials of 2 ml lyophilized powder (Biolpyh™) were produced. The lyophilized powder was stored at 25±2 degrees Celsius and at 1 atmospheric pressure.

Lyophilized PRP application

Before the treatment session, each vial of lyophilized PRP (Biolpyh™) was reconstituted in 5 ml of normal saline using a sterile syringe. The platelet-rich solution was administered intradermally and subcutaneously. Approximately 1 to 2 vials were administered for each treatment session.

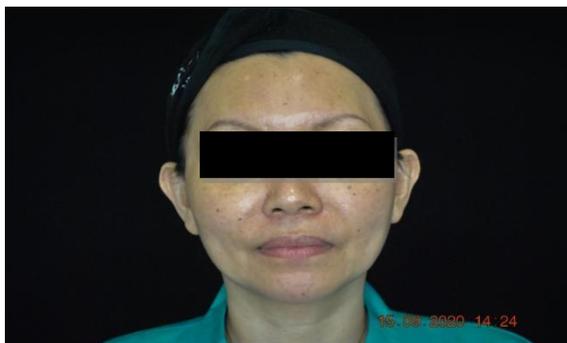


Figure 1A: Before

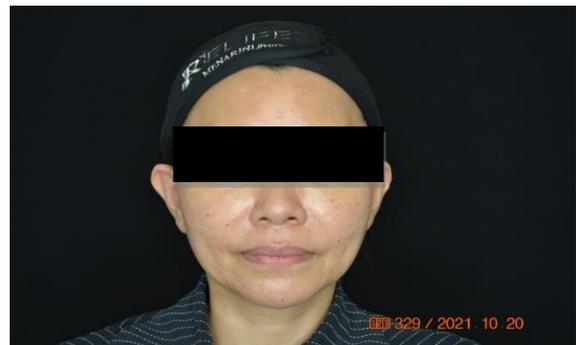


Figure 1B: After

Case study

This is a 49-year-old female who presented with clinical signs of ageing eg sunken temple, sunken cheeks, chin recession and coarse skin texture). The lyophilized PRP solution (Biolpyh™) was injected into her temporal areas, forehead, cheeks and chin subcutaneously. In addition, her skin over her whole face was injected intradermally. She received 3 treatment sessions at one-month intervals. Only minor bruising was noted after the treatments. After comparing clinical photos, we noted that the outline of her forehead, temporal area, and cheeks became smooth, the fine lines, wrinkles and pores on her skin texture showed apparent improvements (Fig. 1A, B).

Discussion

The use of PRP in medical treatments was considered relatively safe and efficient. PRP is commonly utilised in orthopaedic surgeries, reconstructive medicine, and wound healing promotion to speed tissue recovery [Shirata, & Kato, 2019]. PRP is also becoming more prominent in the treatment of medical aesthetics.

Lyophilized PRP may be an ideal method to establish quantitative PRP treatment for medical aesthetic. Despite the wide applications of PRP, there are currently no established standards for acquiring PRP in order to achieve the most effective plasma solution or platelet concentration, hence most treatment was based on qualitative measurement [Peng, 2019]. For

lyophilized PRP, the number of platelet was quantified prior to administration. Thus, clinicians are able to provide more precise prescription, design better treatment proposal and predict the treatment outcome based on the platelet count. In addition, due to the short shelf life of PRP, patients must have blood obtained each time before centrifugation for conventional PRP [Yeung, et al., 2018], but lyophilized PRP preparation requires only a single blood collection which provide better user experience.

In this case study receiving lyophilized PRP treatments, clinical improvements and positive clinical feedback were noted. Decreasing fine lines (wrinkles), improvement of skin textures, and smoother facial outlines were observed. In addition, increased elastic fibers were observed. No obvious fibrotic changes or foreign body reactions were noted.

PRP contains a number of growth factors that may aid in fibroblast activation and tissue regeneration. Platelet-derived growth factor (PDGF), vascular endothelial growth factor (VEGF), and insulin-like growth factor (IGF) are all growth factors generated by platelets and are linked to tissue repair [Pierce, et al., 1991].

PDGF activates collagenase, increases fibronectin synthesis, and is necessary for collagen remodelling in normal wound healing, according to a large body of evidence [Verma, et al., 2019]. However, this study had certain limitations. We only collected the samples in a single case study. Therefore, more cases and data collection are required in further studies to identify the ideal growth factor levels and clinical outcomes.

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PROTOCOL: Safety and Efficacy of Topical Agent, Oral Antioxidant, Laser Therapy and the Combination of Such for Melasma among Malaysians with Fitzpatrick Skin Type III-IV (STALCMA)

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Introduction

Melasma is a common acquired hyperpigmentation condition that mostly affects women of reproductive age, often occurring on the face area (Sarkar R et al., 2014). This chronic condition is often relapsing, causes great emotional suffering and has a detrimental impact on quality of life (Ikino JK et al., 2015). It is a condition that can only be managed but not cured completely (Sonthalia S et al., 2015). Melasma affects people of all ethnicities, however it occurs most commonly in Asian and Hispanic females (Fitzpatrick TB et al., 1987).

The incidence of melasma in South East Asia was 0.25% to 4% of patients seen in dermatology institutes, with peak incidence at age 30 to 44 years. A survey conducted at a dermatology clinic in Thailand found that the prevalence of melasma was as high as 40% in women and 20% in men. Melasma also accounted for 0.98% of cases reported in Indonesia and 4% of cases reported in Malaysia (Hann SK, 2007). The prevalence of melasma is high in South East Asia due to the tropical climate with high sun exposure. Moreover, lack of awareness amongst Asians on applying sunscreen also contributes to the development of melasma in the population.

There are a variety of treatment options available for melasma such as combination of topical agents such as hydroquinone and chemical peeling agents where it stops the transfer of melanin pigment produced onto the surface of the dermal layer by a specific transporter. Besides that, the presence of antioxidants such as tranexamic acid plays an important role in combating melasma where it stops the conversion of tyrosine. In clinic settings, the Q-switched Nd:YAG laser 1064nm with specific fluence is widely used as the main treatment for melasma. Furthermore, combination of this laser with topical agents and antioxidants are suggestive for good outcomes however with possible minimal to moderate side effects might happen (Rivas S et al., 2013).

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Although previously many studies have been done to evaluate the treatment of melasma using various approaches (Gheisari M et al., 2020; Kim HJ et al., 2017, Sim JH et al., 2014), there is limited study that has compared the efficacy and safety of oral and topical therapy versus physical therapy such as laser versus a combination of them for melasma. To be more precise, to-date, there is limited study that has evaluated the efficacy and safety of the treatment options for melasma such as topical hydroquinone, oral tranexamic acid, laser therapy and combination of them on Asian populations with Fitzpatrick skin type III-IV such as in Malaysia. Hence, this study aims to determine the efficacy and safety of these treatment options among Malaysian melasma patients with Fitzpatrick skin type III-IV. The findings of this study may help to establish the treatment options for clinical practice on melasma that suits Asian skin type III-IV.

Research Questions

1. Is treatment with combination of topical hydroquinone 4% and oral antioxidant tranexamic acid 250mg bd for melasma among patients with Fitzpatrick skin type III-IV effective and safe?
2. Is treatment with Q-switched Nd:YAG (1064 nm) laser alone for melasma among patients with Fitzpatrick skin type III-IV effective and safe?
3. Is treatment with combination of Q-switched Nd:YAG (1064nm) laser with hydroquinone 4% and tranexamic acid 250mg bd among patients with Fitzpatrick skin type III-IV effective and safe?
4. Which is/are the best treatment modality in treating melasma in patients with Fitzpatrick skin type III-IV?
5. How satisfied are patients with the treatments they received for melasma?

Underpinning theories

1. There is a significant different efficacy and safety on combination of topical hydroquinone

4%, oral antioxidant tranexamic acid 250mg bd and Q-switched Nd:YAG (1064nm) laser for melasma among patients with Fitzpatrick skin type III-IV versus other treatment options.

2. There is a significant different patients' satisfaction on combination of topical hydroquinone 4%, oral antioxidant tranexamic acid 250mg bd and Q-switched Nd:YAG (1064nm) laser for melasma among patients with Fitzpatrick skin type III-IV versus other treatment options.

Methodology

Quasi experimental study design with simple random allocation using randomization tool application into 3 intervention arms which are: 1) topical hydroquinone 4% and oral antioxidant tranexamic acid 250mg bd or 2) Q-switched Nd:YAG (1064nm) laser therapy or 3) a combination therapy with all the triple treatment modalities in 1) and 2) (refer study flow chart). Patient recruitment and follow-up for intervention will be done at MAHSA Avenue Clinic, Petaling Jaya, Malaysia & UiTM. Patients will be enrolled into the study between July and December 2021.

Patient will be invited into the study if they fulfill the following inclusion and exclusion criteria.

Inclusion criteria:

- Malaysian adult aged 40-55 years old
- Fitzpatrick skin type III-IV
- Hyperpigmented lesion at face area determined by mMASI index

Exclusion criteria:

- Pregnant, lactating or patients with hormonal oral contraception
- Active cutaneous infection
- Use laser devices or similar treatments with depigmentation properties within the last 4 weeks

- Use of oral retinoid or other photosensitising drugs such as nonsteroidal anti-inflammatory drugs, tetracycline, phenytoin and carbamazepine
- Contraindications or known allergy or adverse event such as history of venous or arterial thromboembolic diseases or active thromboembolic diseases or chronic kidney disease patients to the treatment options.

The minimum sample size for the study is calculated based on resource equation approach for independent t-test. The calculation formula used is $n = DF/k + 1$, n =sample size, DF =degree of freedom for the error, k =number of group. Hence 35 patients are required to be sampled for this study.

Data collection process

Patients will be recruited into the study using internal invitation from the clinician and also through advertisement. Patients who are interested to participate will be brief about the study. Upon agreement they will be asked to sign the informed consent form to allow for their demographic, lifestyle and clinical data, imaging results and face photos to be used for research and publication purposes. Patients will be informed that their participation is voluntary and that they can withdraw from the study at any time without at risk to their other treatment or penalty. Patients will not receive any other incentive besides the treatments which will be provided to them at free-of-charge.

Patients will be selected into different treatment arms based on simple random allocation using randomization tool application. The treatment arms include patients who will received: 1) topical hydroquinone 4% and oral antioxidant tranexamic acid 250mg bd or 2) Q-switched Nd:YAG (1064nm) laser therapy or 3) a combination therapy with all the triple treatment modalities in 1) and 2) for 90 days. Follow-up will be done at 0, 30, 60 and 90 days.

For laser treatment, the intervention will be provided once a month. Demographic and lifestyle data such as age, gender, ethnicity, smoking status, average duration of sun exposure and clinical data for example Fitzpatrick skin type, health condition, medical, medication and allergy history, the modified Melasma Area and Severity Index (mMASI) score that has been validated (Pandya AG et al., 2011), image pigmentation score using JANUS-III and patient's satisfaction score will be collected at baseline and every follow-up accordingly. Patient recruitment will be done between 1st August to 31st October 2021. The minimum sample size for the study is calculated based on resource equation approach for independent t-test. The calculation formula used is $n = DF/k + 1$, n =sample size, DF =degree of freedom for the error, k =number of groups (36) that is 12 patients for each treatment arm.

Topical hydroquinone 4% of Melashine® brand and oral antioxidant tranexamic acid 250mg bd of Transamine® brand will be used in this study. The patient will be instructed to use the topical agent at night everyday on the melasma skin area. For laser therapy, Q-switched Nd:YAG (1064nm) using Cosjet ATR® will be utilized.

Data analysis

Data will be analysed descriptively and inferentially using Excel and SPSS (Version 27, IBM Corp, New York, NY). Demographic data will be presented as frequency, percentage, mean and standard deviation (SD) accordingly. Inferential analysis using ANOVA will be used to compare the image pigmentation score from JANUS-III, the score of mMASI and patient's satisfaction score between the groups, before and after intervention. A p -value of <0.05 will be used as a statistically significant level. Imaging analysis from JANUS-III will be presented for comparison purposes before and after intervention.

Ethics requirement & privacy

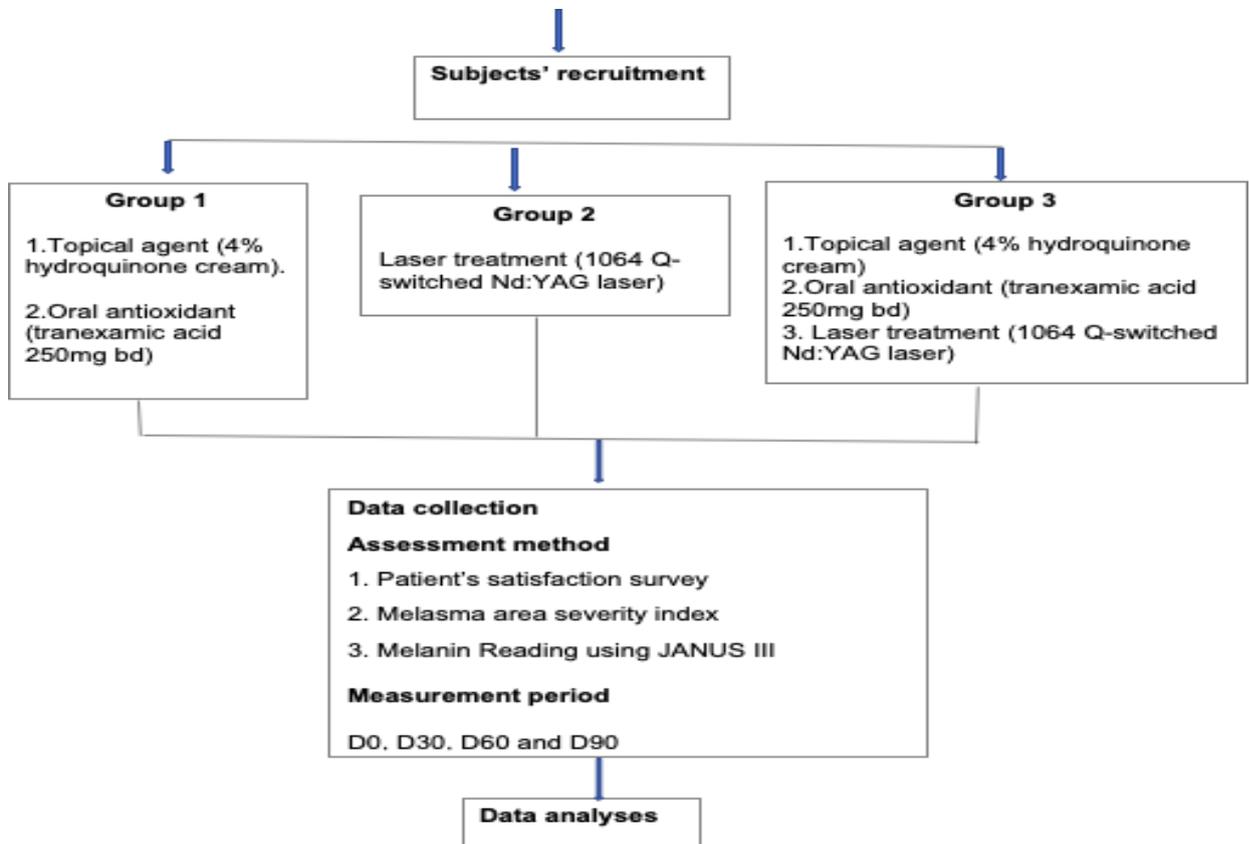
The ethical approval of this study will be obtained from MAHSA & UiTM Ethic Committee. The researchers will adhere to the principle of the Declaration of Helsinki and Malaysia Good Clinical Practice Guidelines. Only principal investigators and research teams have access to the data. Data management will be kept confidential in a protected computer and will be kept up to 2 years. Patient's personal information will be kept confidential and anonymous and presented collectively so that

nobody would be able to identify them individually.

Expected survey output

The findings of this survey may help to establish the treatment options available for clinical practice guidelines on the treatment of melasma in Asian population with Fitzpatrick skin type III-IV. The data and report will be disseminated in the form of publications and presentations. The data set will be made available for the use of any interested party upon request.

Study Flow Chart



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APPENDIX 1: MODIFIED MELASMA AREA AND SEVERITY INDEX (mMASI) SCORE

Modified MASI score :

Modified MASI total score:	0.3 x A (Forehead) x D (Forehead) +
	0.3 x A (Left malar) x D (Left malar) +
	0.3 x A (Right malar) x D (right malar) +
	0.1 x A (Chin) x D (Chin)

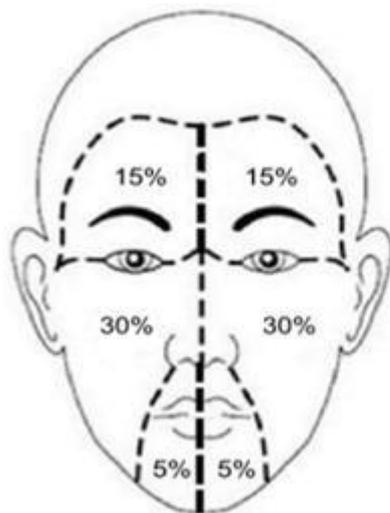


Table 1: Grading of the melasma area and severity index with its three parameters.

Area (A)	0=No involvement; 1=<10% involvement; 2=11-29% involvement; 3=30-49% involvement; 4=50-69% involvement; 5=70-89% involvement; and 6=90-100% involvement.
Darkness (D)	0=normal skin color; 1=barely visible hyperpigmentation; 2=mild hyperpigmentation; 3=moderate hyperpigmentation; 4=severe hyperpigmentation.

APPENDIX 2: Q-SWITCH LASER (TRIBEAM) TREATMENT PARAMETER

Pigmentation depth	Wavelength (nm) TH or G	Hand piece type	Spot size (mm)	Fluence	PTP	Immediate A/Event or E/Point
Epidermal	532	Zoom	2-4	0.6-1.5	NA	Frosting
Dermal	1064TH		4-8	7.14.0	Off	Erythema