THAI DERMATOLOGIST SURVEY OF SKIN AGING ASSESSMENT

BY

MISS PUNNAPATH BURANASIRIN

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF SCIENCE (DERMATOLOGY)
CHULABHORN INTERNATIONAL COLLEGE OF MEDICINE
THAMMASAT UNIVERSITY
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ENTITLED

THAI DERMATOLOGIST SURVEY OF SKIN AGING ASSESSMENT

was approved as partial fulfillment of the requirements for
the degree of Master of Science (Dermatology)

on 16 May, 2017

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Degree	Master of Science
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ABSTRACT

Background: Clinical assessment of the skin is an important and practical way to evaluate skin aging. Although there are several skin aging assessment scales, no standard scale is widely used. Dermatologists may be the most appropriate persons to make decisions related to skin assessment, treatment, and prevention. However, their perceptions regarding the signs of skin aging are unexplored.

Objective: This study was aimed to develop a simplified global skin aging assessment score from dermatologists' perspective

Methods: An online questionnaire survey was conducted during 1 October to 31 December 2016 in the Thai Dermatologist Survey of Skin Aging Assessment.

Twenty-nine signs with published evidence on their relevancy to skin aging process were included in the questionnaire. Certified dermatologists and noncertified dermatologists were asked about their perceive knowledge of each dermatologist and their attitude about essential sign of skin aging, using the 5-point Likert scale. Descriptive statistics and exploratory factor analysis (EFA) were used for data analysis.

Results: Twenty-nine signs of skin aging were used to build a skin aging scale. Of 400 dermatologists, 213 responded (mean age 33.78 years; female 71.09%) responded to the survey (response rate 53.25%). Of 213 randomly selected dermatologists, 145 certified dermatologists responded to the survey (response rate

68.1%). Seventy-five percent of the respondents were female with the mean age of 35.2 years to the survey (mean age 35.20 years; female 75 %) responded to the survey (response rate 68.1%). They have practiced for 7.7 years on average.

Factor analysis revealed group of skin aging in 3-Factor. Factor 1 comprised of 8 items (e.g. deep wrinkle, superficial wrinkle, eye bag, lax appearance etc.). The lesion for provisional diagnosis was named “Atrophy”. Six items (Freckle, lentigines, melasma, venous lake, etc) were considered discoloration (Factor 2). All malignant skin lesions were grouped in Factor 3.

Conclusion: This skin aging scale can be generated from studying multiple skin aging signs on facial skin and attitude knowledge of certified dermatologists by statistics. The GS^2A^2 score can be help dermatologist to evaluate skin aging, not only in clinical practice, but also in human research to compare treatment outcomes.

Keywords: Skin aging assessment, Develop score, Skin aging signs

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I would also like to take this opportunity to record my profound appreciation to all the faculty members of the department of Dermatology Chulabhorn International College of Medicine for their assistance. I must also thank my parents for their continuous patronage and genuine encouragement.

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Miss Punnapath Buranasirin

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LIST OF ABBREVIATIONS

Symbols/Abbreviations	Terms
BCC	Basal Cell Carcinoma
COSMIN	COnsensus-based Standards for the selection of health Measurement Instruments
EFA	Exploratory Factor Analysis
GS^2A^2	Global Subjective Skin Aging Assessment
KAP	Knowledge Attitude Practice
KAP-TDS	Knowledge, Attitude and Practice of Thai Dermatologist Skin Aging Assessment
MERZ	MERZ rating scale
MM	Malignant Melanoma
PRP	Platelet Rich Plasma protein
ROS	Reactive Oxygen Species
SAS	Skin Aging Score
SCC	Squamous Cell Carcinoma
SCINEXA	Score for Intrinsic and Extrinsic skin Ageing

CHAPTER 1
INTRODUCTION

1.1 Background and Rationale

Over recent decades, human desire for homogeneous skin color and texture, absence of wrinkles, and more youthful appearance has influenced increased use of cosmetic products. Proposed explanations for this trend include a desire to be competitive at the workplace, development of new cosmetic procedures, and growing availability of nonsurgical options (1, 2).

The primary target of the aging study is to increase the quality of elderly life and to prevent age-related diseases. Especially, aged skin is more interested due to the skin is the most noticeable sign of the aging mechanism and demonstrate the human health which seems to prognosticate the systemic illness and prognosis.

Chronologic age and solar damage are the most important intrinsic and extrinsic factors associated with skin aging. Skin aging characteristics varies ethnically among races. No one is spared from skin wrinkling, sunspots, uneven skin color, vascular abnormality, benign tumor and skin cancer yet these symptoms manifest differently according to the ethnic origin. Among the races, Caucasians manifest photo damaged signs earlier than other races due to their relatively less melanin contents (3). Furthermore, Caucasians manifest earlier onset of skin aging together with more obvious skin wrinkles and sagging signs than other races (4). In contrast, clinical manifestation of skin aging among Asians differs considerably compared to Caucasians. In Asia population, pigmentation changes are the most frequent and significant manifestation of skin aging (5). In spite of this fact, the mechanisms responsible for the deleterious effects and cutaneous alterations are distinct, and general skin signs are essential for clinical assessment of skin aging. An ideal skin aging assessment should be complete all signs of skin aging.

As features of skin aging depend on genetics, race, age, sex, and exposure to different external factors (6), developing a global skin aging assessment scale has been difficult. Most of skin aging scales were used for research studies (7). Nowadays

there are more than one hundred assisting skin aging scales. These scales have been proposed and used not only in clinical practice, but also in research to compare treatment outcomes. Some assessment methods have used only select signs such as Glougau (8) and Fitzpatrick classification systems (9), focused on specific areas (e.g. face, neck (10), chest (11)) or specific ethnicity (12). Others have applied multidimensional assessment of multiple skin aging signs but the content and measurement properties are under standard (13).

Only 5 published multidimensional assessment scales were determined to have high methodological quality for all skin types pursuant to the COnsensus-based Standards for the selection of health Measurement Instruments (COSMIN)—a group that developed a critical appraisal tool (checklist) containing the standards for evaluating the methodological quality of studies investigating the properties of health measurement instruments (13). Of these, 5 scales are known as the MERZ Rating Scale (MERZ) (14), SCINEXA (15), Skin Aging Score (SAS) (16) and two unnamed scales (17, 18). By the way, there are some limitations, most scores focus on Caucasian and are not complete skin aging signs, not widely use and not clear in terminology. All of these scales developed by relation between skin aging signs and many factors involving aging. Dermatologists are the most important persons to diagnose any skin signs because of their expertise and experience. However, none of these scales were constructed to be assessed from dermatologists' perspective.

Today, there are many techniques and instruments to detect skin aging for research and treatment, including the 3-dimensional camera (19), dermoscope (20), physical sample analysis of color (21), and measurement of elasticity (22). However, these only include some of the signs of skin aging. Some cosmetic products can improve skin elasticity, but changes in other clinical symptoms may be unclear. In addition, pigmentation and malignancy may require a dermatologist to identify signs of aging.

This is the first study was aimed to develop a simple global skin aging assessment score based on the perceptions of dermatologist.

1.2 Research question

The multidimensional scales of skin aging is a scale that include many signs of skin aging such as wrinkle, dyspigmentation, benign tumor and vascular abnormalities. A complete clinical skin assessment is required to detect early skin aging problems and other skin diseases, including pre-malignant and malignant lesions, and to accurately quantify problems of skin aging. Although more than one hundred skin aging assessment scales have been introduced, only twenty scales are multidimensional and none has gained sufficient popularity to become widely used. Mostly scale developed by relation between skin aging and each factor. No scales of aging development by users' perspective. Because of some signs of aging are not easy to provisional diagnose or not essential for evaluation.

As practice experience can influence assessment, dermatologist are the specific person to evaluate skin and use skin aging scales. However, it cannot be concluded whether dermatologists' perspective will affect their perceived knowledge and clinical practice. As a result, this study intends to discover the attitude, knowledge, and clinical practice of Thai dermatologists in the area of clinical assessment of skin aging.

For the question of research is "How simple global score of skin aging should look like?" The study relies on the survey called KAP-TDS, which stands for Knowledge, Attitudes and Practice of Thai Dermatologist Skin Aging Assessments. The survey aims to identify the knowledge of dermatologists on skin aging signs, their attitude and the services they offer. The questionnaire will take into account individual knowledge update, work experience, working conditions, working hour and number of patients. The result of the survey should provide a clearer picture on the relation between the dermatologists' attitude and skin assessment, and help to develop and standardize scale to identify skin aging.

1.3 Specific objective

There are 2 main objectives under the current study: (1) To develop a simplified global skin aging assessment score from the perspective of dermatologists.

(2) To assess Thai dermatologists' perceive knowledge about skin aging signs, their attitude and service offer

1.4 Hypothesis

Base on perspective of dermatologists, we can develop a simple global skin aging assessment score.

1.5 Keywords

Skin aging assessment
Develop score
Skin aging signs

1.6 Operation definition

Table 1.1 Operation definition

Operation	Definition
Certified dermatologists	Physician who graduate in dermatology field including board certification, Doctor of Philosophy in Dermatology, Master of Science in Dermatology, and Fellowship and Diploma in Dermatology
Non-certified dermatologists	All physician except certified dermatologists who work in dermatology field more than 2 years

1.7 Ethical consideration

The objectives, methods and expected benefits of this study were explained to all respondents. Additionally, the possible adverse events and inconvenience during the study were clearly communicated to all respondents. All respondents were entitled

to withdraw, at any time, from the study. Confidentiality of the respondent's data was a primary concern. The ethical committee of Human Research Ethics Committee of Thammasat University (No: 1 Faculty of Medicine) have also granted approval for this study.

1.8 Limitation

The limitations of this study include the following: 1) the data are from only Thai dermatologist; 2) the knowledge of skin aging by all dermatologists could have biased the data; and 3) there was a low response rate but adequate for exploratory factor analysis.

1.9 Expected benefits and application

At present, there are many assessment strategies available for skin aging. However, we are unable to find existing scale which is adequate or suitable for Thais. Dermatologists and physicians play a crucial role in making decisions of skin assessment and the implications for clinical practice, formal and continuing education and future research are widely discussed. We expect this research to be a baseline dermatological skin aging assessment and practice of dermatologists. In addition, the application of this study is to improve skin aging assessment and the performance of dermatologic procedures being performed by dermatologists. It is also included the understanding of the crucial barriers for skin aging assessment and identification of simple patterns of aging sign assessment and essential complex multivariate data. The other expectation of this research is to develop standard feasibility skin aging score that is suitable for dermatologists' use and achieve efficient process to enable the program to be improved more appropriately on skin aging to the community.

1.10 Obstacles and strategies to solve the problems

There are some limitations to this thesis. As quantitative research mainly depends on the researcher, it may be confined by my limited experience to use

exploratory factor analysis. However, I had conducted extensive studied and discussed with several experts to get the most information for my research.

Although the application of systematic review methodology has been implemented, it was not applied to its full potential. Because each study had a different scale development, it is difficult to compare or categorize. The problem was nonetheless solved by setting the criteria for choosing the manuscript that corresponds with this study interests.

Another major restriction for this review is my ability to understand only Thai and English language as some scales were not developed or translated into Thai and English.

Table 1.2 Administration and time schedule

	2016											2017				
	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY
Literature review																
Research Proposal																
Research Ethic																
Experiment																
Data Analysis																
Conclusion &Report																
Publication																

CHAPTER 2
REVIEW OF LITERATURE

Assessing age-related signs is the first step that dermatologists will perform on patients. The clinical assessment is not an invasive and long-lasting procedure. Scales are the tool that helps dermatologists to thoroughly assess skin aging.

Each person has different skin aging features, depending on genetics, race, age, gender and the exposure to different factors (15, 23, 24). Such differences make developing a complete skin aging scale difficult. However, screening scales are still beneficial to provisional diagnoses to cover every lesion.

Although, there are many techniques and instruments to detect skin aging for research and treatment, including the 3-dimensional camera (19, 25), dermoscope (20), physical sample analysis of color (21), and measurement of elasticity (22, 26, 27). The skin changes in other clinical symptoms such as pigmentation and malignancy may require to identify signs of aging.

A simple search of PubMed and Scopus databases for existing skin aging assessment scales, published from 1970 to 2016, identified 114 scales. The first standardized scale, however, was introduced in 1970 to assess the degree of crow's feet wrinkles (28). While some assessment methods have used only selected signs (e.g. wrinkles, dyspigmentation, sagging) and/or focused on specific areas (e.g. face, neck, chest) (7, 29). Others, only twenty scales, have applied multidimensional assessment of multiple skin signs in order to cover various phenomena include whole body wrinkle, sagging, skin dyspigmentation, vascular abnormality and tumor. Five published multidimensional measurements are evaluated as excellent and good validity quality for all skin types by COnsensus-based Standards for the selection of health Measurement Instruments (COSMIN) (14-18). COSMIN is a critical appraisal tool (a checklist) which comprises standards for assessing the methodological quality of studies on the properties of health evaluation and measurement instruments (13). One scale is used to measure intrinsic and extrinsic signs of aging of the entire body (15).

Five multidimensional measurements (Appendix F) compose of 3 scales are known as the MERZ Rating Scale (MERZ) (14), SCINEXA (15), and SAS (16).

The other 2 scales were developed by Bazin et al. (17) and Allehand et al.(18). These are developed in various ways as follows.

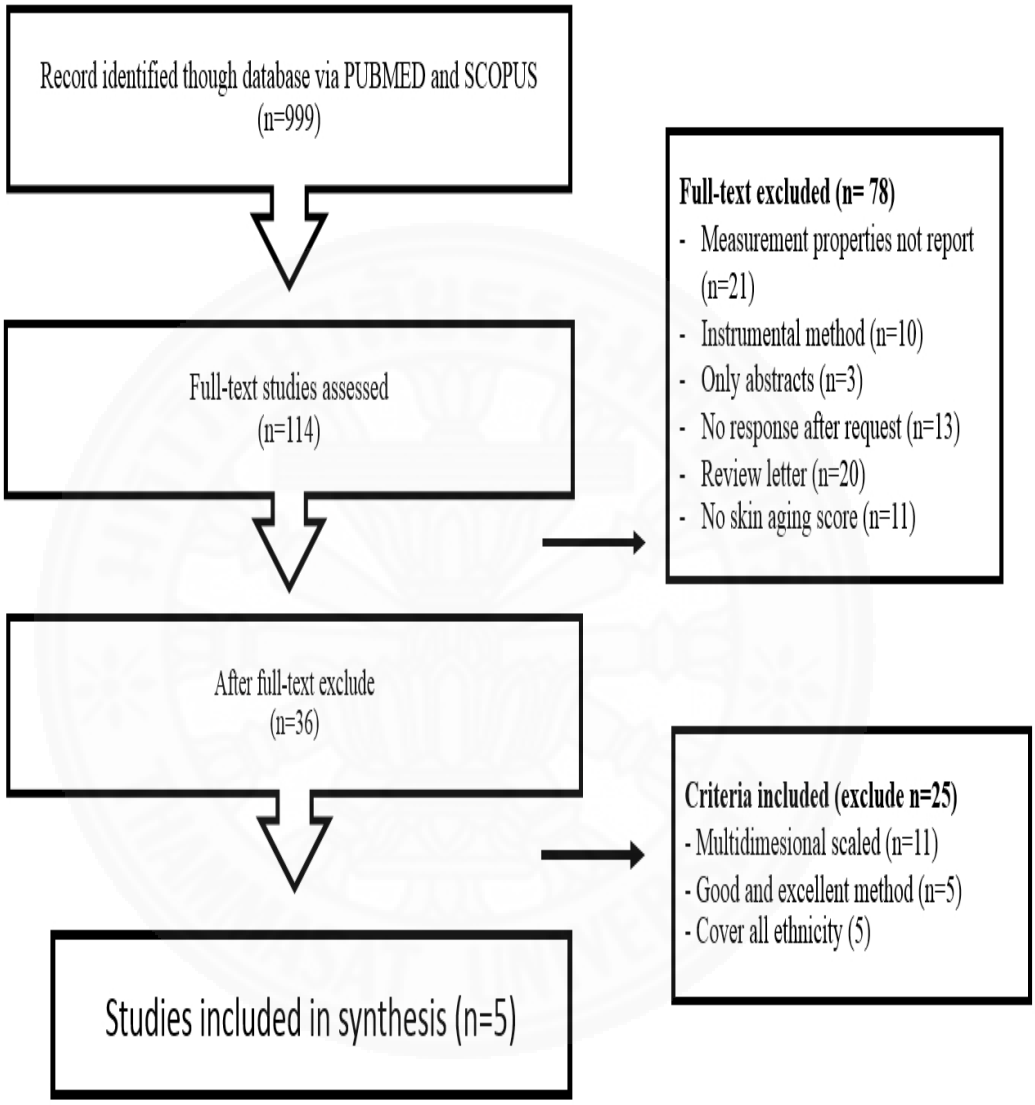


Figure 2.1 Flow Diagram of the search and selection process

2.1 Five multidimensional measurements

2.1.1 Skin Aging Score (SAS)

SAS was developed using analyses of factors from the relationship between skin aging signs and the chronological age (16). SAS is cohort study on visual and tactile evaluation of skin features for quantified skin aging signs. The total of 24 skin aging signs were obtained by factor analysis, which are split into 6 groups by presumed common etiology consisting of milia, comedone, wrinkle, inability to redness, pigment spot. The three level scales are used to rate most of the skin characteristics as absent, slight or very marked.

Table 2.1 Aging signs of SAS

SAS Guinot et al (16)
24 signs
White head on cheek
Black head on cheek
White head on forehead
Black head on forehead
Milia on cheek
Milia on forehead
Pigment spot on cheek
Pigment spot on forehead
Fine lines on cheek
Coarse wrinkle on cheek
Lines on lip
Wrinkle on upper lip
Nasolabial folds
Crow’s feet
Wrinkle under eyes
Fine lines on forehead
Furrow between eye brow
Tissue slacking
Drooping Eyelids
Bags under eyes
Elasticity on cheek
Elasticity on forehead
Inability to redden cheek
Inability to redden forehead

2.1.2 Score for Intrinsic and Extrinsic skin Ageing (SCINEXA)

SCINEXA was developed from intrinsic and extrinsic factors, which are different in clinical features of the skin (15). The scale measurement intrinsic and extrinsic skin aging in regular sunbed users vs. non-sunbed users. Correctly grouped 92% of volunteers on sunbed use based on scale scores. The score include 5 intrinsic and 18 extrinsic aging characteristics for a total maximum score of 54**.** Each parameter is scored ordinary scales 0 (none), 1 (mild), 2 (moderate), 3 (severe) by clinician or dermatologist which are training by owner of SCINEXA. Some item such as uneven pigmentation, cutis rhomboidalis nuchae, Favre racouchot, precancerous and cancer types a binary scale "Yes" (present = 3) or "NO" (absent = 0) was used. The maximum score is 69. (Max. 15 points for intrinsic ageing, 54 points for extrinsic aging)

Table 2.2 Aging signs of SCINEXA

SCINEXA **Vierkotter et al. (15)**
23 signs
Uneven pigment
Fine wrinkle
Lax appearance
Reduce fat tissue
Benign skin tumor
Freckle
Lentigine solarlis
Pigment change
Change of skin phototype
Yellowness
Pseudoscar
Coarse wrinkle
Elastosis
Cutis rhamboidalis nuchae
Favre racouchot
Dryness
Comedone
Telangiectasia
Permanent erythema
Actinic keratosis
Basal cell carcinoma
Squamous cell carcinoma
Malignant melanoma

2.1.3 Scale developed by Bazin et al.

Bazin and Flament developed a scale by applying the correlation with the real chronological age, the perceived appearance age and the photoaging status (17). Twenty eight facial signs can be grouped into four major clinical domains: wrinkles and skin texture, ptosis and sagging, pigmentation disorders, and other skin alterations such as cheek sebaceous pores and vascular disorders by three experts. All signs with different grades of scales were normalized to a 0–5 mark by pictures (absent to mark).

Table 2.3 Aging signs of Bazin et al.

N/A **Bazin et al. (17)**
28 signs
Forehead wrinkles
Fine lines of the forehead
Glabella wrinkles
Interocular wrinkles
Crow's feet wrinkles
Underneath eye wrinkles
Preauricular wrinkles
Cheek folds
Nasolabial fold
Small folds on nasolabial zone
Upper lip wrinkles
Wrinkles of the corner of the lips
Chin withering
Density of pigmentary spots
Localized pigmentary spots of the cheek
Contrast of isolated pigmentary spot of the face
Size of an isolated spot
Drooping of upper outer eyelid
Eye bags
Ptosis of the lower part of the face
Cheek sebaceous pores
Importance of facial skin surface texture presenting alteration
Texture of the mount contour
Forehead pigmentation
Cheekbone pigmentation
Lateral facial pigmentation
Upper lip pigmentation
Vascular disorders

2.1.4 Scale developed by Allerhand et al.

Allehand et al developed a scale by modifying Skin Aging Score (SAS) in which 16 signs were selected based on the credibility of the assessor. Correlations with factors such as gender, age, social class, oxidative stress and BMI are then sought (18). Three independent raters have graded 15 facial skin aging signs from photographs on a narrow-age, community-resident cohort at age 83 years. Sum scores were between 14 and 42.

Table 2.4 Aging signs of Allehand et al.

N/A **Allehand et al. (18)**
16 signs
Milia (cheek)
Milia (forehead)
Pigmented spots (cheek)
Pigmented spots (forehead)
Fine lines (forehead)
Fine lines (cheek)
Lines on lips
Wrinkles (cheek)
Wrinkles (under eyes)
Wrinkles (upper lip)
Furrows between eyebrows
Nasolabial folds
Crow’s feet
Facial tissue slackening
Bags under eyes
Drooping eyelids

2.1.5 MERZ Rating Scale (MERZ)

The development of MERZ derived from the evaluation of 50 subjects by 12 raters implementing 20 grading scales and global face assessment scales (14). The scale grades vary from 0 (no sign) to 4 (very intense or observable signs).

Table 2.5 Aging signs of MERZ rating scales

MERZ **Rzany et al. (14)**
20 signs
Forehead lines at rest
Forehead lines at dynamic
Glabella lines at rest
Glabella lines at dynamic
Crow's feet at rest
Crow's feet at dynamic
Brow positioning
Infraorbital hollow
Nasolabial fold
Upper cheek fullness
Lower cheek fullness
Nasolabial folds
Marionette lines
Upper lip fullness
Lower lip fullness
Lip wrinkles at rest
Lip wrinkles at dynamic
Oral commissures
Jawline
Neck volume

2.2 COSMIN evaluation

COSMIN stands for COnsensus-based Standards for the selection of health Measurement Instruments. The COSMIN checklist was developed as a tool to assess Health-Related Patient-Reported Outcomes (HP-PROs) and to evaluate in terms of study design and static analysis. 43 experts in the field of psychology, epidemiology, statistic and clinical medicine joined the panel to develop this checklist in 2006-2007. Each aspect was assessed by using COSMIN and 5 to 18 items were used as each quality criterion. There are four point scales, from "excellent", "good", "fair" and "poor" which lead to an overall methodological quality score for each aspect.

There are four-step procedures to complete the checklist (Figure 2.2). The first step explains general construction of the checklist. The next step is a procedure to be followed when using this checklist. Five multidimensional scales were done in step 1, 3 and 4 because no IRT methods used in these article.

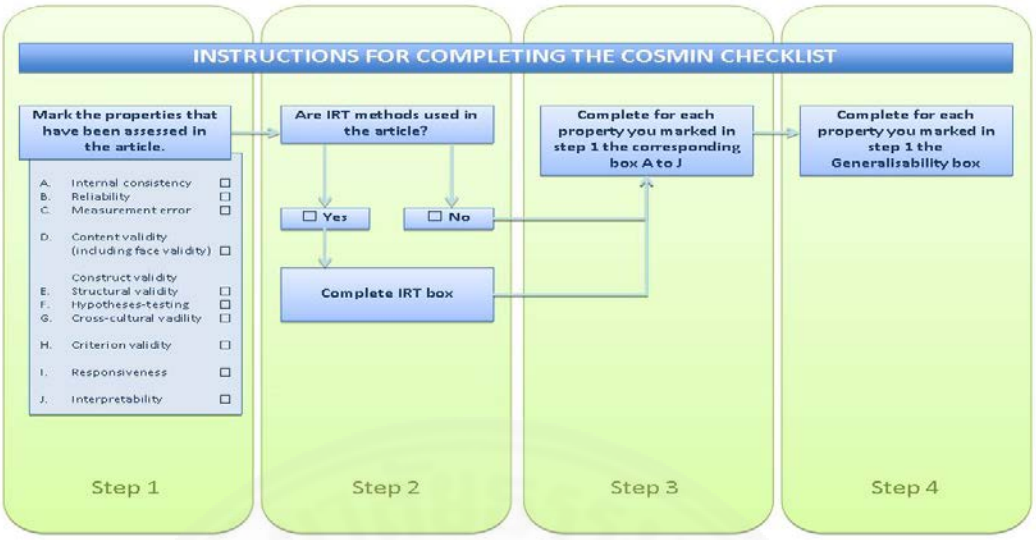


Figure 2.2 Four-step procedure for completing the COSMIN checklist (30)

Although five multidimensional skin aging assessment scales have been introduced, none has gained sufficient popularity to become widely used. Many reasons for this finding are possible. First, the terminology might be unclear and the assessment results might be complicated, requiring competent assessors with special training. For example, the term “inability to redden” (14) pigment spot (15) benign tumor (15) could be interpreted in many different ways, making it unreliable. Second, some scales might be too comprehensive for real-life clinical practice. For instance, SCINEXA covers almost all signs of aging, and of the 13 studies utilizing this scale, only 2 completed the full assessment (31, 32). However, they are complicated and dependent on competent assessors with special training. Also, some scales require permission for their use. Some scale are not various skin aging signs in multidimensional. MERZ rating scales are no signs of pigment and benign tumor. This indicates that there is currently no principal feasibility of physical examinations of skin aging adequately considered in preparation of clinical treatment.

Table 2.6 Validity and reliability of the scales and measurement by COSMIN

Scale name	Author	Name of measurement property that scale evaluated by COSMIN (7)	Paper use these scales
Skin Aging Score (SAS)	Guinot et al, 2002 (16)	Excellent Structural validity Excellent Criterion validity	(15, 16, 18, 33, 34)
SCINEXA	Vierkotter et al, 2009 (15)	Good Hypothesis testing Good Criterion validity	(7, 15, 24, 29, 32, 34-42)
N/A	Bazin and Flament, 2010 (17)	Excellent Reliability Excellent Structural validity	(17, 43, 44)
N/A	Allerhand et al, 2011 (18)	Excellent Reliability Excellent Structural validity	(18, 45)
MERZ Rating Scales	Rzany et al, 2012 (14)	Good Reliability Good Hypothesis testing Good Criterion validity	(14, 46)

CHAPTER 3
CHARACTERISTIC OF SKIN AGING

Aging is a chronological process which displays progressive loss of physiological function in multiple organs (47). Skin is the largest organ of human body that can be impacted by psychological consequence of aging (6). Skin aging process comprises of physical changes, progressive impairment in the homeostatic, clinical manifestation ultimately increasing the susceptibility to environment. Although aging progresses differ among individual depend on genetics, race, age, sex, and exposure to different external factors, the deeper understanding of mechanism, structural and function change of skin aging are important.

3.1 Mechanism of aging

Aging can take place at cellular level and shows both a genetic program and cumulative progression of biologic events. The mechanism of aging process is complex. There are many theories try to describe aging. The biological processes that decline in aging are compose of

3.1.1 Telomere shortening

Telomere is a terminal portion of chromosomes (TTAGGG) (48). According to telomere hypothesis, in aging cause of decrease telomerase to maintain telomere replicate chromosomal ends resulting in progressive shortening with each round of cell (49). The telomere shortening leads to aggregation of oxidative stress that damage tissue, resulting in multiple signs of aging (50). Telomere maintenance can be affected by reactive oxygen species, ROS. First ROS leads to damage the formation of intramolecular G quadruplexes and decreases the affinity of telomeric DNA for telomerase (51). An indirect way in which ROS interacted with the catalytic subunit of telomerase can also result in a loss of telomerase reverse transcriptase (TERT) activity (50) Moreover, ROS can activated p53, an essential regulator of cell aging. The telomere shortening is the best biomarker for cellular aging (52).

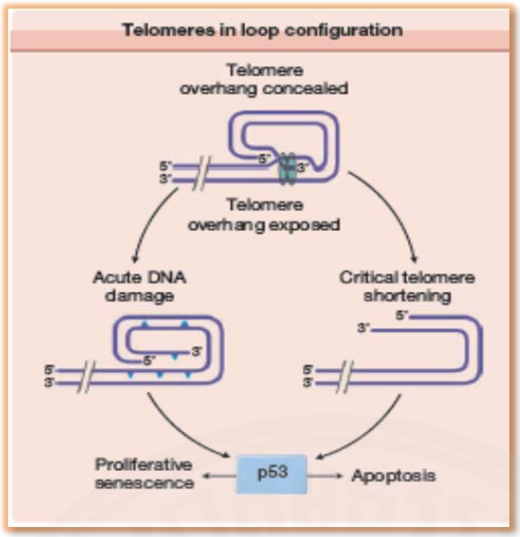


Figure 3.1 Telomeres in loop configuration (47)

3.1.2 Oxidative stress

Reactive oxygen species (ROS) are highly reactive molecules that comprise of multiple diverse chemical species such as superoxide anion, hydroxyl radical, and hydrogen peroxide (53). Generally, ROS can be generated during mitochondrial respiration and phagocytosis which will be transformed into hydroxyl group and hydrogen peroxide (54). The study shows that hydrogen peroxide can create an extremely reactive hydroxyl radical at a rapid rate which impairs DNA, proteins and lipids (55). Continuously exposure to oxidative stress from exogenous and endogenous aerobic metabolism can cause cell aging. It was concluded that one of the factors which can lead to skin aging is ROS (56).

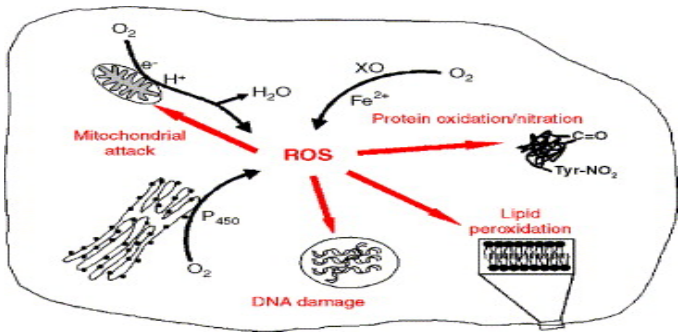


Figure 3.2 Oxidative reaction of aging process (57)

3.1.3 Mitochondrial dysfunction

Function of mitochondria are both producer and target of oxidative stress, thus greatly contributes to aging (58). Moreover, mitochondrial DNA mutation does not contain repair mechanism leading to cell susceptibility to apoptosis. It is also found that the change in the mechanisms of apoptosis can be caused by genetically programmed features and oxidative stress (59).

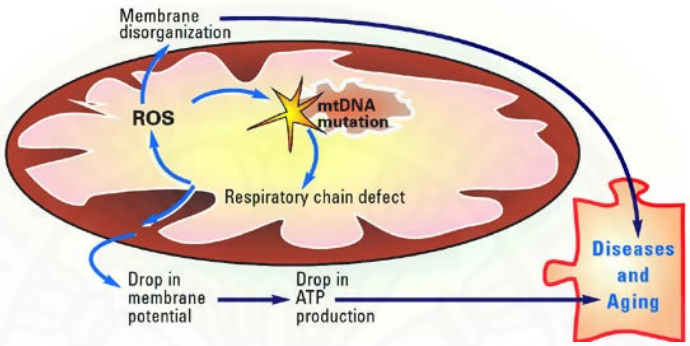


Figure 3.3 Mechanism of mitochondrial DNA mutation (60)

3.1.4 Genetic repair mechanism

The chromosome instability, cell growth arrest and apoptosis that develop oxidative stress can impact DNA repair. DNA repair mechanisms in cells can get rid of damaged segments mainly through the process of DNA in G1 and G2 phase to protect cancerous transformation (61). In a UV-induce model, DNA repair capacity in primary dermal fibroblasts of older subjects reduces in function when compared to younger groups. Moreover, a decrease in S phase can lead to skin aging (62).

3.1.5 Endocrine system dysfunction

Global aging process can impact the entire endocrine system. Some internal mechanisms affect neuroendocrine system of skin. The most significant endocrine compound produced by skin is vitamin D_3, which adjusts the biology of keratinocytes and melanocyte of the skin (63).

Growth hormone (GH) generated by liver are mainly exerted by insulin-like growth factor (IGF). GH-IGF system is a crucial influencer to the dermal and epidermal physiology. While growth hormone reduces aging, GH supplementation

can cause changes in skin condition, a part of which may correspond to some corrective effects on aging skin (64).

Sex hormones affect skin in various ways. Progesterone has been reported to have some relations to skin atrophy, dryness and wrinkle, which concerns chronological aging or photoaging (65). Estrogen and progesterone play a role in homeostasis of epidermis. Lack of estrogen can cause tissue thickness and dryness of skin by reducing MMP activity in fibroblast, decrease hyaluronic acid in dermis (66).

3.2 The structural and physiological change in aged skin

Chronologic age and solar damage are the most important intrinsic and extrinsic factors associated with skin aging. Accordingly, the visible changes found in the aging skin appearance can be a result of two main processes. First, the intrinsic change or chronological aging skin is an evitable biological process leading to structural and functional transformation caused by passage of time. Second, extrinsic factor depends on individual environment exposure and individual genetic makeup (24). Structural and physiological changes of aging may manifest differently. Intrinsic modifications include changes to the skin, subcutaneous tissue, dermal appendages, musculature, as well as the skeleton (67, 68). The skin will experience dryness and look pale with fine wrinkles showing a certain degree of laxity and a variety of benign neoplasm (15, 67). In histological changes, a marked elasticity loss, atrophy of connective tissue, reduce of extracellular matrix components, pigment diminishes are present. On the other hand, extrinsic skin aging is presented by physiologic and morphologic changes. Visible manifestations such as coarse wrinkles, solar elastosis, pigment irregularities and vascular abnormality can be found in the extrinsic skin aging process (16, 24). Extrinsic changes can superimpose the intrinsic skin aging signs in chronically environmental exposed areas (69). The most common cause of extrinsic skin aging signs is UV radiation (70). Histology of extrinsic skin aging changes are acanthotic, dysceratotic with high proliferation index of keratinocytes, dysplasia of melanocyte and loss of Langerhans cell.

Table 3.1 Structural change of skin aging

Feature	Intrinsic aging	Photoaging
Epidermis	Thin and viable	Acanthosis
Elastic tissue	Increase normal tissue	Mark increase, elastotic amorphous mass
Collagen	Thick, disoriented bundles	Marked decrease of bundles and fibers
Glycosaminoglycan	Slightly decreased	Markedly increased
Reticular dermis	Thin fibroblasts decreased, inactive mast cells decreased, no inflammation	
Papillary dermis	No solar elastosis	Solar elastosis
Microvasculature	Moderate loss	Great loss, abnormal and telangiectatic
Subcutaneous fat, muscle and bone	Reduced mass with age	Unaffect
Hair	Hypertrichosis, Gray hair	Discoloration

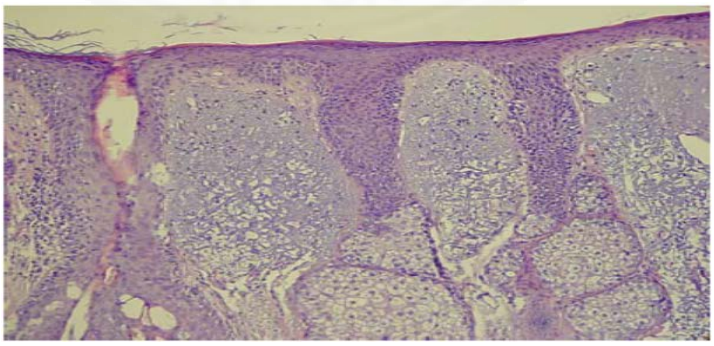


Figure 3.4 Histologic change of skin aging by photo damage (6)

CHAPTER 4
SKIN AGING MANIFESTATION

Different skin aging process leads to distinctive skin aging signs (6). Skin aging depend on genetics, race, age, sex, and exposure to different external factors. Cutaneous aging comprises two different situations (68). As previously mentioned, intrinsic changes include those to the skin, subcutaneous tissue, dermal appendages, musculature, as well as the skeleton (67, 68). Dry and pale skin with visible wrinkles can be found with a certain degree of laxity and a variety of benign neoplasm (15, 67). In contrast, extrinsic skin aging can be shown in various signs depending on individual environment exposure and individual genetic makeup (24). The examples of such signs are rough wrinkles, solar elastosis, pigment irregularities and vascular abnormality (16, 24). Extrinsic changes can superimpose the intrinsic skin aging signs in chronically environmental exposed areas (69). UV radiation can be traced back as a typical cause of extrinsic skin aging signs (70). Ethnic backgrounds are another important factor that differentiates clinical and functional manifestations in skin aging (3, 5, 36). This section is for review skin aging signs that in all ethnicities.

4.1 Skin aging signs (8, 20, 68, 71-73)

4.1.1 Static Wrinkle

4.1.1.1 Superficial wrinkles

Clinical description: Fold, ridge or crease in the skin. Fine wrinkles improved by stretching (68).

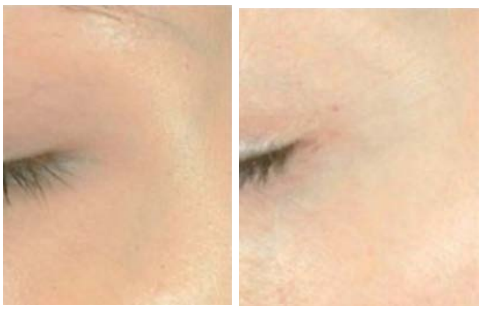


Figure 4.1 Superficial wrinkle (74)

4.1.1.2 Deep wrinkle

Clinical description: Wrinkles not improved by stretching (68).

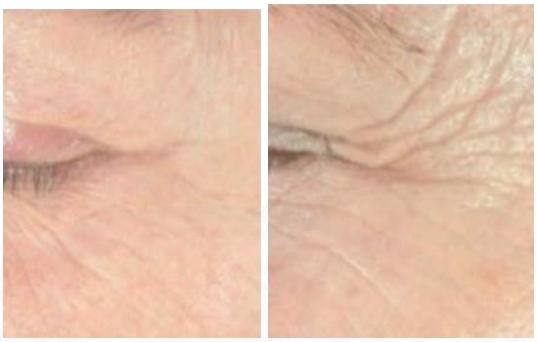


Figure 4.2 Deep wrinkles (74)

4.1.1.3 Criss-cross wrinkles

Clinical description: Deep, crossing lines (8).

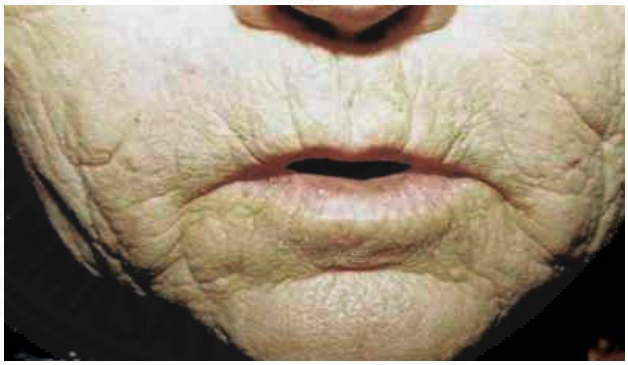


Figure 4.3 Criss-cross wrinkles (23)

4.1.2 Sagging

4.1.2.1 Reduce fat tissue

Clinical description: Decrease of subcutaneous fat from certain facial regions, such as the forehead, preorbital, buccal, temporal, and perioral regions, including the jowls, nasolabial folds, and lateral malar areas (68).

Figure 4.4 Reduce fat tissue (5)

4.1.2.2 Nasolabial fold

Clinical description: Fatty tissue was increased in nasolabial area (71)

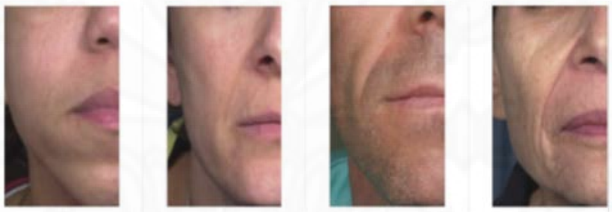


Figure 4.5 Nasolabial fold (75)

4.1.2.3 Eye bag

Clinical description: Mild swelling or puffiness under the eyes (68)**.**

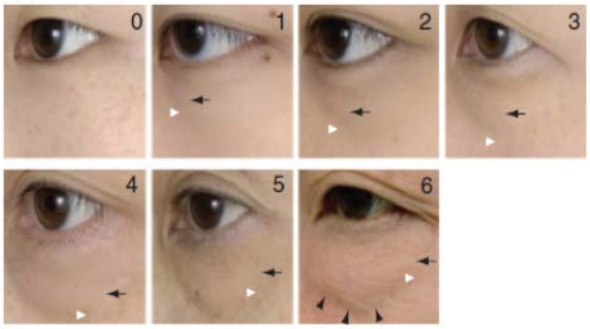


Figure 4.6 Eye bag (76)

4.1.2.4 Folds drooping or ptosis of Eyelids

Clinical description: Drooping or falling of the upper eye lid (73).

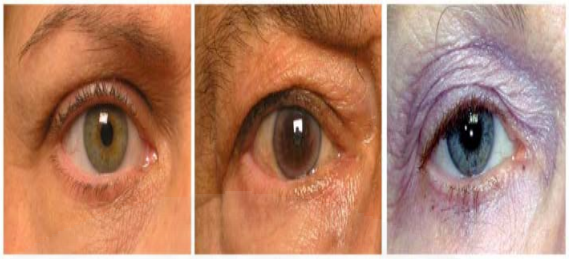


Figure 4.7 Ptosis of eyelids (77)

4.1.3 Decrease elasticity of skin

4.1.3.1 Yellowish discoloration

Clinical description: Abnormal, yellowish, nonfunctional elastotic material accumulation in the upper dermis (71).

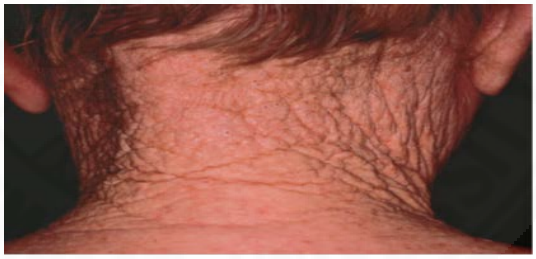


Figure 4.8 Yellowish discoloration (68)

4.1.3.2 Tissue slackening or lax appearance

Clinical description: Skin that is no longer firm or tight (71).

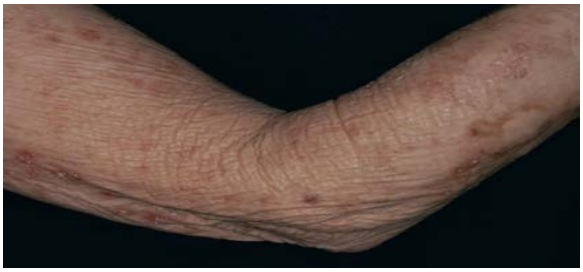


Figure 4.9 Lax appearance (71)

4.1.3.3 White linear areas of scarring (pseudoscar)

Clinical description: Irregular healing of easily torn, fragile skin (71).

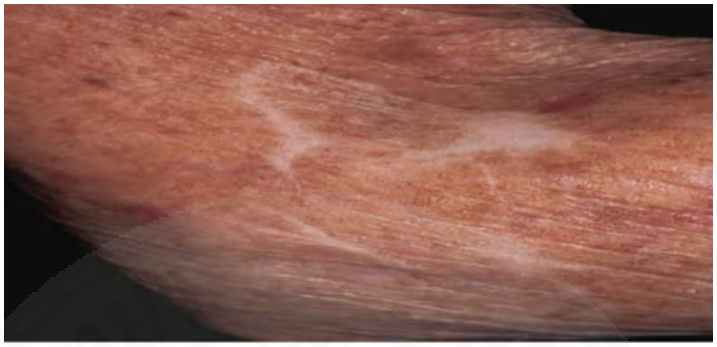


Figure 4.10 White linear areas of scarring (71)

4.1.3.4 Solar elastosis

Clinical description: Thickening as well as yellow discoloration of the skin in chronically sun-exposed areas, often in association with marked wrinkling and most commonly seen on the face (71).

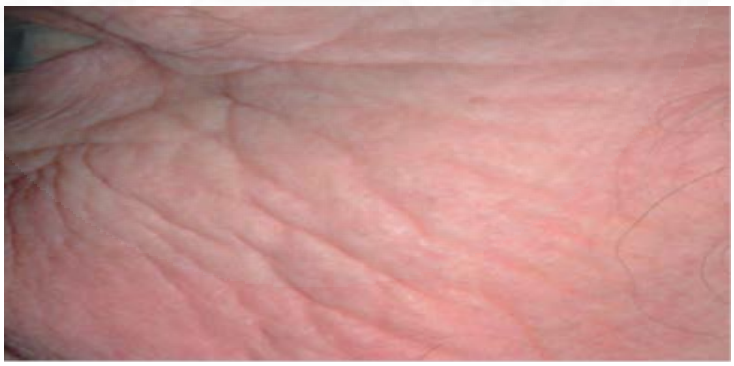


Figure 4.11 Solar elastosis (71)

4.1.4 Abnormality of skin pigmentation

4.1.4.1 Freckles

Clinical description: A small patch of light brown color on the skin, often becoming more pronounced through exposure to the sun (68).

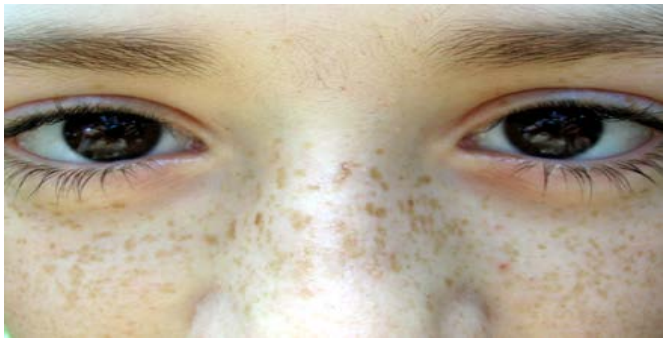


Figure 4.12 Freckles (71)

4.1.4.2 Lentigines

Clinical description: Lesions consist of hyperpigmented macules and may be isolated, agminated (focal cluster), or multiple and present on skin, nails, and mucous membrane (71)**.**

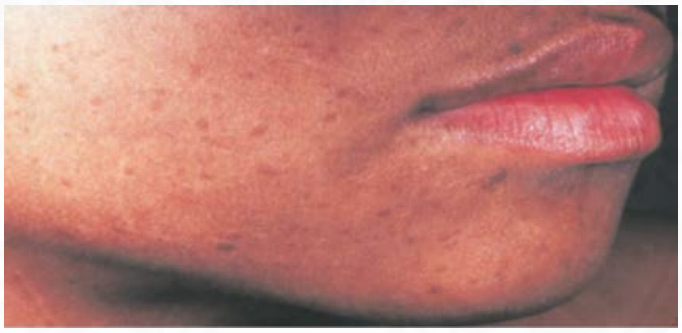


Figure 4.13 Lentigines (71)

4.1.4.3 Solar lentigine

Clinical description: Circumscribed brown macule resulting from a localized proliferation of melanocytes due to acute or chronic exposure to sunlight (68).

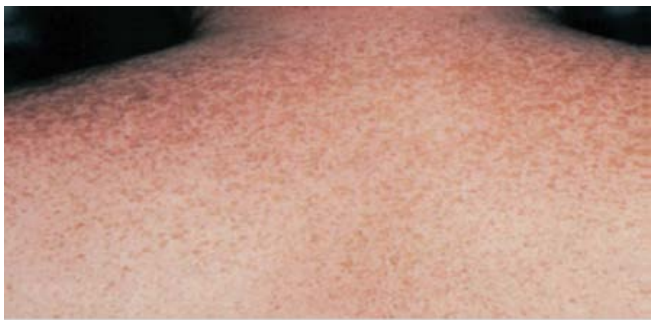


Figure 4.14 Solar lentigine (68)

4.1.4.4 Melasma

Clinical description: Brownish macules with irregular borders and symmetric, photo distribution usually on the face, often coalescing in a reticular pattern (72).

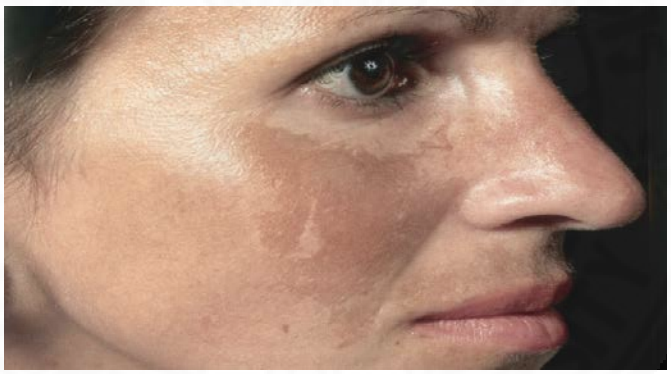


Figure 4.15 Melasma (72)

4.1.4.5 Uneven pigment (Hypo-hyperpigmentation)

Clinical description: Diffuse irreversible hyper and hypopigmentation in the form of mottled hypo-hyperpigmentation (68).

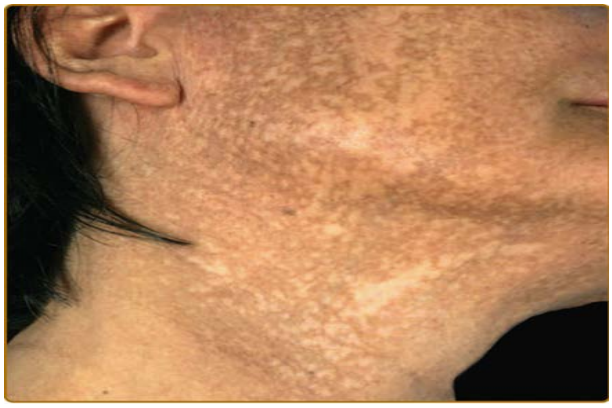


Figure 4.16 Uneven pigment (68)

4.1.4.6 Guttate hypomelanosis

Clinical description: Multiple, discrete round or oval, porcelain-white macules on sun-exposed areas (68, 71, 73)

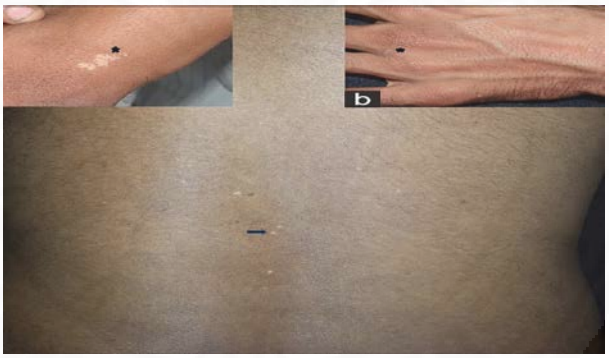


Figure 4.17 Guttate hypomelanosis (78)

4.1.4.7 Poikiloderma of Civatte

Clinical description: Reticulated red to red–brown patches with telangiectasias that spare perifollicular skin. It is typically found on the lateral aspects of the neck in fair-skinned individuals with significant cumulative sun exposure (71).

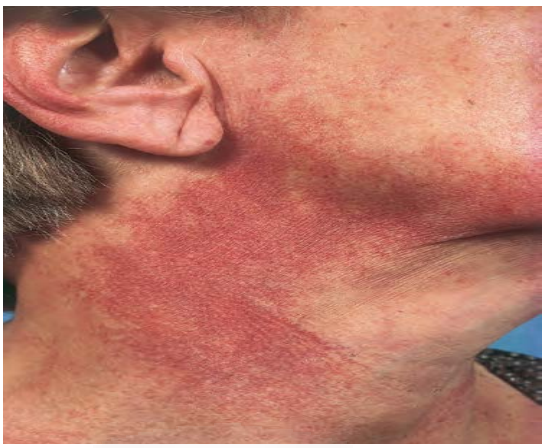


Figure 4.18 Poikiloderma of Civatte (71)

4.1.5 Vascular skin lesion

4.1.5.1 Venous lakes

Clinical description: A dark blue to violaceous asymptomatic, soft papule resulting from a dilated venule (72).

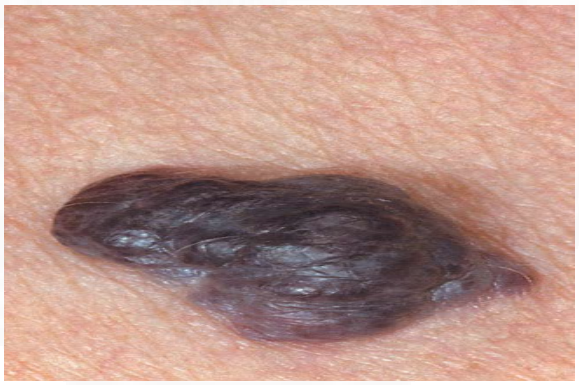


Figure 4.19 Venous lake (72)

4.1.5.2 Senile purpura

Clinical description: A rash of purple spots on the skin caused by internal bleeding from small blood vessels (71).

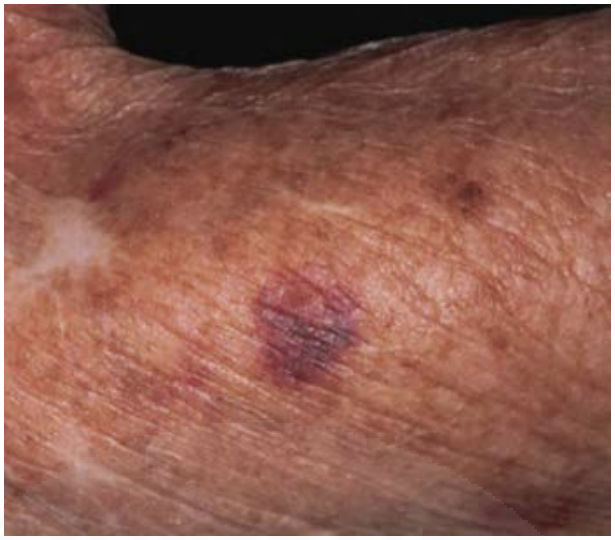


Figure 4.20 Senile purpura (71)

4.1.5.3 Telangiectases

Clinical description: Small dilated blood vessels near the surface of the skin or mucous membranes, measuring between 0.5 and 1 millimeter in diameter (68).

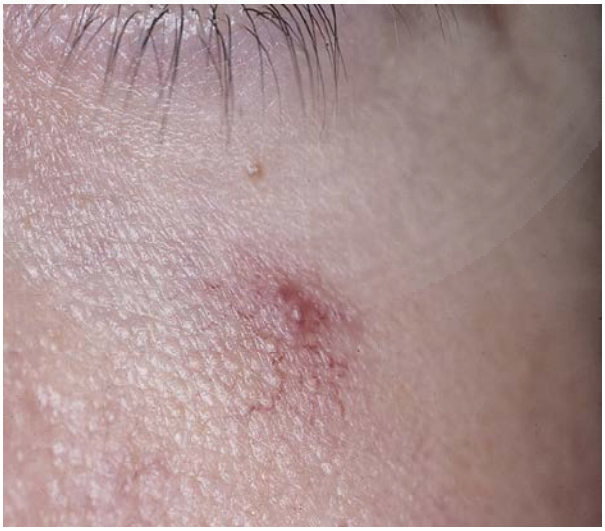


Figure 4.21 Telagiectases (72)

4.1.6 Benign tumor, cyst and pseudocyst

4.1.6.1 Milia

Clinical description: Translucent yellow papules that measure 1–3 mm in diameter. There are usually numerous, closely spaced lesions in chronically sun-exposed sites, especially the neck, face and dorsal hands (72).

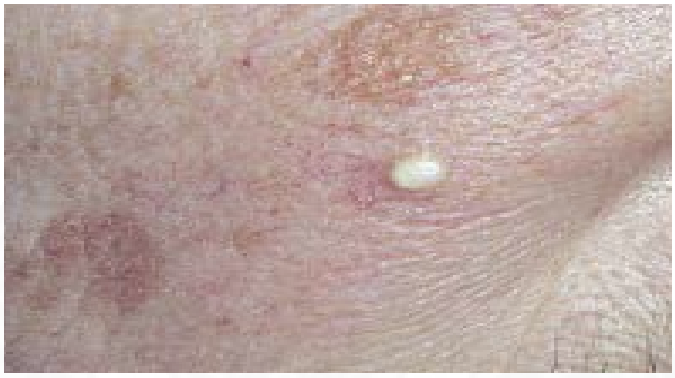


Figure 4.22 Milia (72)

4.1.6.2 Sebaceous hyperplasia

Clinical description: 1 to 3 mm in diameter soft to palpation, not firm in nodular, possible to elicit a very small globule of sebum and have both telangiectasia and central umilication (72).

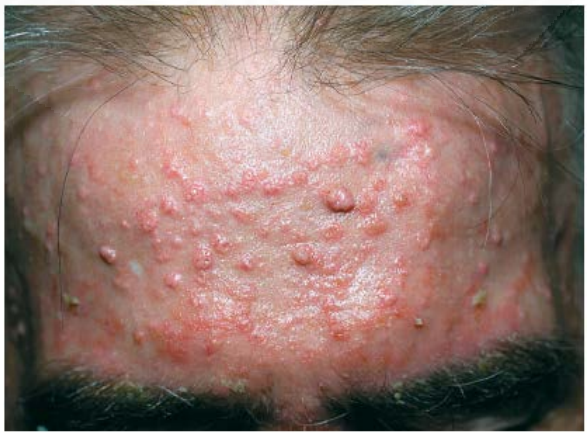


Figure 4.23 Sebaceous hyperplasia (72)

4.1.6.3 Senile comedones

Clinical description: Periorbital, localized, non-inflamed, open and closed comedones. The eruption is usually bilaterally symmetrical but can be more visible on one side which is more exposed to thesun. No inflammation is present, unlike the comedones seen in acne vulgaris (73).

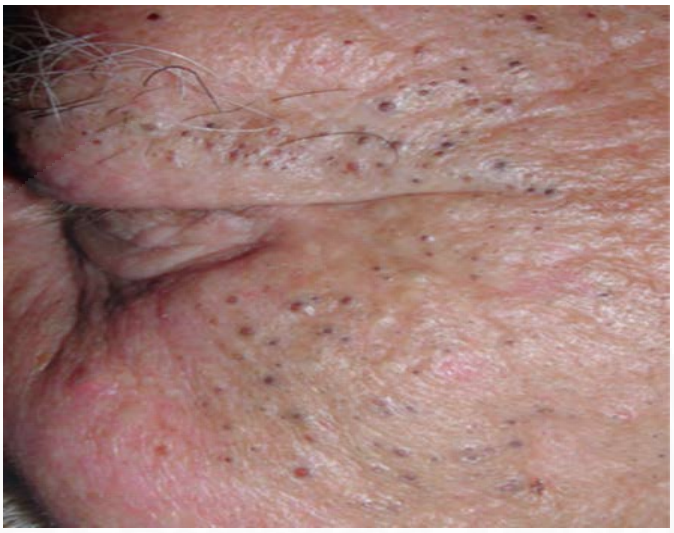


Figure 4.24 Senile comedone (71)

4.1.6.4 Favre racouchot

Clinical description: Multiple open comedones that are widened openings for hair follicles and sebaceous glands filled with material (68).

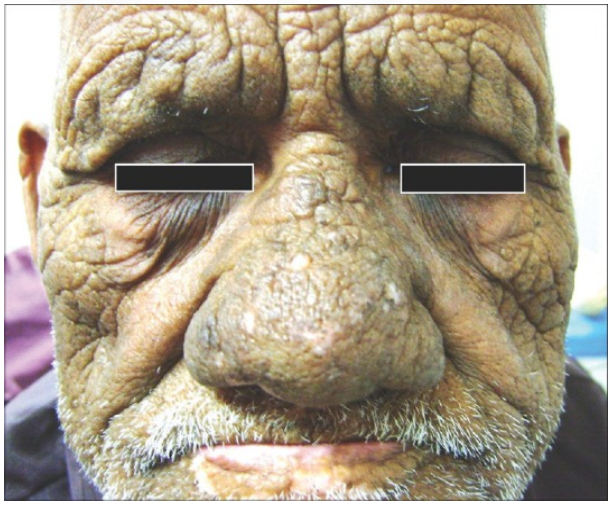


Figure 4.25 Favre recouchot (79)

4.1.7 Precancerous

4.1.7.1 Actinic keratosis

Clinical description: A single or multiple, discrete, dry, rough, adherent scaly lesions occur on the habitually sun exposed skin of adults, usually on a background of dermatoheliosis (72).

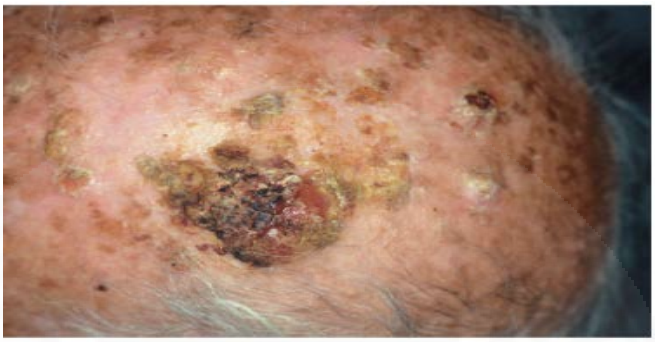


Figure 4.26 Actinic keratosis (72)

4.1.8 Malignancy

4.1.8.1 Squamous cell carcinoma

Clinical description: Solitary or discrete multiple macules, papules, or plaques, slowly enlarging, pink to erythematous thin plaque with well-demarcated, irregular borders and overlying scale or crust which may be hyperkeratotic or scaling (72).

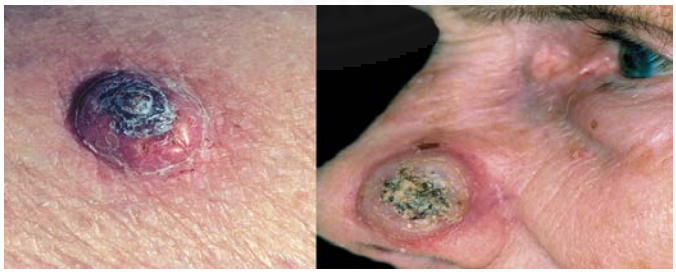


Figure 4.27 Squamous cell carcinoma (72)

4.1.8.2 Basal cell carcinoma (72)

Clinical description: There are five clinical types: nodular, ulcerating, sclerosing (cicatricial), superficial, and pigmented.

- Nodular BCC: Papule or nodule, translucent or “pearly.” Skin-colored or reddish, smooth surface with telangiectasia, well defined, firm.

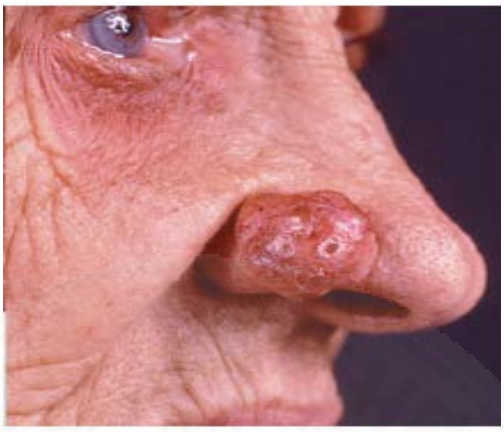


Figure 4.28 Nodular BCC (72)

- Ulcerating BCC: Ulcer (often covered with a crust) with a rolled border (rodent ulcer), which is translucent, pearly, smooth with telangiectasia, and firm.

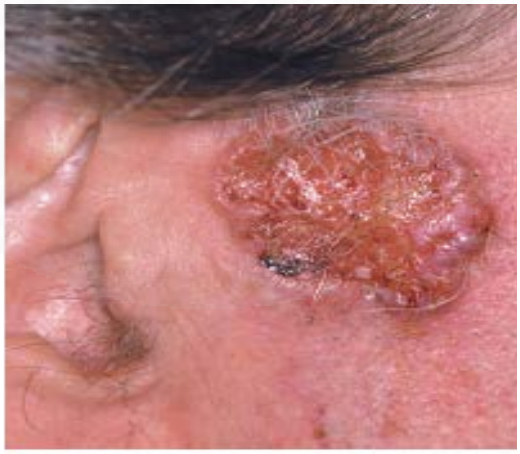


Figure 4.29 Ulcerating BCC (72)

- Sclerosing BCC: A small patch of morphea or a superficial scar, often ill defined, skin-colored and whitish but also with peppery pigmentation.

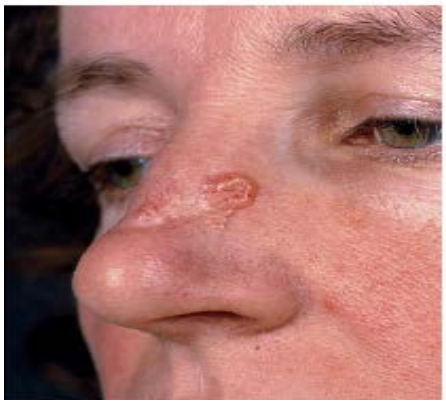


Figure 4.30 Sclerosing BCC (72)

- Superficial multicentric BCCs: Appear as thin plaques. Pink or red; characteristic fine threadlike border and telangiectasia can be seen with the aid of a hand lens. No other form of BCC can present a considerable amount of scaling. This can also give rise to nodular and ulcerating BCC.

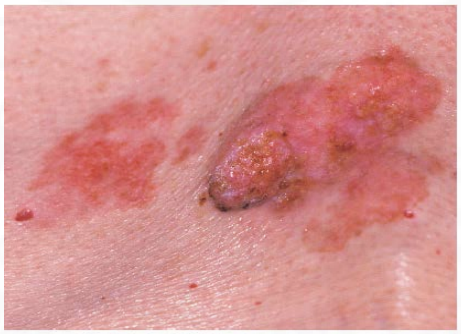


Figure 4.31 Superficial multicentric BCC (72)

- Pigmented BCC*:* May be brown to blue or black. Smooth, glistening surface; hard, firm; may be indistinguishable from superficial spreading or nodular melanoma but is usually harder.

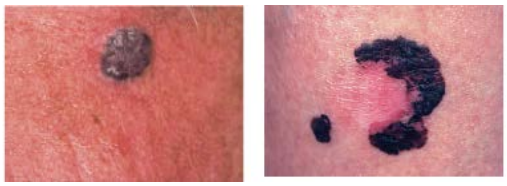


Figure 4.32 Pigmented BCC (72)

4.1.8.3 Malignant melanoma

Clinical description: Six Signs of Malignant Melanoma (ABCDE Rule) **A** *Asymmetry* in shape—one-half unlike the other half, **B** *Border* is irregular, **C** *Color* is not uniform; mottled haphazard display of colors; all shades of brown, black, gray, red, and white, **D** *Diameter* is greater than 6.0 mm; others use D for “ugly duckling” sign: lesion is different with respect to change in size, shape, color, **E** *Elevation* is almost always present and is irregular surface distortion assessed by side-lighting. Melanoma in situ and acral lentiginous lesions initially macular. Others use E for *Enlargement* which refers to a history of a size enlargement of lesion is one of the most important signs of malignant melanoma (72).

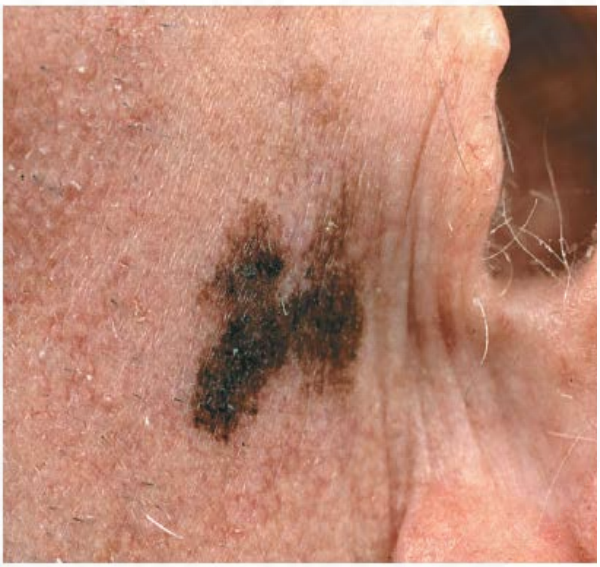


Figure 4.33 Malignant melanoma (72)

4.1.9 Others

4.1.9.1 Xerosis (dry skin)

Clinical description: Dull color (usually gray white), rough texture, and an elevated number of ridges of skin (71).

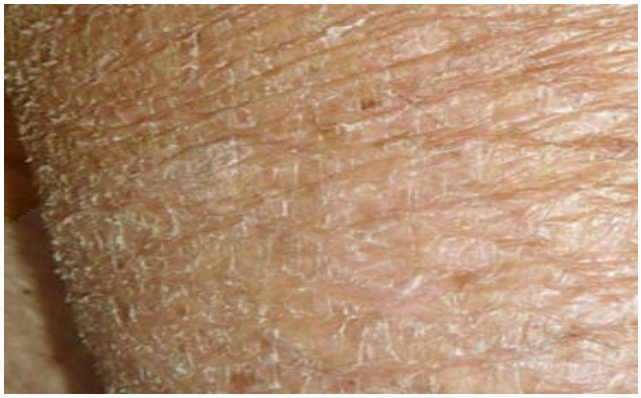


Figure 4.34 Xerosis (72)

4.1.9.2 Erosive pustular dermatosis

Clinical description: sterile pustules, crusts, erosions and mild inflammation arising within the photodamaged skin of a bald scalp (71).

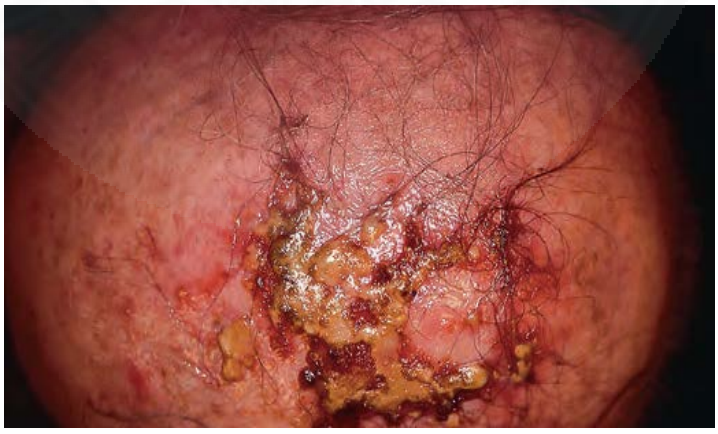


Figure 4.35 Erosive pustular dermatosis (71)

Table 4.1 Skin aging signs and published evidence

Skin aging signs	Paper assess these signs
Static Wrinkle - Superficial wrinkles - Deep wrinkles - Criss-cross wrinkles	(14-18, 24, 28, 35, 43, 80-98)
Sagging - Reduce fat tissue - Nasolabial fold - Eye bag - Folds drooping or ptosis of Eyelids	(14-16, 18, 43, 80, 84, 90, 92, 99, 100)
Decrease elasticity of skin - Yellowish discoloration - Tissue slackening or lax appearance - White linear areas of scarring &pseudoscar' - Solar elastosis	(15-17)
Abnormal skin pigmentation - Freckles - Lentigines - Solar lentigine - Melasma - Uneven pigment (Hypo-hyperpigmentation) - Guttate hypomelanosis - Poikiloderma of Civatte	(14-18, 43, 84, 91, 94)
Abnormality of vascular - Venous lakes - Purpura - Telangiectases	(15, 16)
Benign tumor, cyst, pseudocyst - Milia	(14-18, 84-86)

Skin aging signs	Paper assess these signs
- Sebaceous hyperplasia - Senile comedones - Favre racouchot	
Precancerous - Actinic keratosis	(15)
Malignancy - Squamous cell carcinoma - Basal cell carcinoma - Malignant melanoma	(15)
Other - Xerosis &ry skin' - Erosive pustular dermatosis	(15)

CHAPTER 5
KNOWLEDGE, ATTITUDE AND PRACTICES MODEL

5.1 Definition of KAP survey model

A Knowledge, Attitude and Practices (KAP) survey is a quantitative method (predefined questions formatted in standardized questionnaires) that provides access to quantitative and qualitative information (101). Originally, the KAP survey was implemented for family planning and population studies in the 1950s (102). It is recommended, for best results, to use this method of survey in early phases of the project and again after the intervention is completed (103).

5.1.1 Knowledge

The term knowledge refers to the capacity to gather, retain and use information; a mixture of comprehension, experience, discernment and skill (104)

5.1.2 Attitude

Attitude means feelings towards a subject, as well as any preconceived ideas that towards it. Attitude has been defined as a relatively enduring organization of beliefs around an object, subject, or concept which predisposes one to respond in some preferential manner. Attitude includes three components (83)**:**

5.1.2.1 A cognitive or knowledge element

5.1.2.2 An affective or feeling element

5.1.2.3 A tendency to action

5.1.3 Practice

Practice is the method of knowledge and attitude demonstration through actions (85).

Appropriate programs for the community can be efficiently created if the levels of Knowledge, Attitude and Practice can be comprehended.

Table 5.1 KAP measurement

	Measurement
Knowledge	**Perceived knowledge**: "feeling of knowing" of an elusive item in memory, the more time one will spend searching for that item before giving up (71,72)
	Actual knowledge: Determining whether a person recognizes that he/she knows or does not know something have not been incorporated into the concept of knowledge measurement and assessment of people's knowledge (73)
Attitude	**Direct Measurement**: People are critical to accept conclusions that are consistent with their attitudes (74)
	Indirect Measurement: People are less critical to accept conclusions that are consistent with their attitudes (75)
Practice	**Learning and change in practice, Personal practice**

Table 5.2 Advantage and disadvantage of KAP model

Advantage	**Disadvantage**
1. Useful when conducted in the early phases of the project (101)	1. Lack of standardized approach to validate findings (101).
2. Findings of an initial, qualitative investigation (e.g. observation and focus group discussions) to explore several potential impacts on behavior (104)	2. Data can be hard to interpret accurately: The reliability of the data can be easily influenced by underlying contextual and cultural factors (110)
3. The relation of social, cultural and economic factors that may affect health and the application of public health initiatives (110)	3. Analyst Biases in KAP Surveys : Cultures and languages different has been as a potential methodological problem (111).

CHAPTER 6
SKIN AGING IN THAILAND

Thailand is located in the tropical zone at l 15° 00' North latitude and 100° 00' East longitude (112). UV index exposure category is very high (10-13) (113). Most of the Thais have Fitzpatrick skin type IV (114). The low latitude and the high temperatures in Bangkok results in high levels of UV exposure (115). There are very few reports on skin aging signs from Thailand. A study shows that women in Bangkok have the most severe level of wrinkles compared to those in Shanghai and Tokyo (95). The instruments for assessment of skin aging sign varies such as physical exam, 3D cameras, skin color measurement and others (116, 117). The scaling is a visual scoring method which relies on the visual impression of a specialist and thus is highly subjective. Although there are many scales for evaluating skin aging signs, the majority of the scales were unknown. Most of skin aging scales are used to evaluate only partial items and specific areas, although the factual signs of skin aging are greater, as shown in comedone, premalignancy and malignancy lesions, and vascular malformation. The benefit of covering every sign of skin aging scales might be more appropriate to quantify skin aging because they can cover a variety of problems (118). The coverage includes the assessment of all lesions, awareness of premalignancy and malignancy lesions, approximate factors of skin aging sign and baseline skin aging among the Thais in the future.

There is currently no evident standard score to evaluate skin aging signs in Thailand. References to complete clinical scale can be used for precise quantification of the aging degrees. This method will lead to prompt and accurate diagnosis and determination of specific preventive or corrective treatments. However, the interpretation of constructs and scale description might be subjective. Hence, precise definitions of applied concepts and sign descriptions are vital.

CHAPTER 7
RESEARCH METHODOLOGY

7.1 Study sample

7.1.1 Target population

All certified and noncertified dermatologists are recruited at dermatological society of Thailand for this study. Respondent were identified as dermatologist by screener question at the start survey.

7.1.2 Sample size

A total of 233 are recruited for this study. The sample size is calculated using the following formula (84).

$$n = \frac{[Z_a^2 NP(1- P)]^2}{Z_a^2 P(1- P) + Ne^2}$$

n = Sample size

N = Population size = 585

P = Response distribution = 0.50 (Conservative approach)

Type I error = 1.965

7.1.3 Inclusion criteria

- Certified dermatologists, physicians who graduated in dermatology field including board certification, Doctor of Philosophy in Dermatology, Master of Science in Dermatology, and Fellowship and Diploma in Dermatology

- Non certificate dermatologists who work in dermatology field

7.1.4 Exclusion criteria

- Thai Dermatologists who refuse to participate

- Dermatologists who cannot be contact

- Thai Dermatologists who work in other fields

7.2 Instrument Development

The name of the instrument is Knowledge, Attitudes and Practice of Thai Dermatologist Skin Aging Assessments (KAP-TDS). The KAP-TDS measures the perceived knowledge, attitudes, practice, education, and confidence as well as the role of dermatologists regarding skin aging assessments.

7.2.1 Development of the questionnaire

7.2.1.1 Selected signs of skin aging

Items will be developed based on a review of the literature and standard textbook of dermatology. A simple search of PubMed and Scopus databases for existing skin aging assessment scales published from 1970 to 2016 identified 114 scales Only 5 are highly methodology qualification. All skin signs of the 5 COSMIN-qualified scales were reviewed, along with major textbooks (68, 71) used in dermatology training in Thailand. The redundant and nonspecific signs were excluded. To ensure scale simplicity, skin signs that required facial expression or were localized to specific facial areas were excluded (Figure 7.1). Therefore, 29 signs with published evidence of their relevancy to skin aging were included.

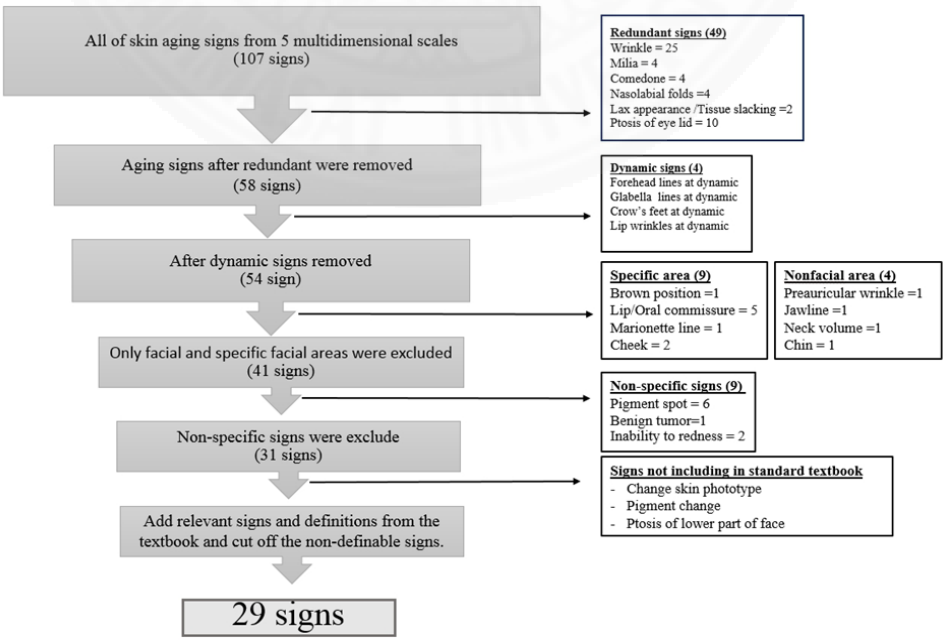


Figure 7.1 Flow Diagram of skin aging signs selection process

Table 7.1 List of 29 Signs and Relevant Sources

NAME OF SKIN AGING SCALES	SAS	SCINEXA	MERZ	N/A	N/A	Text book
AUTHORS / SKIN AGING SIGNS	Guinot et al (16)	Vierkotter et al.(15)	Rzany et al. (16)	Bazin et al.(17)	Allehand et al.(18)	Yaar et al. (68) Lim et al(68, 71)(71)
Wrinkle - Superficial	O	O	O	O	O	O
Wrinkle - Deep	O	O	O	O	O	O
Wrinkle - Criscross						O
Reduce fat tissue		O				O
Nasolabial folds	O	O	O	O	O	O
Eye bag	O			O	O	O
Ptosis of eyelids	O				O	O
Yellowish discoloration		O				O
Lax appearance/Tissue slacking	O	O			O	O
Solar elastosis		O				O
Pseudoscar		O				O
Cutis Rhomboidalis Nuchae		O				O
Freckles		O				O
Solar lentigines		O				O
Melasma		O				O
Uneven Pigment/Pigment spot		O		O	O	O
Guttate hypomelanosis						O
Venous lakes						O
Senile Purpura						O
Telangiectasias		O				O
Milia	O	O			O	O
Sebaceous hyperplasia						O
Senile comedone	O					O
Favre-Racouchot syndrome		O				O
Actinic keratosis		O				O
Xerosis		O				O
Squamous cell carcinoma		O				O
Basal cell carcinoma		O				O
Malignant melanoma		O				O

7.2.1.2 Questionnaires designs

Based on the findings of the study, a questionnaire was developed to comprise five sections. The questionnaire design was assessed by five expert dermatologists. The assessment scale will limit the results to each individual, without allowing them to communicate with each other. Five sections (Table7.2) are covered dermatologist knowledge, their perspective and their practice in skin aging signs. Section 1, Dermatologists were asked about the general demographics of the respondents. Section 2 were explored the perceived knowledge of the respondent. Section 3 asked about a context that influence skin aging assessment. Section 4 asked responders' opinion about essential sign for assessment in each items. Section 5 related to the responders' practice.

Section 2,3,4 each subscale is measured with typical five-level Likert items in the questionnaire, consisting of Strongly disagree, Disagree, Neither agree nor disagree, Agree, or Strongly agree (119).

Section 5 Part Skin assessment using answer with Yes or No.

Table 7.2 Interview guide

Section 1	Demographic Data Form	- The respondents will be given demographic 7 questions before the interview (Appendix A). - Data collection includes: gender, age, work setting, work experience, and current knowledge update.
Section 2	Knowledge Form	- 32 items assess the perceived knowledge of respondents (Appendix B). - 29 items assess their knowledge about skin aging signs. - 3 items assess a partial score for evaluation of skin aging.
Section 3	Context Form	- 4 items to assess in different contexts skin aging assessment; time, number of patient per day, individual factors (Appendix C).

Section 4	Attitude Form	- 29 items to assess the attitude of respondents about the essential signs of skin aging (Appendix D).
Section 5	Practice Form	- 25 items to assess their practice regarding skin aging. - 9 items about their practice assessment (Appendix E). - 16 items about practice procedures (Appendix F).

7.3 Research design

This is descriptive research, cross sectional survey. This survey was carried out over about 3 months from October to December 2016 at Thammasat University Hospital, Thailand Tobacco Monopoly Hospital. This study was in approval process by the ethical committee of Human Research Ethics Committee of Thammasat University (No: 1 Faculty of Medicine) and informed consent will be taken from all the participants. Confidence and privacy of participants will be ensured by excluding identification details form the study instrument.

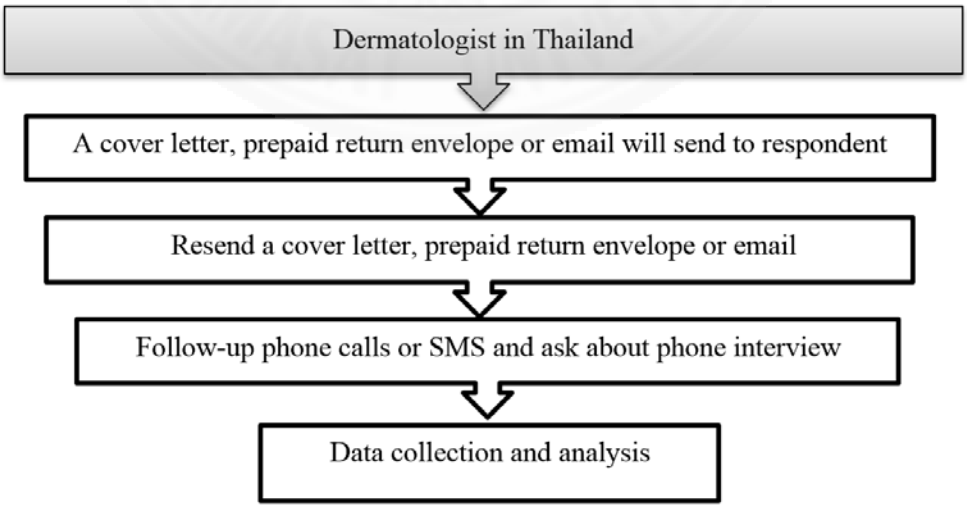


Figure 7.2 Research design component

7.3.1 Procedure

Issuing an official introduction letter, summary of the study proposal and a statement of proposal from the CICM, and sending these to the Dermatology Society of Thailand. Attaining the name, contact address, phone number and/or e-mail address of all dermatologists in Thailand from the Dermatology Society of Thailand. Participants were further selected according to the inclusion and exclusion criteria. Developing a comprehensive questionnaire regarding the demographic data, perceived knowledge about skin aging signs, their attitude and services offered. A link to the survey (https://bit.ly/KAP-TDS) was distributed to 30 dermatologists by e-mail and a mailed letter (with prepaid return envelope) as a pilot cohort for the assessment of the questionnaire reliability. A link to the survey (https://bit.ly/KAP-TDS) was distributed to all dermatologists by e-mail and a mailed letter (with prepaid return envelope). All responses will be summarized and analyzed Intervention and follow up

Figure 7.3 A link to the survey (https://bit.ly/KAP-TDS)

7.4 Data collection

The questionnaire was mailed to the target dermatologists by e-mail or a mailed letter (with prepaid return envelope) with a link to a Google form (https://bit.ly/KAP-TDS). Dermatologists were requested to return the questionnaire within two weeks. Those who did not do so are defined as non-respondents. After 2 weeks, the questionnaire was resent along with a cover letter and prepaid return envelope or e-mailed to non-respondents. After 4 weeks, follow-up phone calls will be made to ask for a phone interview.

7.5 Data analysis

7.5.1 Descriptive demographics

Appropriate statistical tests, the Pearson chi-square and Student's t-test, will be used to analyze categorical and continuous variables, respectively.

7.5.2 Exploratory Factor Analysis (EFA)

Together with their knowledge and experience, Thai dermatologists use Exploratory factor analysis (EFA) to analyze and explore the essential signs of skin aging. EFA was chosen because the aim of this process is to identify linear group combinations of items that identify the optimal number of factors. The Kaiser-Guttman criterion(120) and scree test (121) were used to explore the optimal number of factors, which were used as an input for repeated EFA. Then, the factors were rotated to evenly spread the variability, so that all solutions were relatively the same. Items with high uniqueness were removed, whereas the remaining items had high factor loading, which should be at least 0.70, as this corresponds to approximately half of the variance of the variable being explained by the factor of interest. The retained items were grouped into factors, each of which was named based on the member items. Orthogonal (varimax) and oblique (promax) rotation provided similar outcomes. However, we chose to go with the latter due to the possible non-independent nature of the factors. An initial reliability test and item-based statistical analysis also were performed together with

EFA.(122) Stata/SE version 13 (StataCorp) was used for all statistical calculations. P-values of <0.05 were considered statistically significant.

Table 7.3 Data analysis

	Multivariate data	Quantitative data
Data summarization	EFA	Mean Standard deviation Median Interquartile
Test of difference	Kaiser-Guttman Scree test Parallel test	Person chi-square Student's t-test

CHAPTER 8
RESULTS

8.1 Demographic characteristics of respondent

According to the demographic data of all dermatologists showing in the table 8.1, 213 respondents were female (70.4%). The mean ± SD age was 33.78 ± 7.47 years and the median age of these respondents was 33.78 years. They work at medical service centers as follows: private clinics (54.5%), medical schools (27.7%), private hospitals (22.1%), and public hospitals (17.37%). The mean ± SD work experience was 6.74 ± 6.74 years. The result of this study also reveals the mean ± SD of the participation in international conference, that the respondents attend each year, 2.66 ± 2.36 times.

Of 213 randomly selected dermatologists, 145 responded to the survey (response rate, 68.1%) were certified dermatologist. 75% of respondents were female, and mean age was 35.2 years. Ages of non-certified and certified dermatologist were significantly differed (0.0002).

Most of the respondents worked at private clinics (54.5%), compared with 27.7% who work at medical schools, 17.37% at public hospitals, and 22.1% at private hospitals. The median work experience was 6.74 years, and they attended approximately 3 international conferences annually on average.

The Demographic data showed that other 68 respondents (31.9%), who were included in this study, had been classified as non-certified dermatologists and 43 of them were female (63.24%). The mean ± SD age of these non-certified dermatologists was 30.45 ± 6.10 years. Workplaces of this group of the respondents were private clinics (72.06%), medical schools (19.12%), private hospitals (5.88%), and public hospitals (5.88%) respectively. The mean ± SD work experience was 4.67 ± 5.94 and was expected to annually attend international conference 2.18 ± 2.23 times. Work settings of non-certified and certified dermatologist were significantly differed (0.002).

Table 8.1 Demographic Data

Variables	Statistics data (213)	Certified (145)	Non Certified (68)	P-value
Age				
Mean ± SD.	33.78 ± 7.47	35.20 ± 7.5	30.45 ± 6.10	< 0.001
[Min, Max]	[25, 62]			
Sex				
Female	150 (70.4%)	107 (74.83%)	43 (63.24%)	0.116
Working experience				
Mean ± SD.	6.74 ± 6.74	7.7 ± 6.89	4.67 ± 5.94	0.002
Min, Max	[0, 42]			
Workplace setting				0.002
Medical School	27.7%	31.72%	19.12%	0.055
Public Hospital	17.37%	22.76%	5.88%	0.002
Private Hospital	22.1%	29.66%	5.88%	0.001
Private Clinic	54.5%	46.21%	72.06%	< 0.001
International conference per year	2.66 ± 2.36	2.90 ± 2.39	2.18 ± 2.23	0.038

P-value corresponds to Independent t-test.

8.2 Attitude of dermatologist for essential signs of skin aging

8.2.1 Baseline characteristics

More than half of certified and noncertified dermatologist thought all signs of skin aging were essential by selected strongly agree and agree The answer of respondents who selected strongly agree of malignant lesion are more than 70 percent (Table 8.2). The average percentage Likert's scales of each signs were between 67.74 and 86.51 (Figure 8.1). Deep wrinkle was the highest score, 4.33. Milia was the lowest score, 3.39.

Table 8.2 Baseline characteristic attitude about essential signs of skin aging

Skin aging signs	Strongly disagree	Disagree	Neither agree Nor disagree	Agree	strongly agree
Wrinkle - Superficial	2.4%	1.9%	6.2%	49.3%	40.3%
Wrinkle - Deep	2.4%	1.4%	3.3%	47.2%	45.8%
Wrinkle - Criscross	2.4%	4.3%	17.1%	42.7%	33.6%
Reduce fat tissue	2.4%	1.4%	7.5%	44.8%	43.9%
Nasolabial folds	2.4%	2.4%	8.5%	41%	45.8%
Eye bag	2.4%	1.4%	9.9%	43.4%	42.9%
Ptosis of eyelids	3.3%	3.3%	7.6%	45%)	40.8%
Yellowish discoloration	3.3%	4.7%	16.6%	44.5%	30.8%
Lax appearance	2.8%	0.9%	10.4%	44.3%	41.5%
Solar elastosis	3.3%	0.9%	13.2%	42.5%	40.1%
Pseudoscar	2.8%	4.7%	22.3%	40.3%	29.9%
Cutis Rhomboidalis Nuchae	3.8%	5.7%	15.6%	46.4%	28.4%
Freckles	6.1%	11.8%	17.5%	39.6%	25%
Solar lentigines	3.8%	8%	15.6%	41%	31.6%
Melasma	2.4%	8.5%	14.2%	44.3%	30.7%
Uneven Pigment	2.8%	6.6%	18.9%	42.5%	29.2%
Guttate hypomelanosis	3.8%	4.3%	11.4%	42.7%	37.9%
Venous lakes	3.8%	14.2%	25.9%	37.7%	18.4%
Senile Purpura	3.8%	10.0%	20.0%	40.0%	26.2%
Telangiectasias	3.3%	13.2%	17.9%	40.6%	25%
Milia	4.7%	22.2%	22.2%	31.6%	19.3%

Skin aging signs	Strongly disagree	Disagree	Neither agree Nor disagree	Agree	strongly agree
Sebaceous hyperplasia	3.8%	12.3%	16.5%	43.9%	23.6%
Senile comedone	3.8%	3.3%	10.4%	46.7%	35.8%
Favre-Racouchot syndrome	5.2%	7.1%	17.0%	40.6%	30.2%
Actinic keratosis	2.8%	5.2%	11.8%	47.4%	32.7%)
Xerosis	4.7%	10.4%	14.2%	38.7%	32.1%
Squamous cell carcinoma	5.2%	10.4%	15.1%	36.8%	32.5%
Basal cell carcinoma	5.7%	13.7%	18.5%	31.3%	30.8%
Malignant melanoma	4.2%	7.5%	13.7%	46.2%	28.3%

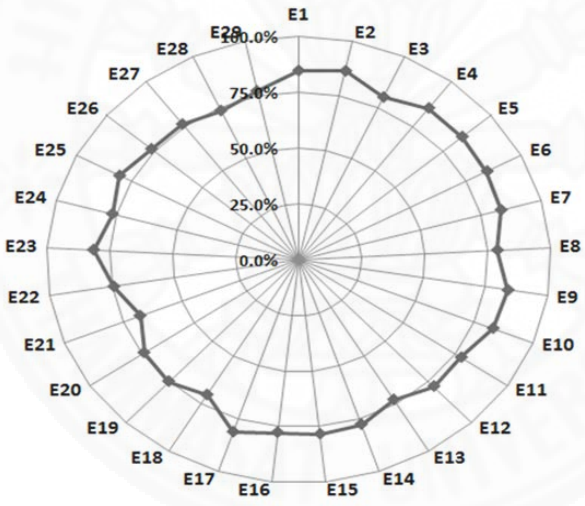


Figure 8.1 Attitude about essential sign for assessment in each item (E1 = Wrinkle-Superficial, E2 = Wrinkle-Deep, E3 = Wrinkle-Criscross, E4 = Reduced fat tissue, E5 = Nasolabial folds, E6 = Eye bag, E7 = Ptosis of upper eye lids, E8 = Yellowish Discoloration, E9 = Lax appearance, E10 = Solar elastosis, E11 = White linear (Pseudoscar), E12 = Cutis Rhomboidalis Nuchae, E13 = Freckles, E14 = Lentigines, E15 = Melasma, E16 = Uneven pigment, E17 = Guttate Hypomelanosis, E18 = Venous lakes, E19 = Purpura, E20 = Telangiectasias, E21 = Milia, E22 = Sebaceous

Hyperplasia, E23 = Senile Comedones, E24 = Favre-Racouchot Symdrome, E25 = Actinic Keratosis, E26 = Xerosis (dry skin), E27 = Squamous Cell Carcinoma, E28 = Basal Cell Carcinoma, E29 = Malignant Melanoma)

8.2.2 Exploratory factor analysis (EFA)

We divided EFA into 2 parts, which are for all dermatologists (certified and noncertified dermatologist) and only for certified dermatologist.

For all dermatologists, after EFA, Kaiser-Guttman criterion and scree plot were used for analysis, it was suggested that 3 factors were optimal in our EFA (Figure 8.2). Factor 1 composed of 8 signs (wrinkle – Superficial, Wrinkle – Deep, Reduced fat tissue, etc.). Factor 2 and factor 3 comprised of 6 signs, 4 signs, respectively (Table 8.3). Factor analysis can tell you which variables in your dataset will "go together" in ways that are not always obvious. However, the interpretation of what those sets of variables actually represent is up to the analyst, where reasonable people can disagree.

145 certified dermatologist responded to the survey. Both the Kaiser-Guttman criterion and scree plot suggested that 3 factors were optimal in our EFA. Factor 1 composed of 8 signs of atrophy (wrinkle - superficial, wrinkle - deep, wrinkle - crisscross, reduced fat tissue, nasolabial folds, eye bags, lax appearance, solar elastosis), which reflected dermis and soft tissue lesions (Table 8.4). Factor 2 composed of 7 signs of discoloration (freckles, lentigines, melasma, venous lakes, purpura, telangiectasias, milia). Factor 3 composed of all malignant lesions.

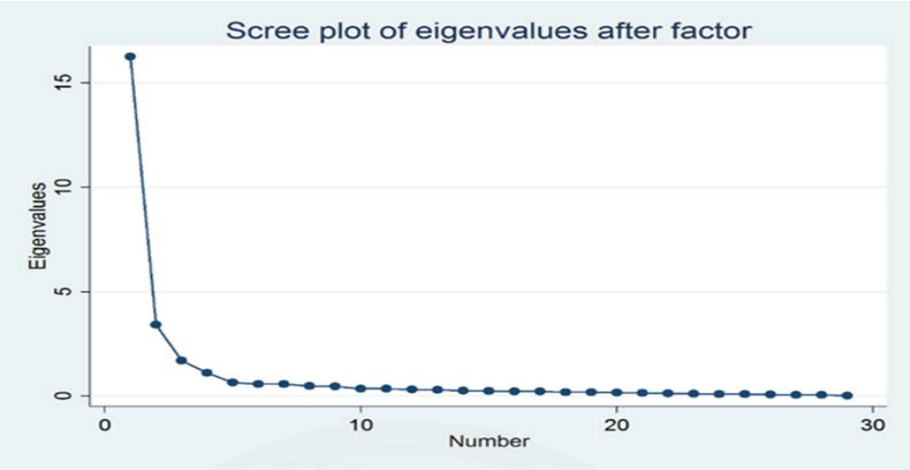


Figure 8.2 Scree plot of eigenvalues after exploratory factor analysis.

We propose a simplified Global Subjective Skin Aging Assessment (GS^2A^2) score comprising 3 factors, which are not only based on empirical evidence from dermatologists in practice, but are representative of the pathophysiologic changes that take place in the skin aging process (Table 8.5). GS^2A^2 score not only includes factors relevant to skin aging from the perspective of dermatologists, but also is easily calculated as calculated as three-factor score. We can interpret the results in two parts: First, The total GS^2A^2 score, that might be used to assess a cosmetic product that claim to have comprehensive anti-aging effect whereas factor-based score could be used to differentiate whether the change in overall clinical outcomes were because of atrophy, discoloration, or malignancy. Another is the inclusion of scores on each of the factors that show symptoms that need to be resolved thoroughly. Moreover, standard terminology is used for each factor, resulting in better inter-rater reliability, which should be proven by further study. Those results would support GS^2A^2 score as a simple and informative tool.

Table 8.3 EFA essential sign certified and non-certified dermatologist

Factor 1	**Loadings**
Wrinkle - Superficial	0.8468
Wrinkle - Deep	0.8994
Wrinkle - Criscross	0.7181
Reduced fat tissue	0.8448
Nasolabial folds	0.8331
Eye bag	0.8012
Lax appearance	0.8007
Solar elastosis	0.7532
Factor 2	
Freckles	0.8334
Lentigines	0.7827
Melasma	0.7827
Uneven pigment	0.7016
Telangiectasias	0.7720
Milia	0.7296
Factor 3	
Favre-Racouchot Syndrome	0.7361
Xerosis (dry skin)	0.7755
Squamous Cell Carcinoma	0.7667
Basal Cell Carcinoma	0.7389

Table 8.4 EFA essential sign certified dermatologist

Factor 1 - Atrophic	**Loadings**
Wrinkle – Superficial	0.8587
Wrinkle – Deep	0.8999
Wrinkle – Criscross	0.7437
Reduced fat tissue	0.8359
Nasolabial folds	0.7898
Eye bag	0.7696
Lax appearance	0.8027
Solar elastosis	0.7991
Factor 2 - Discoloration	
Freckles	0.8519
Lentigines	0.7946
Melasma	0.7565
Venous lakes	0.7056
Purpura	0.7346
Telangiectasias	0.7749
Milia	0.8056
Factor 3 - Malignancy	
Squamous Cell Carcinoma	0.8555
Basal Cell Carcinoma	0.8620
Malignant Melanoma	0.8120

Table 8.5 GS^2A^2 Each of the following signs can be obviously seen

Aging signs (ADM)	**1**	**2**	**3**	**4**	**5**
Atrophy Wrinkles - superficial Wrinkles - deep Wrinkles - crisscross Reduced fat tissue Nasolabial folds Eye bags Lax appearance Solar elastosis					
A- Total (8-40)					
Discoloration Freckles Lentigines Melasma Venous lakes Purpura Telangiectasias Milia					
D- Total (7-35)					
Malignancy Squamous cell carcinoma Basal cell carcinoma Malignant melanoma					
M- Total (3-15)					
ADM-Total (18-90)					

8.3 Perceived knowledge about skin aging signs

8.3.1 Baseline Characteristics

213 respondents, who were asked “I can make a provisional diagnoses the following signs”. The average percentages of Likert’s scale of each signs were between 66.29 and 90.52. Nasolabial fold was at a highest score and squamous cell carcinoma was are at a lowest score. The answer of respondents who selected strongly agree of malignant lesion are less than 15 percent (Figure 8.3).

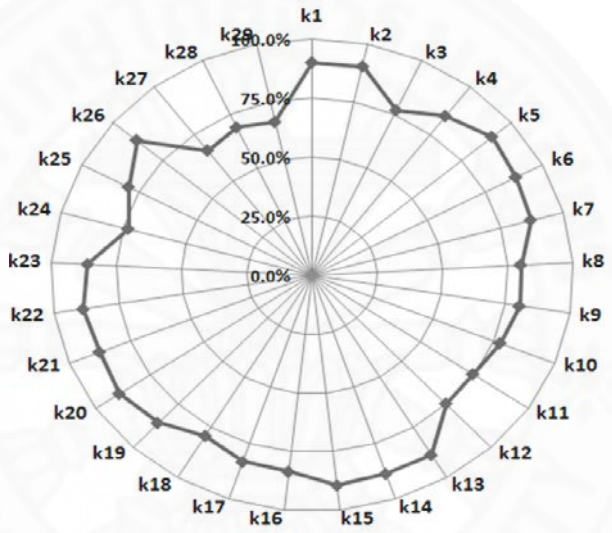


Figure 8.3 Average percentage of perceive knowledge in each skin aging sign. The question is I can make a provisional diagnosis the following signs (k1= Wrinkle-Superficial, k2 = Wrinkle-Deep, k3 = Wrinkle-Criscross, k4 = Reduced fat tissue, k5 = Nasolabial folds, k6 = Eye bag, k7 = Ptosis of upper eye lids, k8 = Yellowish Discoloration, k9 = Lax appearance, k10 = Solar elastosis, k11 = White linear (Pseudoscar), k12 = Cutis Rhomboidalis Nuchae, k13 = Freckles, k14 = Lentigines, k15 = Melasma, k16 = Uneven pigment, k17 = Guttate Hypomelanosis, k18 = Venous lakes, k19 = Purpura, k20 = Telangiectasias, k21 = Milia, k22 = Sebaceous Hyperplasia, k23 = Senile Comedones, k24 = Favre-Racouchot Symdrome, k25 = Actinic Keratosis, k26 = Xerosis (dry skin), k27 = Squamous Cell Carcinoma, k28 = Basal Cell Carcinoma, k29 = Malignant Melanoma

8.3.2 Association between perceive knowledge and attiude about essential signs of skin aging

Almost of the average of essential signs and perceive knowledge of skin aging are significantly difference. Only 4 signs are not significantly difference, they consisted of reduced fat tissue, yellowish discoloration, guttate hypomelanosis, actinic keratosis (Table 8.6). The mean difference positive composed of 14 signs including wrinkle-superficial, wrinkle-deep, nasolabial fold, ptosis of upper eye lids, freckles, lentigines, melasma, uneven pigment, venous lakes, purpura, telangiectasias, milia, sebaceous hyperplasia, senile comedones.The mean difference negative composed of 11 signs including wrinkle-criscross, lax appearance, solar elastosis, white linear (pseudoscar), cutis rhomboidalis nuchae, Favre-racouchot symdrome, xerosis (dry skin), squamous cell carcinoma, basal cell carcinoma, malignant melanoma.

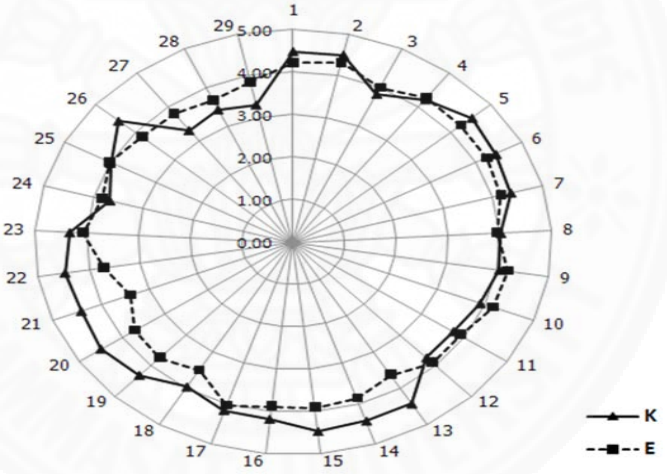


Figure 8.4 Association between perceive knowledge and essential signs of skin aging (K = perceive knowledge, E = Attiude of dermatologist about essential signs, 1 = Wrinkle-Superficial, 2 = Wrinkle-Deep, 3 = Wrinkle-Criscross, 4 = Reduced fat tissue, 5 = Nasolabial folds, 6 = Eye bag, 7 = Ptosis of upper eye lids, 8 = Yellowish Discoloration, 9 = Lax appearance, 10 = Solar elastosis, 11 = White linear (Pseudoscar), 12 = Cutis Rhomboidalis Nuchae, 13 = Freckles, 14 = Lentigines, 15 = Melasma, 16 = Uneven pigment, 17 = Guttate Hypomelanosis, 18 = Venous lakes,19 = Purpura, 20 = Telangiectasias, 21 = Milia, 22 = Sebaceous Hyperplasia, 23 = Senile Comedones, 24

= Favre-Racouchot Symdrome, 25 = Actinic Keratosis, 26 = Xerosis (dry skin), 27 = Squamous Cell Carcinoma, 28 = Basal Cell Carcinoma, 29 = Malignant Melanoma)

Table 8.6 Association between perceive knowledge of dermatologist and essential signs of skin aging

Skin aging sign	Average of essential sign	Average of perceive knowledge	Mean Difference ± SD	P-value
Wrinkle-Superficial	4.5 ± 0.9	4.23 ± 0.84	0.26 ± 0.86	<0.001*
Wrinkle-Deep	4.52 ± 0.88	4.33 ± 0.81	0.19 ± 0.73	<0.001*
Wrinkle-Criscross	3.84 ± 1.16	4.01 ± 0.95	-0.17 ± 1.03	0.020*
Reduced fat tissue	4.23 ± 0.96	4.26 ± 0.85	-0.04 ± 0.94	0.561
Nasolabial folds	4.53 ± 0.88	4.25 ± 0.89	0.27 ± 0.85	<0.001*
Eye bag	4.43 ± 0.93	4.23 ± 0.86	0.19 ± 0.93	0.003*
Ptosis of upper eye lids	4.36 ± 0.93	4.17 ± 0.94	0.18 ± 0.98	0.006*
Yellowish Discoloration	4.01 ± 1.02	3.95 ± 0.98	0.05 ± 1.11	0.494
Lax appearance	4.03 ± 1.07	4.21 ± 0.88	-0.18 ± 0.97	0.008*
Solar elastosis	3.88 ± 1.11	4.15 ± 0.92	-0.27 ± 1.02	<0.001*
White linear (Pseudoscar)	3.73 ± 1.18	3.9 ± 0.98	-0.16 ± 1.02	0.023*
Cutis Rhomboidalis Nuchae	3.74 ± 1.28	3.9 ± 1	-0.17 ± 1.21	0.042*
Freckles	4.44 ± 0.96	3.66 ± 1.16	0.78 ± 1.31	<0.001*
Lentigines	4.44 ± 0.98	3.89 ± 1.06	0.55 ± 1.17	<0.001*
Melasma	4.47 ± 0.93	3.92 ± 1	0.55 ± 1.16	<0.001*
Uneven pigment	4.18 ± 1.05	3.89 ± 1	0.29 ± 1.17	<0.001*
Guttate Hypomelanosis	4.17 ± 1.17	4.07 ± 1	0.09 ± 1.11	0.216
Venous lakes	3.97 ± 1.19	3.53 ± 1.06	0.43 ± 1.43	<0.001*
Purpura	4.31 ± 1.02	3.75 ± 1.07	0.54 ± 1.24	<0.001*
Telangiectasias	4.47 ± 0.91	3.71 ± 1.08	0.76 ± 1.17	<0.001*
Milia	4.39 ± 0.97	3.39 ± 1.16	1 ± 1.32	<0.001*
Sebaceous Hyperplasia	4.45 ± 0.95	3.71 ± 1.07	0.74 ± 1.17	<0.001*
Senile Comedones	4.31 ± 1.05	4.08 ± 0.97	0.23 ± 1.07	0.002*
Favre-Racouchot Symdrome	3.66 ± 1.36	3.83 ± 1.1	-0.18 ± 1.22	0.033*
Actinic Keratosis	3.99 ± 1.14	4.02 ± 0.96	-0.04 ± 1.15	0.634
Xerosis	4.41 ± 0.95	3.83 ± 1.13	0.58 ± 1.29	<0.001*
SCC	3.31 ± 1.05	3.81 ± 1.15	-0.5 ± 1.39	<0.001*
BCC	3.45 ± 1.1	3.68 ± 1.21	-0.24 ± 1.46	0.017*
MM	3.32 ± 1.06	3.87 ± 1.04	-0.55 ± 1.23	<0.001*

Values presented as mean ± SD. P-value corresponds to Paired t-test.

8.3.3 Subgroup analysis

8.3.3.1 Comparison perceive knowledge about skin aging signs between certified and non-certified dermatologist

Certified dermatologist gets higher average Likert's score in all signs and are significantly difference. Only 3 signs consists of nasolabial fold, eye bag and yellowish discoloration are non-significant difference at an average of Likert's score (P-value >0.005).

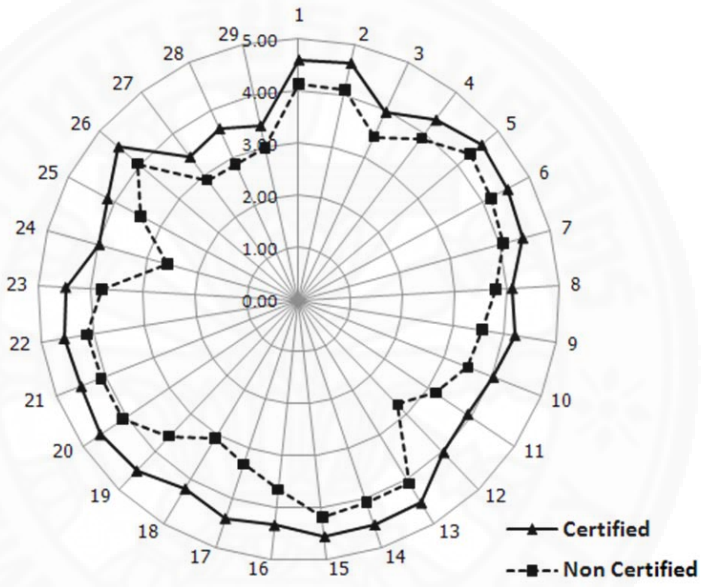


Figure 8.5 Perceive knowledge between certified and non-certified dermatologist (1 = Wrinkle-Superficial, 2 = Wrinkle-Deep, 3 = Wrinkle-Criscross, 4 = Reduced fat tissue, 5 = Nasolabial folds, 6 = Eye bag, 7 = Ptosis of upper eye lids, 8 = Yellowish Discoloration, 9 = Lax appearance, 10 = Solar elastosis, 11 = White linear (Pseudoscar), 12 = Cutis Rhomboidalis Nuchae, 13 = Freckles, 14 = Lentigines, 15 = Melasma, 16 = Uneven pigment, 17 = Guttate Hypomelanosis, 18 = Venous lakes, 19 = Purpura, 20 = Telangiectasias, 21 = Milia, 22 = Sebaceous Hyperplasia, 23 = Senile Comedones, 24 = Favre-Racouchot Symdrome, 25 = Actinic Keratosis, 26 = Xerosis (dry skin), 27 = Squamous Cell Carcinoma, 28 = Basal Cell Carcinoma, 29 = Malignant Melanoma)

8.3.3.2 Comparison perceive knowledge between board certified and non-board certified dermatologist

Boardcertified dermatologist are at a higher average Likert's score in all signs. Almost of the signs are significant difference (P<0.005) except nasolabial fold, freckles, lentigines, melasma and sebaceous gland hyperplasia (Figure 8.6).

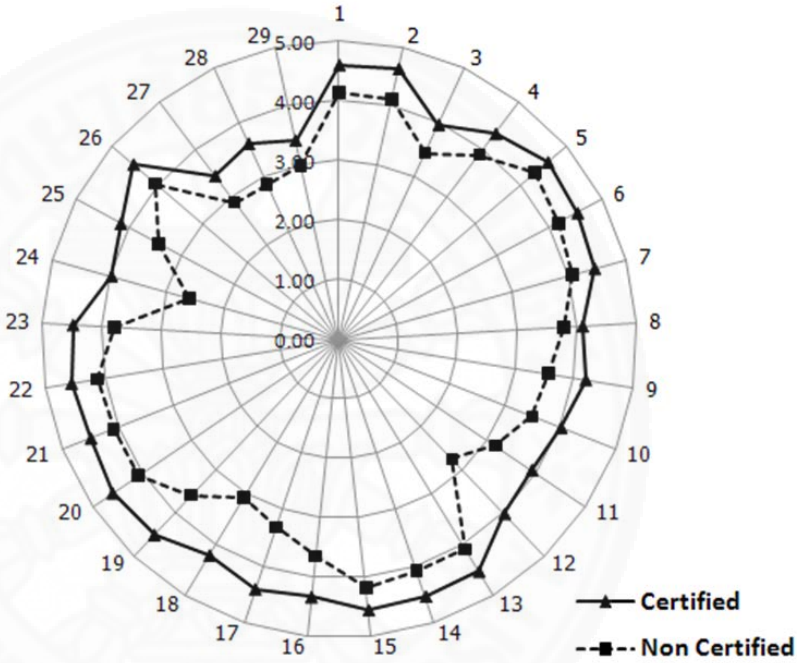


Figure 8.6 Perceive knowledge between board certified and non-board certified dermatologist (1 = Wrinkle-Superficial, 2 = Wrinkle-Deep, 3 = Wrinkle-Criscross, 4 = Reduced fat tissue, 5 = Nasolabial folds, 6 = Eye bag, 7 = Ptosis of upper eye lids, 8 = Yellowish Discoloration, 9 = Lax appearance, 10 = Solar elastosis, 11 = White linear (Pseudoscar), 12 = Cutis Rhomboidalis Nuchae, 13 = Freckles, 14 = Lentigines, 15 = Melasma, 16 = Uneven pigment, 17 = Guttate Hypomelanosis, 18 = Venous lakes, 19 = Purpura, 20 = Telangiectasias, 21 = Milia, 22 = Sebaceous Hyperplasia, 23 = Senile Comedones, 24 = Favre-Racouchot Symdrome, 25 = Actinic Keratosis, 26 = Xerosis (dry skin), 27 = Squamous Cell Carcinoma, 28 = Basal Cell Carcinoma, 29 = Malignant Melanoma)

8.4 Responder's practice

8.4.1 Baseline characteristic

More than 60 percent of respondents assess skin aging signs/disease on patients when they found any signs of skin aging (Table 8.7).

Table 8.7 Responder's practice

	Yes	**No**
Wrinkle	198 (93%)	15 (7%)
Sagging	188 (88.3%)	25 (11.7%)
Decrease Elasticity of skin	168 (78.9%)	45 (21.1%)
Pigment Heterogeneity	178 (83.6%)	35 (16.4%)
Vascular disorder	129 (60.6%)	84 (39.4%)
Benign tumor and Cyst	156 (73.2%)	57 (26.8%)
Precancerous	158 (74.2%)	55 (25.8%)
Malignant	153 (71.8%)	60 (28.2%)
Xerosis	181 (85%)	32 (15%)

8.4.2 Association between perceive knowledge and skin assessment

The practising of skin aging sign assessment respondent had a higher average perceive knowledge than non practising respondent. Some factors are significance but some are not, nevertheless considerably becomes the advantage. There was significant difference between the perceive knowledge in practising dermatologist ("yes" answer) at a higher level than non practising dermatologist ("no" answer) except wringkle, vascular disorder and xerosis. According to a significant difference, it showed that dermatologist who practise an assessment in sagging, decrease elasticity of skin, pigment heterogeneity, benign tumor and cyst and precancerous had a higher level of perceive knowledge than non practice dermatologist (Table8.8).

Table 8.8 Association between perceive knowledge and practices of knowledge source for contextual dimension

Practice	Perceive knowledge	Yes		No		P-value
		N	Mean ± SD	N	Mean ± SD	
Wrinkle	Superficial Deep Criscross	198	4.3 ± 0.85	15	4.11 ± 1.07	0.41
Sagging	Reduced fat tissue Nasolabial folds Eye bag Ptosis	188	4.43 ± 0.81	25	4.06 ± 1.13	0.044*
Decrease Elasticity of skin	Yellowish Discoloration Lax appearance Solar elastosis White linear (Pseudoscar) Cutis Rhomboidalis Nuchae	168	3.96 ± 0.94	45	3.58 ± 0.97	0.019*
Pigment Heterogeneity	Freckles Lentigines Melasma Uneven pigment Guttate Hypomelanosis	178	4.42 ± 0.87	35	3.94 ± 1.03	0.004*
Vascular disorder	Venous lakes Purpura Telangiectasias	129	4.34 ± 0.89	84	4.1 ± 1.03	0.066
Benign tumor and Cyst	Milia Sebaceous Hyperplasia Senile Comedones Favre-Racouchot Symdrome	156	4.32 ± 0.85	57	3.89 ± 1.12	0.010*
Precancerous	Actinic Keratosis	158	4.19 ± 0.98	55	3.4 ± 1.36	<0.001*
Malignant	Squamous Cell Carcinoma Basal Cell Carcinoma Malignant Melanoma	153	3.52 ± 0.98	60	2.94 ± 0.98	<0.001*
Xerosis	Xerosis	181	4.44 ± 0.93	32	4.28 ± 1.02	0.393

Values presented as mean ± SD. P-value corresponds to Independent t-test.

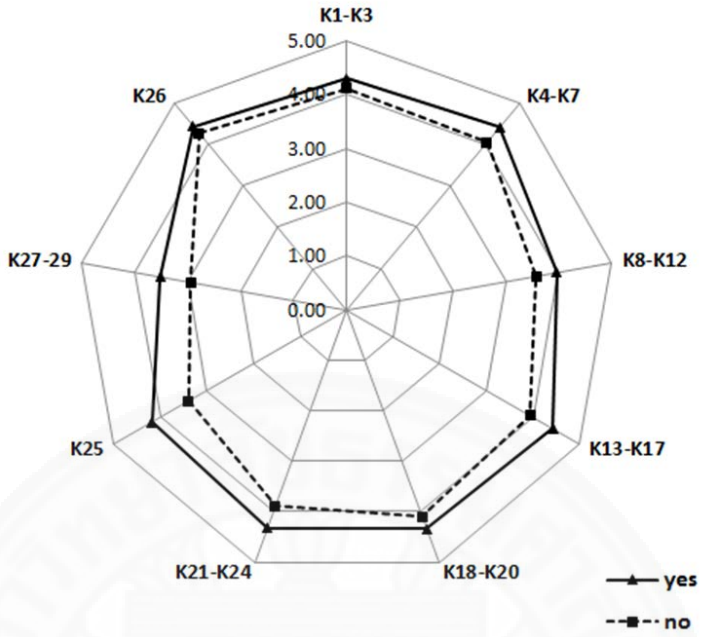


Figure 8.7 Association between perceive knowledge and skin assessment (K1-K3 = Wrinkle; K4-K7 = Sagging; K8-K12 = Decrease Elasticity of skin; K13-K17 = Pigment Heterogeneity; K18-K20 = Vascular disorder; K21-K24 = Benign tumor and Cyst; K25= Precancerous; K26 = Xerosis; K 27-29 = Malignant)

8.4.3 Association between mean attitude of essential signs and skin assessment

Majority of respondents around 60% realized the essential of skin aging signs and practised skin aging signs assessment.The average of practising in skin aging sign assessement were higher than not practising.

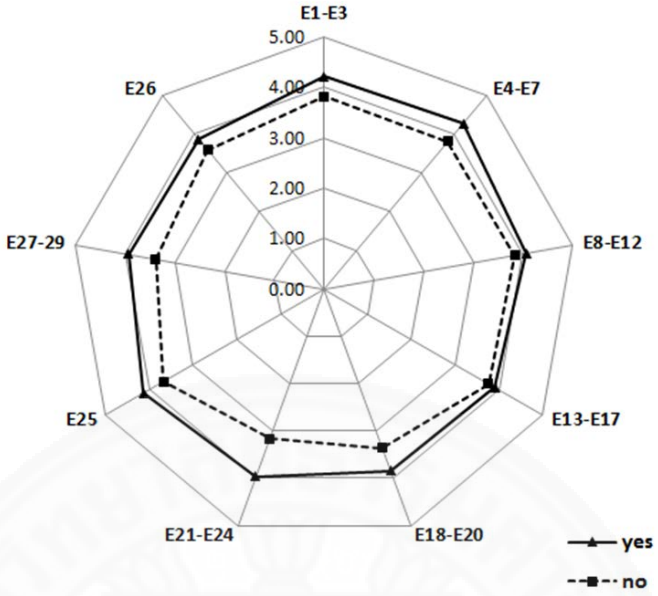


Figure 8.8 Association between mean attitude of essential signs and skin assessment (K1-K3 = Wrinkle; K4-K7 = Sagging; K8-K12 = Decrease Elasticity of skin; K13-K17 = Pigment Heterogeneity; K18-K20 = Vascular disorder; K21-K24 = Benign tumor and Cyst; K25= Precancerous; K26 = Xerosis; K 27-29 = Malignant)

8.4.4 Association between GS^2A^2 and skin aging assessment

According to all of the information, it is found that the respondent practises the assessment in the skin aging sign of GS^2A^2 were higher than not practising.

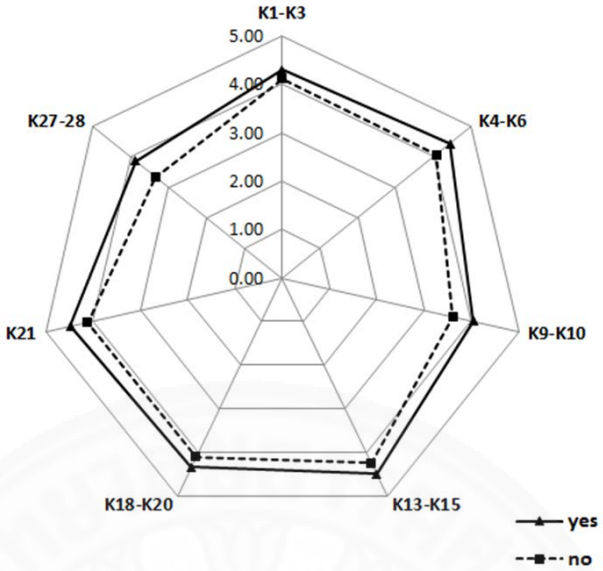


Figure 8.9 Association between GS^2A^2 and practices of knowledge source for contextual dimension (K1-K3 = Wrinkle; K4-K7 = Sagging; K8-K12 = Decrease Elasticity of skin; K13-K17 = Pigment Heterogeneity; K18-K20 = Vascular disorder; K21-K24 = Benign tumor and Cyst; K25= Precancerous; K26 = Xerosis; K 27-29 = Malignant)

8.5 Perceive knowledge of skin aging scales

8.5.1 Baseline characteristics

The questions ask whether "I am familiar with the following scale," to evaluate the familiarity and popularity of currently available, well-developed skin aging assessment scales among Thai dermatologists.

One-fifth (21.6%) of the respondents were familiar with SAS, compared with 11.5% and 11.2% for MERZ and SCINEXA, respectively (Figure 8.10). The average Likert's scale response were 2.46, 2.22, and 2.21, respectively. SAS was significantly well-known among Thai dermatologist than MERZ ($p<0.001$) and SCINEXA ($p<0.001$); no difference between MERZ and SCINEXA was observed ($p=0.59$) (Figure 8.11). The average amount of data from one hundred of SAS, MERZ and SCINEXA scores are 49.2, 45.0 and 44.4 percent, respectively.

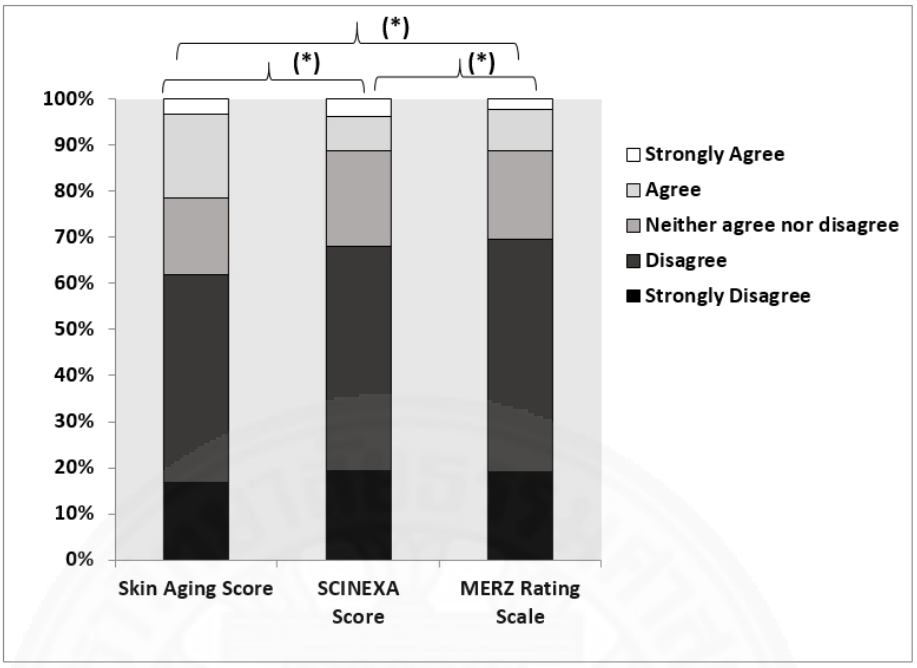


Figure 8.10 Responses to the question "I am familiar with the following scale."

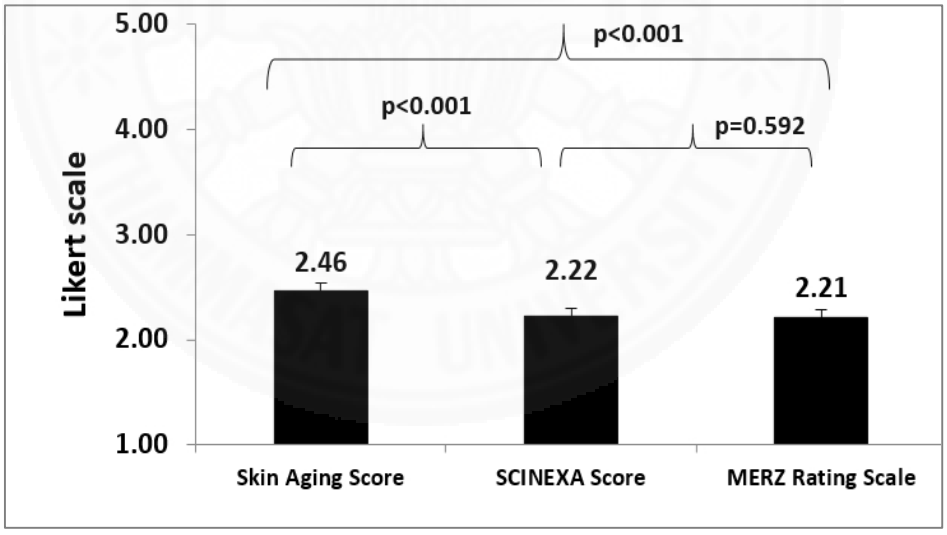


Figure 8.11 Comparison average of score for evaluation the familiarity and popularity of the currently-available, well-developed rating scales among Thai dermatologists (1, Strongly Disagree; 2, Disagree; 3, Neither Agree or Disagree; 4, Agree; and 5, Strongly Agree); P-value corresponds to Independent t-test.

Table 8.9 Comparison 4 skin aging scales

SAS	SCINEXA	MERZ	GS^2A^2
24 signs	23 signs	19 signs	18 signs
White head on cheek	Uneven pigment	Forehead lines at rest	Wrinkles Superficial
Black head on cheek	Fine wrinkle	Forehead lines at dynamic	Wrinkles deep
White head on forehead	Lax appearance	Glabellar lines at rest	Wrinkles crisscross
Black head on forehead	Reduce fat tissue	Glabellar lines at dynamic	Reduced fat tissue
Millia on cheek	Benign skin tumor	Crow's feet at rest	Nasolabial folds
Millia on forehead	Freckle	Crow's feet at dynamic	Eye bags
Pigment spot on cheek	Lentigine solarlis	Brow positioning	Lax appearance
Pigment spot on forehead	Pigment change	Infraorbital hollow	Solar elastosis
Fine lines on cheek	Change of skin phototype	Upper cheek fullness	Freckles
Coarse wrinkle on cheek	Yellowness	Lower cheek fullness	Lentigines
Lines on lip	Pseudoscar	Nasolabial folds	Melasma
Wrinkle on upper lip	Coarse wrinkle	Marionette lines	Venous lakes
Nasolabial folds	Elastosis	Upper lip fullness	Purpura
Crow's feet	Cutis rhamboidalis nuchae	Lower lip fullness	Telangiectasias
Wrinkle under eyes	Favre racouchot	Lip wrinkles at rest	Millia
Fine lines on forehead	Dryness	Lip wrinkles at dynamic	Squamous cell carcinoma
Furrow between eye brow	Comedone	Oral commissures	Basal cell carcinoma

SAS	SCINEXA	MERZ	GS^2A^2
Tissue slacking	Telangiectasia	Jawline	Malignant melanoma
Bags under eyes	Actinic keratosis		
Elasticity on cheek, forehead	Squamous cell carcinoma		
Inability to redden cheek, forehead	Basal cell carcinoma		
	Malignant melanoma		

8.6 Procedure

8.6.1 Baseline characteristics

Non ablative laser is the most popular procedure, 84.5%. The sequels are Intense Pulse Light (79.3%), chemical peel (75.1%) and neuromodulator (botulinum toxin) (74.2%) respectively. Face lift and blepharoplasty are the least popularity (4.2%) (Figure 8.12).

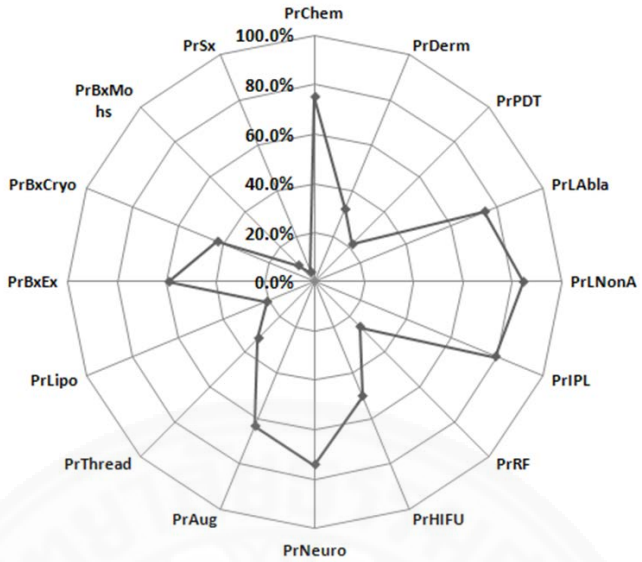


Figure 8.12 Practice procedure that dermatologist done (PrChem = Chemical peels, PrDerm = Dermabrasion, PrPDT = Photodynamic Therapy, PrLAbla = Laser Ablative, PrLNon = Laser Nonablative, PrIPL = Intense Pulse Light, PrRF = Radiofrequency, PrHIFU = High Intensity Focus Ultrasound, PrNeuro = Neuromodulator (Botulunum toxin), PrAug = Augmentation, PrThread = Thread lift, PrLipo = Liposuction/Lipolysis, PrBxEx = Biopsy : Shaves, Punch, Incision, Excision, PrBxCryo = Biopsy : Cryosurgery, Electrosurgery, PrBxMohs = Biopsy : Mohs micrographic surgery, Prsx = Surgery : Facelift, Blepharoplasty)

8.6.2 Subgroup analysis

A comparison between the practice procedure of certified and noncertified dermatologist were performed. Certified dermatologist did skin biopsy more than noncertified dermatologist, Cryosurgery and electrosurgery are significantly differences ($p<0.005$). Noncertified dermatologist did skin augmentation more than certified dermatologist. For facelift and blepharoplasty, noncertified dermatologist practiced more than certified dermatologist (Figure 8.13). The working experience of noncertified dermatologists is less than certified dermatologists who did surgery at 4.7 and 5.8 respectively (Table 8.10).

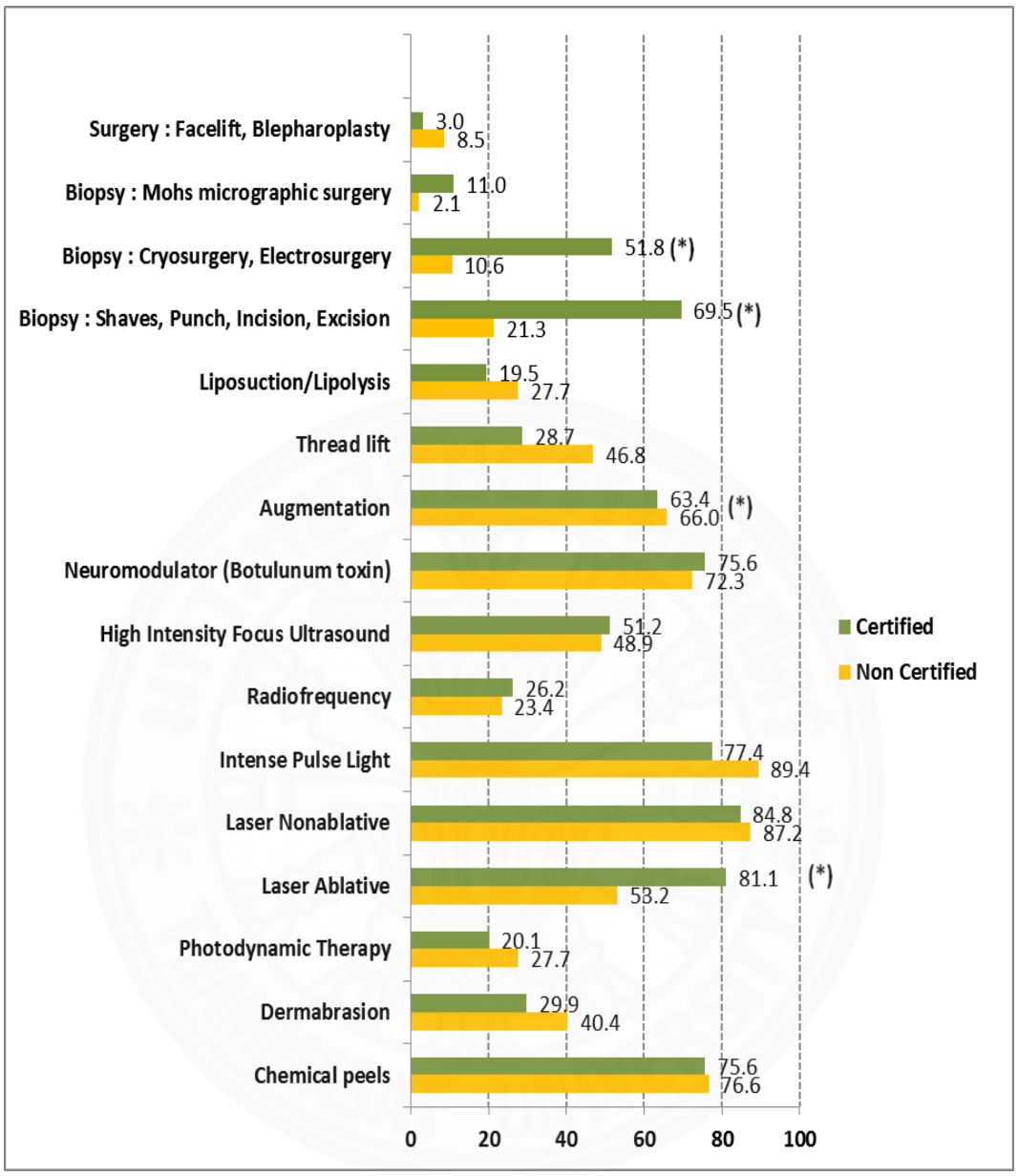


Figure 8.13 Comparison between the practice procedure of certified and non-certified dermatologist

Table 8.10 Surgery procedure and work experience

	Experience		P-value
	Certified (n=5)	Non Certified (n=3)	
Facelift and Blebpharoplasty	5.8 ± 3.6	4.7 ± 4.6	0.711

Values presented as mean ± SD. P-value corresponds to Independent t-test.

8.7 Context that influence skin aging assessment

4 items were assessed in different contexts of skin aging assessment. More than 50% of respondents selected agree and strongly agree to perform a complete physical examination and confident to take a physical examination (Figure 8.14). But there is limited time to take a physical examination. In contrast, for the question about the number of patient per day, respondents selected agree and strongly agree less than 45%.

A comparison context that influence skin aging assessment between certified and non-certified dermatologist found that all context are significant difference ($P<0.05$).

Table 8.11 Comparison context that influence skin aging assessment between certified and non-certified dermatologist

Education background	Non-Certified	Certified	P-value
N	68	145	
PE Complete	3.11 ± 1.1	3.57 ± 0.86	0.011
Limited Time	3.17 ± 1.22	3.61 ± 1.06	0.017
Too many patients	2.83 ± 1.13	3.38 ± 1.01	0.002
Confident PE-based Diagnosis	3.47 ± 1	3.86 ± 0.71	0.015

Values presented as mean ± SD. P-value corresponds to Independent t-test.

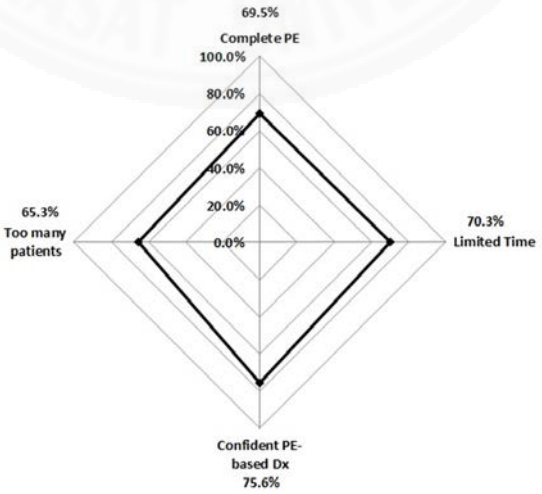


Figure 8.14 Context that influence skin aging assessment

CHAPTER 9
DISCUSSION

Chronologic age and solar damage are the most important intrinsic and extrinsic factors associated with skin aging. In spite of this fact, the mechanisms responsible for the deleterious effects and cutaneous alterations are distinct, and general skin signs are essential for clinical assessment of skin aging.

Dermatologists are the most appropriate persons to perform and make decisions related to skin aging assessment, treatment and prevention (123). For dermatologists, precise definitions of applied concept and description of aging signs and the use of complete assessment are necessary to quickly and correctly achieve the diagnosis, and eventually conclude specific treatments, either by way of prevention or correction for patients.

According to the Dermatologist Society of Thailand, there are a total number of 585 qualified dermatologists in the country (124). Most of the dermatologist population practice in Bangkok instead of upcountry. There are 66 persons working in academic dermatology centers which have been established for residency training (124). Six of these are university departments: Chulalongkorn, Pramongkutklao, Ramathibodi, Chiangmai, Thammasat and Siriraj. Only one is run by the Department of Medical Services of the Ministry of Public Health, Institute of Dermatology.

The attitudes of dermatologists about the clinical assessment of skin aging are unexplored. Also, it is unclear whether their attitudes will affect their perceived knowledge and clinical practices. Although there are many assessment skin aging methods, studying the roles of dermatologist' actual implication into practice is not reported in Thailand and their attitudes toward skin assessment are unclear.

As practice experience can influence assessment (125, 126), a reliable and generalizable skin aging assessment scale should not only be evidence-based, but also take into account the perspective of dermatologists. Hence, this KAP survey study was begun. The data which was derived from questionnaires showed that majority of respondents realized the importance of the essential skin aging signs assessment especially in malignancy lesion. Provisional diagnosis in malignancy lesion could not

be made by those respondents which relevant to the theory that those indicated signs require further investigation either by Dermoscope or biopsy for definite diagnosis.

The mean difference on the essential signs of skin aging is higher than (or positive) the perceive knowledge and P-value (<0.005**)** which indicates that the respondents do not confident in the result of investigation including 14 signs that are wrinkle-superficial, wrinkle-deep, nasolabial fold, ptosis of upper eye lids, freckles, lentigines, melasma, uneven pigment, venous lakes, purpura, telangiectasias, milia, sebaceous hyperplasia, senile comedones. Based on this study, it is necessary to develop, educate and provide the training to respondents to increase the confident when diagnosis is performed.

A comparison of perceive knowledge between certified dermatologist and noncertified dermatologist is performed, the result of study indicates that majority of certified dermatologist is more knowledgeable person and be able to provide accurate diagnosis than non-certified dermatologist. This similar result is also applied when a comparison between certified board and non-certified board in Master of Science, Diploma, Doctor of philosophy and fellow in dermatology is done. The educational background and experience are influence their decision making and effects to the confident when diagnosis of the patient condition is made.

More than 60 percent of respondents assess skin aging signs/disease on patients when they found any signs of skin aging. Overall, the practising of skin aging sign assessment respondent had a higher average perceive knowledge than non practising respondent. Some factors are significance but some are not, nevertheless considerably becomes the advantage.

With regards to the practice in a clinic by dermatologist, it is found that the practice dermatologist who assesses sagging, decrease elasticity of skin, pigment heterogeneity, benign tumor and cyst and precancerous is more knowledgeable person in skin aging signs than non-practice dermatologist. It is the positive signs indicating that the practice dermatologist is competent and be more understandable in skin aging signs assessment.

Non ablative laser is the most popular procedure, 84.5%. The sequels are Intense Pulse Light, and chemical peel respectively. Face lift and blepharoplasty are the

least popularity (4.2%) Face lift and blepharoplasty are the least popularity (4.2%). Surprisingly, face lift and blepharoplasty are performed by non-certified dermatologist rather than certified dermatologist. The working experience in non-certified dermatologist is less than certified dermatologist who had performed the surgery; hence this issue has to be more pre-caution in terms of malpractice.

Although more than 100 skin aging assessment scales have been introduced, none has gained sufficient popularity to become widely used. This is supported by our finding that a minimal number of Thai dermatologists were familiar with even the methodologically robust scales. Many reasons for this finding are possible. First, the terminology might be unclear and the assessment results might be complicated, requiring competent assessors with special training. For example, the term “inability to redden” in SAS could be interpreted in many different ways, making it unreliable. Second, some scales might be too comprehensive for real-life clinical practice. For instance, SCINEXA covers almost all signs of aging, and of the 13 studies utilizing this scale, only 2 completed the full assessment (31, 32).

We propose a simplified Global Subjective Skin Aging Assessment (GS^2A^2) score comprising 3 factors, which are not only based on empirical evidence from dermatologists in practice, but are representative of the pathophysiologic changes that occur in the skin aging process. The term “atrophy” comprises reduction of elastic fibers as well as changes in collagen components and subcutaneous tissues (fat, muscle, bone), leading to skin signs of wrinkles, solar elastosis, reduced fat tissue, nasolabial folds, etc. The term “discoloration” includes melanin, changes in vascular pigmentation, and keratin-filled cysts. All common skin aging malignancies are included in factor 3. Based on these 3 factors, skin aging is multidimensional, and one skin sign is not sufficient to express the skin aging process in general.

A comparison of various scales (Table 8.9) was performed and it was found that GS^2A^2 had number of skin aging signs less than the other kinds of scale except scale that was developed by Allerhand et al. However, GS^2A^2 was more multidimensional character, better identify definite diagnosis and dermatologist agreed that it was the essential signs to diagnose skin aging.

Today, there are many techniques and instruments to detect skin aging for research and treatment, including the 3-dimensional camera (19, 25), dermoscope (20), physical sample analysis of color (21), and measurement of elasticity (22, 26, 27). However, these include only some of the signs of skin aging. Some cosmetic products can improve skin elasticity, but changes in other clinical symptoms may be unclear. In addition, pigmentation and malignancy may require a dermatologist to identify signs of aging.

GS^2A^2 score not only includes factors relevant to skin aging from the perspective of dermatologists, but also is easily calculated as three-factor score. We can interprete the results in two parts: First, The total GS^2A^2 score, that might be used to assess a cosmetic product that claim to have comprehensive anti-aging effect whereas factor-based score could be used to differentiate whether the change in overall clinical outcomes were because of atrophy, discoloration, or malignancy. Another is the inclusion of scores on each of the factors that show symptoms that need to be resolved thoroughly. Moreover, standard terminology is used for each factor, resulting in better inter-rater reliability, which should be proven by further study. Those results would support GS^2A^2 score as a simple and informative tool. The GS^2A^2 compose of essential signs of skin aging by dermatologist, quite complete compared to other scales, easy to use because most doctors know and the classification is easy to use. This score also can be used to measure overall antiaging effects before and after dermatologic treatment, such as a cosmetic product claiming to minimize overall skin aging. For example, the clinical effects of a multicomponent nutritional supplement for photoaged skin could be evaluated using GS^2A^2 score instead of the Glogau classification system, which reflects only antiwrinkle effects and not overall antiaging effects (127). However, as the subjectivity of this score could be affected by many factors, GS^2A^2 score should be used as a before-and-after comparison rather than as an average across individuals.

CHAPTER 10
CONCLUSIONS AND RECOMMENDATIONS

10.1 Conclusions

In this thesis, KAP survey is a tool for evaluate perspective of dermatologist. A comparison of perceive knowledge between certified dermatologist and noncertified dermatologist is performed, the result of study indicates that majority of certified dermatologist is more knowledgeable person and be able to provide accurate diagnosis than non-certified dermatologist. It is the positive signs indicating that the practice dermatologist is competent and be more understandable in skin aging signs assessment. The working experience in non-certified dermatologist is less than certified dermatologist who had performed the surgery; hence this issue has to be more pre-caution in terms of malpractice.

GS^2A^2 score is a simple numerical score that can be used to evaluate the antiaging effects of a cosmetic product or dermatologic intervention. These scale can be used in all ethnicity especially in Asian people.

In conclusion, GS^2A^2 score should be used as a before-and-after comparison rather than as an average across individuals.

10.2 Recommendations

10.2.1 Applying to the future

These results would support the GS^2A^2 score as a simple and informative tool. The GS^2A^2 score includes factors relevant to skin aging from the perspective of dermatologists, and it is easily calculated as a 3-factor score. The summary score may be used for assessing cosmetic products that claim to have a global anti-aging effect, whereas a factor-based score could be used to differentiate whether the change in overall clinical outcomes was because of atrophy, discoloration, or malignancy. Moreover, standard terminology is used for each factor, resulting in better inter-rater reliability, which should be proven by further study.

10.2.2 Validity and reliability test

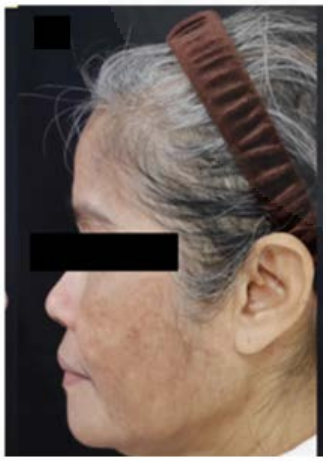
This study presented only the initial phase of scale development. As suggested by COSMIN, GS^2A^2 score should be tested further for validity and reliability.

GS^2A^2 can be used to measure overall antiaging effects before and after dermatologic treatment, such as using cosmetic products claiming to minimize overall skin aging. However, skin aging comprises of several factors. The scale is subjective and easily influenced. Therefore, GS^2A^2 score should be used as a before-and-after comparison in individuals. Further study is required in another group of dermatologists for Confirmatory Factor Analysis (CFA) to establish the construct validity and reliability of the scale.

To investigate the reliability of each item, pilot study will be done to evaluate sample size. The hypothesis of study of this scale can be compared with the treatment outcome of skin aging (for example, using retinol or platelet-rich plasma protein) in individuals. Three dermatologists will rate the scale using photographs (before and after treatment). Inter-rater reliability was calculated for each skin aging item.

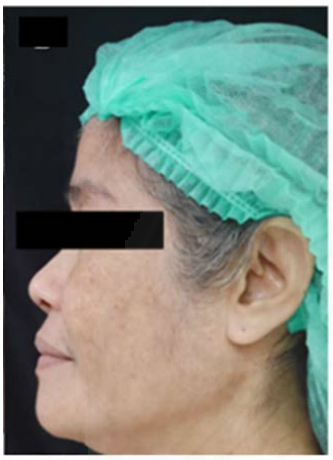
For example, Figure 10.1 shows the result between before and after treatment by platelet-rich plasma protein (PRP). The comparison of summarized score in individuals can be used to assess global anti-aging effect. For this example, the total of score before treatment was thirty eight, whereas each factor-based score were 22, 13, 3 of atrophy, discoloration and malignancy, respectively (Figure 10.2). The after 1 month treatment by platelet-rich plasma protein achieved the lower total score of thirty three (Figure 10.3). For factor-based score, atrophy in superficial wrinkles and lax appearance has improved in a positive way. Discoloration in melasma and telangiectasia has lessened. No change in malignant group was found.

Figure 10.1 Before and after treatment by platelet-rich plasma protein (PRP)



Aging signs (ADM)	1	2	3	4	5
Atrophy					
Wrinkles - superficial					✓
Wrinkles - deep	✓				
Wrinkles - crisscross	✓				
Reduced fat tissue				✓	
Nasolabial folds				✓	
Eye bags		✓			
Lax appearance				✓	
Solar elastosis	✓				
A- Total (8-40)	22				
Discoloration					
Freckles	✓				
Lentigines	✓				
Melasma					✓
Venous lakes	✓				
Purpura	✓				
Telangiectasias			✓		
Milia	✓				
D- Total (7-35)	13				
Malignancy					
Squamous cell carcinoma	✓				
Basal cell carcinoma	✓				
Malignant melanoma	✓				
M- Total (3-15)	3				
ADM-Total (18-90)	38				

Figure 10.2 Before treatment with platelet-rich plasma protein and evaluated by GS^2A^2



Aging signs (ADM)	1	2	3	4	5
Atrophy					
Wrinkles - superficial	✓			✓	
Wrinkles - deep	✓				
Wrinkles - crisscross				✓	
Reduced fat tissue				✓	
Nasolabial folds		✓			
Eye bags			✓		
Lax appearance					
Solar elastosis	✓				
A- Total (8-40)	20				
Discoloration	✓				
Freckles	✓				
Lentigines			✓		
Melasma	✓				
Venous lakes	✓				
Purpura		✓			
Telangiectasias					
Milia	✓				
D- Total (7-35)	10				
Malignancy					
Squamous cell carcinoma	✓				
Basal cell carcinoma	✓				
Malignant melanoma	✓				
M- Total (3-15)	3				
ADM-Total (18-90)	33				

Figure 10.3 After treatment with platelet-rich plasma protein and evaluated by GS^2A^2

Because this score was developed based on inputs from a representative group of Thai dermatologists who have experience with Asian patients, GS^2A^2 score is particularly relevant to Asians.

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APPENDICES

APPENDIX A
GENERAL INFORMATION

1. **Age (years) _____**

2. **Gender**

   O Male

   O Female

3. **Province _____**
4. **Education back ground**

   ☐ Board Certifications

   ☐ Doctor of Philosophy in Dermatology

   ☐ Diploma/Master of science in Dermatology

   ☐ General Practitioner

5. **How many years of work experience in this field_____**
6. **Work setting**

   ☐ Medical School

   ☐ Public Hospital

   ☐ Private Hospital

   ☐ Private Clinic

7. **How many international conference have you attended per years?**

   _____

APPENDIX B

PERCEIVED KNOWLEDGE FORM

Part 1

1.1 I can make a provisional diagnosis the following signs.

ฉันสามารถวินิจฉัยอาการแสดงเหล่านี้ได้

	Strongly disagree	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly agree**
Wrinkle-Superficia					
Wrinkle-Deep					
Wrinkle-Criscross					
Reduced fat tissue					
Nasolabial folds					
Eye bag					
Ptosis of upper eye lids					
Yellowish Discoloration					
Lax appearance					
Solar elastosis					
White linear (Pseudoscar)					
Cutis Rhomboidalis Nuchae					
Freckles					
Lentigines					
Melasma					

	Strongly disagree	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly agree**
Uneven pigment					
Guttate Hypomelanosis					
Venous lakes					
Purpura					
Telangiectasias					
Milia					
Sebaceous Hyperplasia					
Senile Comedones					
Favre-Racouchot Symdrome					
Actinic Keratosis					
Xerosis (dry skin)					

1.2 I can make a provisional diagnosis the following diseases.

ฉันสามารถวินิจฉัย โรค เหล่านี้ได้

	Strongly disagree	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly agree**
Squamous Cell Carcinoma					
Basal Cell Carcinoma					
Malignant Melanoma					

Part 2

I am familiar with the following scale.

ฉันคุ้นเคยกับ Scale เหล่านี้

	Strongly disagreed	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly agree**
SCINEXA Score					
Skin Aging Score					
MERZ Rating Scale					

APPENDIX C

CONTEXT THAT INFLUENCE SKIN AGING ASSESSMENT

	Strongly disagree	**Disagree**	**…**	**Agree**	**Strongly agree**
ฉันตรวจร่างกายคนไข้ครบถ้วนเสมอ (I always perform a complete physical examination in my patient.)					
ฉันมีเวลาที่จำกัดในการตรวจต่อคนไข้หนึ่งคน (I have limited time to perform physical exam per patient.)					
จำนวนคนไข้ในคลินิคของฉันต่อวันมีปริมาณมาก (The numbers of patient per day at my clinic are too much.)					
ฉันมีความมั่นใจในการตรวจและวินิจฉัยคนไข้ (I have confidence in performing physical examination and diagnosis on my patient.)					

APPENDIX D

ATITIUDE FORM

Part 1

I think that each of the following sign and disease are essential for skin aging diagnosis.

ฉันคิดว่าแต่ละอาการแสดงและโรคเหล่านี้มีความจำเป็นในการวินิจฉัย Skin aging

	Strongly disagree	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly agree**
Wrinkle-Superficial					
Wrinkle-Deep					
Wrinkle-Criscross					
Reduced fat tissue					
Nasolabial folds					
Eye bag					
Ptosis of upper eye lids					
Yellowish Discoloration					
Lax appearance					
Solar elastosis					
White linear (Pseudoscar)					

	Strongly disagree	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly agree**
Cutis Rhomboidalis Nuchae					
Freckles					
Lentigines					
Melasma					
Uneven pigment					
Guttate Hypomelanosis					
Venous lakes					
Purpura					
Telangiectasias					
Milia					
Sebaceous Hyperplasia					
Senile Comedones					
Favre-Racouchot Symdrome					
Actinic Keratosis					
Squamous Cell Carcinoma					

	Strongly disagree	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly agree**
Basal Cell Carcinoma					
Malignant Melanoma					
Xerosis (dry skin)					

APPENDIX E

PRACTICE FORM

Part 1 Assessment

In my clinics, I assess the following signs/disease

ในคลินิกผิวหนัง (ทั้งในโรงพยาบาลและคลินิกทั่วไป) ฉันได้ทำการประเมิน sign และ disease เหล่านี้กับคนไข้เมื่อพบอาการแสดงอย่างน้อยหนึ่งอย่างของ Skin aging

	YES	NO
Wrinkle		
Sagging		
Decrease Elasticity of skin		
Pigment Heterogeneity		
Vascular disorder (Venous lake, Telangiectasias)		
Benign Tumor, Cyst, Pseudocyst (Milia,Sebaceous hyperplasia, Senile comedones, Favre-Rocouchot Syndrome)		
Precancerous (Actinic Keratosis)		
Malignant (Squamous Cell Carcinoma, Basal Cell Carcinoma, Malignant Melanoma, Xerosis)		
Xerosis		

Part 2 Procedure

The following procedure are performed in my clinic

ฉันได้ทำหัตถการเหล่านี้ในคลินิกผิวหนังที่ฉันทำงานอยู่ (ตอบได้มากกว่า 1 ข้อ)

□ Chemical peels

□ Dermabrasion

□ Photodynamic Therapy

□ Laser – Ablative

□ Laser – Nonablative

□ Intense Pulse Light

□ Radiofrequency

□ High Intensity Focus Ultrasound

□ Neuromodulator (Botulimun toxin)

□ Augmentation (Filler,Fat)

□ Thread lift

□ Liposuction/Lipolysis

□ Biopsy: Shaves, Punch, incision, excision

□ Biopsy: Cryosurgery, Electrosurgery

□ Biopsy: Mohs micrographic surgery, Sentinel node biopsy

□ Surgery: Facelift, Blepharoplasty

APPENDIX F

COSMIN CHECKLIST EVALUATION

Skin Aging Score (SAS)

Guinot et al, 2002 (16)

Step1: Structural validity (Box E.)

Step2: No IRT models

Step3:

Box E. Structural validity				
1 Does the scale consist of effect indicators, i.e. is it based on a reflective model? *Design requirements*	**excellent**	**good**	**fair**	**poor**
2 Was the percentage of missing items given?	Percentage of missing items described	Percentage of missing items NOT described		
3 Was there a description of how missing items were handled?	Described how missing items were handled	Not described but it can be deduced how missing items were handled	Not clear how missing items were handled	
4 Was the sample size included in the analysis adequate?	7* #items and ≥100	5* #items and ≥100 OR 5-7* #items but <100	5* #items but <100	<5* #items
5 Were there any important flaws in the design or methods of the study?	No other important methodological flaws in the design or execution of the study		Other minor methodological flaws in the design or execution of the Study (e.g. rotation method not described)	Other important methodological flaws in the design or execution of the study (e.g. inappropriate rotation method)
Statistical methods 6 for CTT: Was exploratory or confirmatory factor analysis performed?	Exploratory or confirmatory factor analysis performed and type of factor analysis appropriate in view of existing information	Exploratory factor analysis performed while confirmatory would have been more appropriate		No exploratory or confirmatory factor analysis performed
7 for IRT: Were IRT tests for determining the (uni-) dimensionality of the items performed?	IRT test for determining (uni)dimensionality performed			IRT test for determining (uni) dimensionality NOT performed

Step1: Criterion validity (Box H.)

Step2: No IRT models

Step3:

Box H. Criterion validity				
Design requirements 1 Was the percentage of missing items given?	**excellent** Percentage of missing items described	**good** Percentage of missing items NOT described	**fair**	**poor**
2 Was there a description of how missing items were handled?	Described how missing items were handled	Not described but it can be deduced how missing items were handled	Not clear how missing items were handled	
3 Was the sample size included in the analysis adequate?	Adequate sample size (≥100)	Good sample size (50-99)	Moderate sample size (30-49)	Small sample size (<30)
4 Can the criterion used or employed be considered as a reasonable 'gold standard'?	Criterion used can be considered an adequate 'gold standard' (evidence provided	No evidence provided, but assumable that the criterion used can be considered an adequate 'gold standard'	Unclear whether the criterion used can be considered an adequate 'gold standard'	Criterion used can NOT be considered an adequate 'gold standard'
5 Were there any important flaws in the design or methods of the study?	No other important methodological flaws in the design or execution of the study		Other minor methodological flaws in the design or execution of the study	Other important methodological flaws in the design or execution of the study
Statistical methods 6 for continuous scores: Were correlations, or the area under the receiver operating curve calculated?	Correlations or AUC calculated			Correlations or AUC NOT calculated
7 for dichotomous scores: Were sensitivity and specificity determined?	Sensitivity and specificity calculated			Sensitivity and specificity NOT calculated

Step 4: Determining the Generalizability of the results

Box Generalizability	
1 Median or mean age (with standard deviation or range)?	43.5
2 Distribution of sex?	Only female
3 Important disease characteristics (e.g. severity, status, duration) and description of treatment?	No disease (Healthy skin)
4 Setting(s) in which the study was conducted? e.g. general population, primary care or hospital/rehabilitation care	Not report
5 Countries in which the study was conducted?	France
6 Language in which the HR-PRO instrument was evaluated?	English
7 Was the method used to select patients adequately described? e.g. convenience, consecutive, or random	Consecutive
8 Was the percentage of missing responses (response rate) acceptable?	0

SCINEXA

Vierkotter et al, 2009 (15)

Step1: Hypotheses testing (Box F.)

Step2: No IRT models

Step3:

Box F. Hypotheses testing				
Design requirements	**excellent**	**good**	**fair**	**Poor**
1 Was the percentage of missing items given?	Percentage of missing items described	Percentage of missing items NOT described		
2 Was there a description of how missing items were handled?	Described how missing items were handled	Not described but it can be deduced how missing items were handled	Not clear how missing items were handled	
3 Was the sample size included in the analysis adequate?	Adequate sample size (≥100 per analysis)	Good sample size (50-99 per analysis)	Moderate sample size (30-49 per analysis)	Small sample size (<30 per analysis)
4 Were hypotheses regarding correlations or mean differences formulated a priori (i.e. before data collection)?	Multiple hypotheses formulated a priori	Minimal number of hypotheses formulate a priori	Hypotheses vague or not formulated but possible to deduce what was expected	Unclear what was expected
5 Was the expected *direction* of correlations or mean differences included in the hypotheses?	Expected direction of the correlations or differences stated	Expected direction of the correlations or differences NOT stated		
6 Was the expected absolute or relative *magnitude* of correlations or mean differences included in the hypotheses?	Expected magnitude of the correlations or differences stated	Expected magnitude of the correlations or differences NOT stated		
7 for convergent validity: Was an adequate description provided of the comparator instrument(s)?	Adequate description of the constructs measured by the comparator instrument(s)	Adequate description of most of the constructs measured by the comparator instrument(s)	Poor description of the constructs measured by the comparator instrument(s)	NO description of the constructs measured by the comparator instrument(s)
8 for convergent validity: Were the measurement	Adequate measurement	Adequate measurement	Some information on measurement properties (or a	No information on the measurement

properties of the comparator instrument(s) adequately described?	properties of the comparator instrument(s) in a population similar to the study population	properties of the comparator instrument(s) but not sure if these apply to the study population	reference to a study on measurement properties) of the comparator instrument(s) in any study population	properties of the comparator instrument(s)
9 Were there any important flaws in the design or methods of the study?	No other important methodological flaws in the design or execution of the study		Other minor methodological flaws in the design or execution of the study (e.g. only data presented on a comparison with an instrument that measures another construct)	Other important methodological flaws in the design or execution of the study
10 Were design and statistical methods adequate for the hypotheses to be tested?	Statistical methods applied appropriate	Assumable that statistical methods were appropriate, e.g. Pearson correlations applied, but distribution of scores or mean (SD) not presented	Statistical methods applied NOT optimal	Statistical methods applied NOT appropriate

Step1: Criterion validity (Box H.)

Step2: No IRT models

Step3:

Box H. Criterion validity				
Design requirements 1 Was the percentage of missing items given?	**excellent** Percentage of missing items described	**good** Percentage of missing items NOT described	**fair**	**poor**
2 Was there a description of how missing items were handled?	Described how missing items were handled	Not described but it can be deduced how missing items were handled	Not clear how missing items were handled	
3 Was the sample size included in the analysis adequate?	Adequate sample size (≥100)	Good sample size (50-99)	Moderate sample size (30-49)	Small sample size (<30)
4 Can the criterion used or employed be considered as a reasonable 'gold standard'?	Criterion used can be considered an adequate 'gold standard' (evidence provided	No evidence provided, but assumable that the criterion used can be considered an adequate 'gold standard'	Unclear whether the criterion used can be considered an adequate 'gold standard'	Criterion used can NOT be considered an adequate 'gold standard'
5 Were there any important flaws in the design or methods of the study?	No other important methodological flaws in the design or execution of the study		Other minor methodological flaws in the design or execution of the study	Other important methodological flaws in the design or execution of the study
Statistical methods 6 for continuous scores: Were correlations, or the area under the receiver operating curve calculated?	Correlations or AUC calculated			Correlations or AUC NOT calculated
7 for dichotomous scores: Were sensitivity and specificity determined?	Sensitivity and specificity calculated			Sensitivity and specificity NOT calculated

Step 4: Determining the Generalizability of the results

Box Generalizability		
1 Median or mean age (with standard deviation or range)?	Group1 41.5±15.9	Group2 49.5±16.5
2 Distribution of sex?	M:F 38:20	M:F 9:7
3 Important disease characteristics (e.g. severity, status, duration) and description of treatment?	No disease	
4 Setting(s) in which the study was conducted? e.g. general population, primary care or hospital/rehabilitation care	Not report	
5 Countries in which the study was conducted?	Germany	
6 Language in which the HR-PRO instrument was evaluated?	English	
7 Was the method used to select patients adequately described? e.g. convenience, consecutive, or random	2 selected groups (non-sunbed user and sunbed user)	
8 Was the percentage of missing responses (response rate) acceptable?	0	

N/A

Bazin and Flament, 2010 (17)

Step1: Reliability (Box B.)

Step2: No IRT models

Step3:

Box B. Reliability: relative measures (including test-retest reliability, inter-rater reliability and intra-rater reliability)				
Design requirements 1 Was the percentage of missing items given?	**excellent** Percentage of missing items described	**good** Percentage of missing items NOT described	**fair**	**poor**
2 Was there a description of how missing items were handled?	Described how missing items were handled	Not described but it can be deduced how missing items were handled	Not clear how missing items were handled	
3 Was the sample size included in the analysis adequate?	Adequate sample size (≥100)	Good sample size (50-99)	Moderate sample size (30-49)	Small sample size (<30)
4 Were at least two measurements available?	At least two measurements			Only one measurement
5 Were the administrations independent?	Independent measurements	Assumable that the measurements were independent	Doubtful whether the measurements were independent	measurements NOT independent
6 Was the time interval stated?	Time interval stated		Time interval NOT stated	
7 Were patients stable in the interim period on the construct to be measured?	Patients were stable (evidence provided)	Assumable that patients were stable	Unclear if patients Were stable	Patients were NOT stable
8 Was the time interval appropriate?	Time interval appropriate		Doubtful whether interval time NOT appropriate	Time interval was appropriate
9 Were the test conditions similar for both measurements? e.g. type of administration, environment, instructions	Test conditions were similar (evidence provided)	Assumable that test conditions were similar	Unclear if test conditions were similar	Test conditions were NOT similar

10 Were there any important flaws in the design or methods of the study?	No other important methodological flaws in the design or execution of the study		Other minor methodological flaws in the design or execution of the study	Other important methodological flaws in the design or execution of the study
Statistical methods 11 for continuous scores: Was an intraclass correlation coefficient (ICC) calculated?	ICC calculated and model or formula of the ICC is described	ICC calculated but model or formula of the ICC not described or not optimal. Pearson or Spearman correlation coefficient calculated with evidence provided that no systematic change has occurred	Pearson or Spearman correlation coefficient calculated WITHOUT evidence provided that no systematic change has occurred or WITH evidence that systematic change has occurred	No ICC or Pearson or Spearman correlations calculated
12 for dichotomous/nominal/ordinal scores: Was kappa calculated?	Kappa calculated			Only percentage agreement calculated
13 for ordinal scores: Was a weighted kappa calculated?	Weighted Kappa calculated		Unweighted Kappa calculated	Only percentage agreement calculated
14 for ordinal scores: Was the weighting scheme described? e.g. linear, quadratic	Weighting scheme described	Weighting scheme NOT described		

Step1: Structural validity (Box E.)

Step2: No IRT models

Step3:

Box E. Structural validity				
1 Does the scale consist of effect indicators, i.e. is it based on a reflective model? *Design requirements*	**excellent**	**good**	**fair**	**poor**
2 Was the percentage of missing items given?	Percentage of missing items described	Percentage of missing items NOT described		
3 Was there a description of how missing items were handled?	Described how missing items were handled	Not described but it can be deduced how missing items were handled	Not clear how missing items were handled	
4 Was the sample size included in the analysis adequate?	7* #items and ≥100	5* #items and ≥100 OR 5-7* #items but <100	5* #items but <100	<5* #items
5 Were there any important flaws in the design or methods of the study?	No other important methodological flaws in the design or execution of the study		Other minor methodological flaws in the design or execution of the Study (e.g. rotation method not described)	Other important methodological flaws in the design or execution of the study (e.g. inappropriate rotation method)
Statistical methods 6 for CTT: Was exploratory or confirmatory factor analysis performed?	Exploratory or confirmatory factor analysis performed and type of factor analysis appropriate in view of existing information	Exploratory factor analysis performed while confirmatory would have been more appropriate		No exploratory or confirmatory factor analysis performed
7 for IRT: Were IRT tests for determining the (uni-) dimensionality of the items performed?	IRT test for determining (uni) dimensionality performed			IRT test for determining (uni) dimensionality NOT performed

Step 4: Determining the Generalizability of the results

Box Generalizability	
1 Median or mean age (with standard deviation or range)?	Not present
2 Distribution of sex?	Only female
3 Important disease characteristics (e.g. severity, status, duration) and description of treatment?	No disease
4 Setting(s) in which the study was conducted? e.g. general population, primary care or hospital/rehabilitation care.	Not report
5 countries in which the study was conducted?	China (Guangzhou)
6 Language in which the HR-PRO instrument was evaluated?	English
7 Was the method used to select patients adequately described? e.g. convenience, consecutive, or random	Consecutive
8 Was the percentage of missing responses (response rate) acceptable?	-

N/A

Allerhand et al, 2011 (18)

Step1: Reliability (Box B.)

Step2: No IRT models

Step3:

Box B. Reliability: relative measures (including test-retest reliability, inter-rater reliability and intra-rater reliability)				
Design requirements	**excellent**	**good**	**fair**	**poor**
1 Was the percentage of missing items given?	Percentage of missing items described	Percentage of missing items NOT described		
2 Was there a description of how missing items were handled?	Described how missing items were handled	Not described but it can be deduced how missing items were handled	Not clear how missing items were handled	
3 Was the sample size included in the analysis adequate?	Adequate sample size (≥100)	Good sample size (50-99)	Moderate sample size (30-49)	Small sample size (<30)
4 Were at least two measurements available?	At least two measurements			Only one measurement
5 Were the administrations independent?	Independent measurements	Assumable that the measurements were independent	Doubtful whether measurements the measurements NOT were independent independent	
6 Was the time interval stated?	Time interval stated		Time interval NOT stated	
7 Were patients stable in the interim period on the construct to be measured?	Patients were stable (evidence provided)	Assumable that patients were stable	Unclear if patients	Patients were were stable NOT stable
8 Was the time interval appropriate?	Time interval appropriate		Doubtful whether interval time NOT appropriate	Time interval was appropriate
9 Were the test conditions similar for both measurements? e.g. type of administration, environment, instructions	Test conditions Assumable that were similar test conditions (evidence were similar provided)	Unclear if test conditions were similar	Test conditions were NOT similar	

10 Were there any important flaws in the design or methods of the study?	No other important methodological flaws in the design or execution of the study		Other minor methodological flaws in the design or execution of the study	Other important methodological flaws in the design or execution of the study
Statistical methods 11 for continuous scores: Was an intraclass correlation coefficient (ICC) calculated?	ICC calculated and model or formula of the ICC is described	ICC calculated but model or formula of the ICC not described or not optimal. Pearson or Spearman correlation coefficient calculated with evidence provided that no systematic change has occurred	Pearson or Spearman correlation coefficient calculated WITHOUT evidence provided that no systematic change has occurred or WITH evidence that systematic change has occurred	No ICC or Pearson or Spearman correlations calculated
12 for dichotomous/nominal/ordinal scores: Was kappa calculated?	Kappa calculated			Only percentage agreement calculated
13 for ordinal scores: Was a weighted kappa calculated?	Weighted Kappa calculated		Unweighted Kappa calculated	Only percentage agreement calculated
14 for ordinal scores: Was the weighting scheme described? e.g. linear, quadratic	Weighting scheme described	Weighting scheme NOT described		

Step1: Structural validity (Box E.)

Step2: No IRT models

Step3:

Box E. Structural validity				
1 Does the scale consist of effect indicators, i.e. is it based on a reflective model? *Design requirements*	**excellent**	**good**	**fair**	**poor**
2 Was the percentage of missing items given?	Percentage of missing items described	Percentage of missing items NOT described		
3 Was there a description of how missing items were handled?	Described how missing items were handled	Not described but it can be deduced how missing items were handled	Not clear how missing items were handled	
4 Was the sample size included in the analysis adequate?	7* #items and ≥100	5* #items and ≥100 OR 5-7* #items but <100	5* #items but <100	<5* #items
5 Were there any important flaws in the design or methods of the study?	No other important methodological flaws in the design or execution of the study		Other minor methodological flaws in the design or execution of the Study (e.g. rotation method not described)	Other important methodological flaws in the design or execution of the study (e.g. inappropriate rotation method)
Statistical methods 6 for CTT: Was exploratory or confirmatory factor analysis performed?	Exploratory or confirmatory factor analysis performed and type of factor analysis appropriate in view of existing information	Exploratory factor analysis performed while confirmatory would have been more appropriate		No exploratory or confirmatory factor analysis performed
7 for IRT: Were IRT tests for determining the (uni-) dimensionality of the items performed?	IRT test for determining (uni)dimensionality performed			IRT test for determining (uni)dimensionality NOT performed

Step 4: Determining the Generalizability of the results

Box Generalizability	
1 Median or mean age (with standard deviation or range)?	83.24
2 Distribution of sex?	M:F 238:331
3 Important disease characteristics (e.g. severity, status, duration) and description of treatment?	No disease
4 Setting(s) in which the study was conducted? e.g. general population, primary care or hospital/rehabilitation care	Not report
5 Countries in which the study was conducted?	UK
6 Language in which the HR-PRO instrument was evaluated?	English
7 Was the method used to select patients adequately described? e.g. convenience, consecutive, or random	Age selected
8 Was the percentage of missing responses (response rate) acceptable?	0

MERZ Rating Scales

Rzany et al, 2012 (14)

Step1: Reliability (Box B.)

Step2: No IRT models

Step3:

Box B. Reliability: relative measures (including test-retest reliability, inter-rater reliability and intra-rater reliability)				
Design requirements	**excellent**	**good**	**fair**	**poor**
1 Was the percentage of missing items given?	Percentage of missing items described	Percentage of missing items NOT described		
2 Was there a description of how missing items were handled?	Described how missing items were handled	Not described but it can be deduced how missing items were handled	Not clear how missing items were handled	
3 Was the sample size included in the analysis adequate?	Adequate sample size (≥100)	Good sample size (50-99)	Moderate sample size (30-49)	Small sample size (<30)
4 Were at least two measurements available?	At least two measurements			Only one measurement
5 Were the administrations independent?	Independent measurements	Assumable that the measurements were independent	Doubtful whether the measurements were independent	measurements NOT independent
6 Was the time interval stated?	Time interval stated		Time interval NOT stated	
7 Were patients stable in the interim period on the construct to be measured?	Patients were stable (evidence provided)	Assumable that patients were stable	Unclear if patients Were stable	Patients were NOT stable
8 Was the time interval appropriate?	Time interval appropriate		Doubtful whether interval time NOT appropriate	Time interval was appropriate
9 Were the test conditions similar for both measurements? e.g. type of administration, environment, instructions	Test conditions were similar (evidence provided)	Assumable that test conditions were similar	Unclear if test conditions were similar	Test conditions were NOT similar

10 Were there any important flaws in the design or methods of the study?	No other important methodological flaws in the design or execution of the study		Other minor methodological flaws in the design or execution of the study	Other important methodological flaws in the design or execution of the study
Statistical methods 11 for continuous scores: Was an intraclass correlation coefficient (ICC) calculated?	ICC calculated and model or formula of the ICC is described	ICC calculated but model or formula of the ICC not described or not optimal. Pearson or Spearman correlation coefficient calculated with evidence provided that no systematic change has occurred	Pearson or Spearman correlation coefficient calculated WITHOUT evidence provided that no systematic change has occurred or WITH evidence that systematic change has occurred	No ICC or Pearson or Spearman correlations calculated
12 for dichotomous/nominal/ordinal scores: Was kappa calculated?	Kappa calculated			Only percentage agreement calculated
13 for ordinal scores: Was a weighted kappa calculated?	Weighted Kappa calculated		Unweighted Kappa calculated	Only percentage agreement calculated
14 for ordinal scores: Was the weighting scheme described? e.g. linear, quadratic	Weighting scheme described	Weighting scheme NOT described		

Step1: Hypothesis testing (Box F.)

Step2: No IRT models

Step3:

Box F. Hypotheses testing				
Design requirements	**excellent**	**good**	**fair**	**Poor**
1 Was the percentage of missing items given?	Percentage of missing items described	Percentage of missing items NOT described		
2 Was there a description of how missing items were handled?	Described how missing items were handled	Not described but it can be deduced how missing items were handled	Not clear how missing items were handled	
3 Was the sample size included in the analysis adequate?	Adequate sample size (≥100 per analysis)	Good sample size (50-99 per analysis)	Moderate sample size (30-49 per analysis)	Small sample size (<30 per analysis)
4 Were hypotheses regarding correlations or mean differences formulated a priori (i.e. before data collection)?	Multiple hypotheses formulated a priori	Minimal number of hypotheses formulate a priori	Hypotheses vague or not formulated but possible to deduce what was expected	Unclear what was expected
5 Was the expected *direction* of correlations or mean differences included in the hypotheses?	Expected direction of the correlations or differences stated	Expected direction of the correlations or differences NOT stated		
6 Was the expected absolute or relative *magnitude* of correlations or mean differences included in the hypotheses?	Expected magnitude of the correlations or differences stated	Expected magnitude of the correlations or differences NOT stated		
7 for convergent validity: Was an adequate description provided of the comparator instrument(s)?	Adequate description of the constructs measured by the comparator instrument(s)	Adequate description of most of the constructs measured by the comparator instrument(s)	Poor description of the constructs measured by the comparator instrument(s)	NO description of the constructs measured by the comparator instrument(s)
8 for convergent validity: Were the measurement	Adequate measurement	Adequate measurement	Some information on measurement properties (or a	No information on the measurement

properties of the comparator instrument(s) adequately described?	properties of the comparator instrument(s) in a population similar to the study population	properties of the comparator instrument(s) but not sure if these apply to the study population	reference to a study on measurement properties) of the comparator instrument(s) in any study population	properties of the comparator instrument(s)
9 Were there any important flaws in the design or methods of the study?	No other important methodological flaws in the design or execution of the study		Other minor methodological flaws in the design or execution of the study (e.g. only data presented on a comparison with an instrument that measures another construct)	Other important methodological flaws in the design or execution of the study
10 Were design and statistical methods adequate for the hypotheses to be tested?	Statistical methods applied appropriate	Assumable that statistical methods were appropriate, e.g. Pearson correlations applied, but distribution of scores or mean (SD) not presented	Statistical methods applied NOT optimal	Statistical methods applied NOT appropriate

Step1: Criterion validity (Box H.)

Step2: No IRT models

Step3:

Box H. Criterion validity				
Design requirements 1 Was the percentage of missing items given?	**excellent** Percentage of missing items described	**good** Percentage of missing items NOT described	**fair**	**poor**
2 Was there a description of how missing items were handled?	Described how missing items were handled	Not described but it can be deduced how missing items were handled	Not clear how missing items were handled	
3 Was the sample size included in the analysis adequate?	Adequate sample size (≥100)	Good sample size (50-99)	Moderate sample size (30-49)	Small sample size (<30)
4 Can the criterion used or employed be considered as a reasonable 'gold standard'?	Criterion used can be considered an adequate 'gold standard' (evidence provided	No evidence provided, but assumable that the criterion used can be considered an adequate 'gold standard'	Unclear whether the criterion used can be considered an adequate 'gold standard'	Criterion used can NOT be considered an adequate 'gold standard'
5 Were there any important flaws in the design or methods of the study?	No other important methodological flaws in the design or execution of the study		Other minor methodological flaws in the design or execution of the study	Other important methodological flaws in the design or execution of the study
Statistical methods 6 for continuous scores: Were correlations, or the area under the receiver operating curve calculated?	Correlations or AUC calculated			Correlations or AUC NOT calculated
7 for dichotomous scores: Were sensitivity and specificity determined?	Sensitivity and specificity calculated			Sensitivity and specificity NOT calculated

Step 4: Determining the Generalizability of the results

Box Generalizability	
1 Median or mean age (with standard deviation or range)?	51.7±10.3
2 Distribution of sex?	Equal
3 Important disease characteristics (e.g. severity, status, duration) and description of treatment?	No disease
4 Setting(s) in which the study was conducted? e.g. general population, primary care or hospital/rehabilitation care	Not report
5 Countries in which the study was conducted?	Germany
6 Language in which the HR-PRO instrument was evaluated?	English
7 Was the method used to select patients adequately described? e.g. convenience, consecutive, or random	The chosen was within The framework of scale
8 Was the percentage of missing responses (response rate) acceptable?	7 Missing rate (Upper face unit, Question of effort of aesthetic treatment, Estimation of subject age)

BIOGRAPHY

Name	Punnapath Buranasirin, MD
Date of Birth	11 March 1988
Educational Attainment	Academic Year 2016: Master of Science (Dermatology), International Program, Chulabhorn International College of Medicine, Thammasat University

Work Experience

2011 – 2013	Internship at Rajvithi Hospital, Bangkok
2013 – 2014	Internship at Bhuddasothorn Hospital, Chachoengsao
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Publication None