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Review Article

Gingival pigmentation index proposal of a new index with a brief review of current indices

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ABSTRACT

Cosmetic expectations have increased with time and current trends speak volumes about gingival esthetics and smile designing. Gingival pigmentation especially on the labial aspect of anterior teeth has become an important component of general esthetics. Various physiologic and pathologic factors cause gingival pigmentation. The existing indices do not deal with the etiology, extent and severity of gingival pigmentation. Hence, we propose a new classification and index for gingival pigmentation to assess the treatment needs for the patient.

Keywords: Gingival melanin pigmentation, gingival pigmentation index, gingival pigmented lesions, melanin index, physiological gingival pigmentation

INTRODUCTION

The deposition of coloring matter, coloration, or discoloration by a pigment pertaining to the gingiva is gingival pigmentation.[1] Our knowledge about gingival pigmentation (GP) and their etiologies has increased enormously over the past decade. The racial–physiological pigmentation is not of medical concern, but may at times be of esthetic concern. Light brown to black pigmentation may be physiologic or racial in healthy colored-skinned individuals, whereas the same oral pigmentation in Caucasians may be abnormal. The development of pigmentation is regulated by the individual's genetic makeup. The intensity of pigmentation is frequently altered by physical, chemical, and hormonal factors.

The normal physiologic color of gingiva is coral pink or salmon pink, with physiological variations of melanin pigmentation. Melanin pigmentation of gingiva is common in dark-skinned individuals. Melanin hyperpigmentation may possess a defensive role against progress of gingival inflammation.[2] Melanin is the most common endogenous pigment. It is a nonhemoglobin-derived brown pigment produced by melanocytes and is also a powerful cationchelator.[3] Melanocytes are dendritic cells of neuroectodermal origin. They work independent of the surrounding epithelial cells and behave as unicellular exocrine gland, convert tyrosine to melanoprotein (melanin), which is transferred to keratinocytes by way of melanosomes. Thus, the melanin is deposited in the basal layer of the oral epithelium.[4,5]

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Gingiva may also exhibit pigmentations due to other etiologies. Benign and malignant lesions, cultural intentional tattooing, drugs, heavy metal ingestions-poisonings, iatrogenic, smoking, and systemic problems can all cause GP.[6,7]

We propose a new improved classifi cation for GP and pigmented lesions, [Table 1] based on our experience gained from previous classification systems. We also propose a new index for GP [Table 2] to assess the treatment needs for such patients.

REVIEW OF CURRENT INDICES

Classification is a mode to arrange the disease(s) and or condition(s) in cohorts, to help communicate among the professionals and to study them. Classification systems are necessary in order to provide a rational and scientific framework to study the etiology, pathogenesis, and treatment of diseases and to plan the treatment in an orderly fashion. In addition, such systems help us prioritize and organize the health care needs of the patients.

Indices should be objective and not be susceptible to the examiner's opinion. They should have clear categories that make it easy to make a decision as to which category a condition should fit into. An index should be valid possessing, in statistical terms, good sensitivity, and specificity. Furthermore, the ideal index should also be reliable and reproducible with no variations as a result of internal flaws within the index and give the same result if the condition being assessed has not changed. It should also be able to detect small changes and should be able to measure changes in either direction, that is, whether the condition being measured improves or deteriorates. Finally, it should be acceptable and free of discomfort for patients or subjects, with the length of time to complete any assessment and examination taken into consideration.[8]

GP has three dimensions: etiology, distribution, and severity. The existing indices on GP are as follows.

1. Oral pigmentation index (DOPI):[9]
   This index of oral pigmentation is the commonly used index due to its simplicity and ease of use. The scores are as follows:
   - No clinical pigmentation (pink-colored gingiva)
   - Mild clinical pigmentation (mild light brown color)
   - Moderate clinical pigmentation (medium brown or mixed pink and brown color)
   - Heavy clinical pigmentation (deep brown or bluish black color)

2. Melanin index: [10]
   This index has classified pigmentation as follows:
   - No pigmentation
   - One or two solitary unit(s) of pigmentation in papillary gingiva without the formation of a continuous ribbon between solitary units
   - More than three units of pigmentation in papillary gingiva without the formation of a continuous ribbon
   - One or more short continuous ribbons of pigmentation
   - One continuous ribbon including the entire area between canines

3. Melanin pigmentation index: [11]
   Takashi *et al*. have proposed another index to measure gingival melanin pigmentation. The index is as follows:
   - Score 0: No pigmentation
   - Score 1: Solitary unit(s) of pigmentation in papillary gingiva without extension between neighboring solitary units
   - Score 2: Formation of continuous ribbon extending from neighboring solitary units

   This index is not equipped to describe the degree of melanin pigmentation.

4. Gingival pigmentation index: [12]
   - Score 0: Absence of pigmentation
   - Score 1: Spots of brown to black color or pigments.
   - Score 2: Brown to black patches but not diffuse pigmentation
   - Score 3: Diffuse brown to black pigmentation, marginal, and attached

In our view, all the aforementioned indices seem to lack the capacity to relate various aspects of GP. They are also not determining thepatient's treatmentneed. Moreover, other gingival-pigmented lesions are beyond their scope, as they were intended only for racial pigmentation.

DISCUSSION

An index quantitatively reflects the clinical state or conditions using set of criteria on a graduated numerical scale whereby one can easily define, describe, distinguish, compare, and analyze the status of an individual or a group with reference to that state and/or conditions.

Table 1: Proposed new classification of gingival pigmentation

Class	Criteria of classification
I.	Coral pink/salmon pink colored gingival
II.	Localized/Isolated spots/areas of gingival melanin pigmentation which does not involve all the three parts of gingiva, that is, attached, free, and papillary gingiva
	Mild to moderate pigmentation
	Severe/intense pigmentation
III.	Localized/Isolated unit/s of melanin pigmentation which involve all the three parts of gingiva, that is, attached, free, and papillary gingiva
	Mild to moderate pigmentation
	Severe/intense pigmentation
IV.	Generalized diffuse pigmentation which involve all the three parts of gingiva that is, attached, free, and papillary gingiva
	Mild to moderate pigmentation
	Severe/intense pigmentation
V.	Tobacco associated pigmentation like smoker's melanosis and chewing tobacco
VI.	Gingival pigmentation due to exogenous pigments
	Amalgam tattoos
	Cultural gingival tattooing
	Drinks
	Food colors
	Habitual betelnut/khat chewing
	Lead-Burtonian line
	Mercury
	Silver
	Arsenic
	Bismuth
	Graphite
	Otherforeign bodies
	Topical medications
	Idiopathic
VII.	Gingival pigmentation due to endogenous pigments
	Bilirubin
	Blood breakdown products: Ecchymosis, Petechiae
	Hemochromatosis
	Hemosiderin
VIII.	Drug-induced gingival pigmentation
	ACTH
	Antimalarial drugs
	Chemotherapeutic agent-busulfan and doxorubicin
	Minocycline
	Oral contraceptives
	Phenothiazines
IX.	Gingival pigmentation associated with systemic diseases and syndromes
	Addison's disease
	Albright's syndrome
	Basilar melanosis with incontinence
	Beta thalassemia
	Healed muco-cutaneous lesions-Lichen planus, Pemphigus, Pemphigoid
	Hereditary hemorrhagic telangiectasia
	HIV-associated melanosis
	Neurofibromatosis
	Peutz-Jeghers and other familial hamartoma syndromes
	Pyogenic granuloma/Granulomatous epulis
X.	Pigmented benign and malignant lesions involving the gingiva
	Angiosarcoma
	Hemangioma
	Kaposi's sarcoma
	Malignant melanoma
	Melanocytic nevus
	Pigmented macule

(*Contd*....)

Table 2: Proposed gingival melanin pigmentation and pigmented lesions index

Score 0	Coral pink-colored gingiva, no gingival pigmentation, and/or pigmented lesions
Score 1	Mild, solitary/diffuse, gingival melanin pigmentation involving anterior gingiva, with or without the involvement of posterior gingiva
Score 2	Moderate to severe, solitary or diffuse, gingival melanin pigmentation involving anterior gingiva with or without the involvement of posterior gingiva
Score 3	Gingival melanin pigmentation only in posterior gingiva
Score 4	Tobacco-associated pigmentation: Smoker's melanosis, chewing tobacco
Score 5	Gingival pigmentation due to exogenous pigments-Amalgam tattoos arsenic, bismuth, chewing betel nut, cultural gingival tattooing, drinks, food colors, lead-burtonian line, mercury, silver, topical medications, idiopathic etc
Score 6	Gingival pigmentation due to other endogenous pigments: Bilirubin, blood breakdown products, ecchymosis, hemochromatosis, hemosiderin, petechiae etc
Score 7	Drug-associated gingival pigmentation: Antimalarial drugs, minocycline, oral contraceptives etc
Score 8	Gingival pigmentation associated with other causes: Addison's disease, albright's syndrome, basilar melanosis with incontinence, hereditary hemorrhagic telangiectasia, HIV patients, lichen planus, neurofibromatosis, Peutz-Jeghers syndrome, pyogenic granuloma/granulomatous epulis etc
Score 9	Pigmented benign lesions: Hemangioma, melanocytic nevus, pigmented macule
Score 10	Pigmented malignant lesions: Angiosarcoma, Kaposi's sarcoma, malignant melanoma

Dummett[13] in 1944 noted that some dark complexioned individuals possessed perfectly pink gums devoid of any melanogenous pigmentation. In our view, mild shades of GP may require esthetic treatment in light-skinned individuals but may not have esthetic concern in dark-skinned subjects.

In our proposed index, [Table 2] 0-3 is the range available to record the gingival color and its variation within physiological limits. A clinician may recommend a depigmentation procedure when the patient scores 1-2 of our index and has up to class 2

of Liebart and Deruelle.[14] Smile line classification, which is as follows:

Class 1: Very high smile line - more than 2 mm of the marginal gingiva visible
Class 2: High smile line - between 0 and 2 mm of the marginal gingiva visible
Class 3: Average smile line - only gingival embrasures visible
Class 4: Low smile line - gingival embrasures and cemento-enamel junction not visible.

The classification of GP and the proposed new index should provide a workable framework upon which future studies can be performed to develop effective managements for this complex group of diseases. It is expected that as our knowledge progresses; future revisions to the classification system will be needed. Our classification is a valuable addition to the existing classification systems.

To our knowledge, the present proposed index represents the most comprehensive of all the indices that evaluate the GP and other pigmented lesions. It takes into account the esthetic aspects, that is, the presence of melanin pigmentation in the esthetic anterior smile region and the severity of GP; it also considers the etiology of various other pigmented lesions in the gingiva. Hence, we believe that it will be a useful tool for both clinicians as well as periodontal epidemiologists.

CONCLUSION

Due to clarity and simplicity of the proposed index, this classification can be applied even by naïve professionals. The broad implementation of this classification and index may facilitate the comparison of GP across the globe and help esthetic management of such presentations. The baseline data obtained by using the parameters of our index can help in studying the prevalence of GP and pigmented lesions.

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