Categorizing facial creases: A review

Facial creases categorization

Abstract

Ensuring uniformity in the nomenclature standardization of facial creases is important to enable the scholarly community to follow and debate the advancements in research. This review highlights the prevailing disparity in the nomenclature that refers to the same facial crease by researchers and laypeople, and suggests uniform names for the facial creases based on available literature. The previous and current trends in facial crease classification are also discussed. The nomenclature of the facial creases considered for this review include: the nasolabial fold; corner of the mouth lines; upper and lower lip creases around the mouth region; the mandibular folds; the bifid nose; the transverse nasal line; the vertical glabellar line; chin crease; the mental crease; four type of creases around the eyes; forehead creases; and periauricular creases. A figure illustrating the above facial creases is included as reference. It is hoped that the proposed standardization of nomenclature would ensure a more scientific referencing of facial creases enabling more effective scientific interaction among the scholarly community as well as the laypeople interested in the research and application of facial creases.

Keywords: Facial creases nomenclature; uniformity and standardization; facial crease classification

Introduction

The development of facial wrinkling is almost always associated with the aging of individuals wherein the skin loses elasticity prompting researchers to conduct studies on chronological changes based on the face [1-6]. At the cellular level, there is marked lowering of cell division in the stratum germinativum and with the flattening of the epidermal-dermal interface [7]. The loss of subcutaneous fat also contributes to the ageing process [7]. Among menopausal women, the loss of estrogen is also known to lead to reduction in the thickness of the dermis and epidermis [8]. The amount of skin collagen that diminishes with aging also leads to skin sagging, wherein the skin becomes more coarse, crossed-lined and less elastic [9]. The development of facial creases being a normal phenomenon during aging attracts the popular interest of laypersons and forms a subject matter of scientific research, as well as necessitating the need for formalizing the nomenclature of these creases.

The first problem in bringing about uniformity in facial crease nomenclature is that there exist multiple terms for one and the same crease on the face. For example, The Collins Dictionary defines ‘wrinkle’ as “a slight ridge in the smoothness of a surface, such as a crease in the skin as a result of age” and a ‘crease’ as “a wrinkle or furrow especially on the face” using ‘wrinkle’ and ‘crease’ interchangeably. ‘Folds’ and ‘furrows’ are also the terms utilized to describe facial creases. A furrow is “any deep groove, especially a deep wrinkle on the forehead” and a fold is “a mark, crease, or hollow made by folding” [10]. The term ‘lines’ has also been utilized to describe a crease [2]. Lay terms such as crow’s feet for creases manifesting at the periphery of the eyes have also been utilized by previous researchers [3, 4, 11]. By definition alone, the words wrinkles, folds, furrows and creases are interchangeable. Lemperle, Holmes, Cohen,

Lemperle [12] differentiate wrinkles as occurring on the dermal layer of the skin and 'folds' as being caused by intrinsic ageing laxity of the skin, gravity, sagging and bone loss.

Researchers have also reported categorization of facial creases by rating the wrinkles based on photographs or images [13-15]. With the advancement in technology, skin casts or skin replicas have been adopted for the methods to classify crease severity [12, 16, 17]. Histological studies have also been carried out in order to identify crease morphology [18, 19]. Direct 3D in-vivo measurements [20] and skin elastic measurement utilizing a cutometer were conducted by few researchers [15, 16, 21]. Raking light optical profilometry has also been utilized in crease analysis [22]. Automated computer crease classification in tandem with photographic assessment was also utilized to investigate the usefulness of computers at classifying wrinkle severity [23] and for age estimation [24].

There appear to be no consensus on the scaling for measuring the severity of wrinkles and the grading scales reported are seen to be researcher-dependent. In general, these scales include a zero "0" to five "5" range [12, 25, 26] where '0' indicates no wrinkle and the highest number indicates severe wrinkling. The ranges for these scales vary from 3-point [13] to 14-point[14]. The drawbacks in merely utilizing a set of photographs for identification include the dependency on the particular set of photographs, which may lead to false classification, prompting researchers to reclassify crease severity [27]. This review is aimed at categorizing creases on the face based on the location and the common names associated with the crease. Creases present on the face include the nasolabial fold, upper and lower lip creases around the mouth region, the mandibular folds, the bifid nose, the transverse nasal line, the vertical glabellar line, the mental crease, creases around the eyes (periorbital lines, upper and lower eyelid lines and infra orbital

crease), forehead creases and periauricular creases. Figure 2 illustrates the creases which are present on the face.

Nasolabial fold

The nasolabial fold (NLF) [12] is a crease which is situated on the cheek. It starts from the tip of the alae of the nose and ends at the cheek adjacent to the cheilions (corners of the mouth). If the fold is severe, it will combine with the mandibular fold forming a single long crease [28]. The nasolabial fold is one of the most studied creases on the face. As such, there are multiple names to refer this crease. Researchers have seen to mention NLF as the melolabial fold [29, 30], nose-lip fold [31], nose-cheek fold ("smile line") [32] or nasomandibular fold [33]. Classification of NLF has been conducted by previous research on dissected cadavers [34-36]. There is a general agreement that the shape of NLF can be classified based on the angle of the shape, which could be either 'concave', 'straight' or 'convex'. However, while Rubin, Mishriki, Lee [35] did not include a figure to show the crease shape morphology in their research, other authors were in disagreement with each other on the classification of 'convex' and 'concave' NLF creases [34, 36]. The differences between the crease classifications is shown in Figure 1.

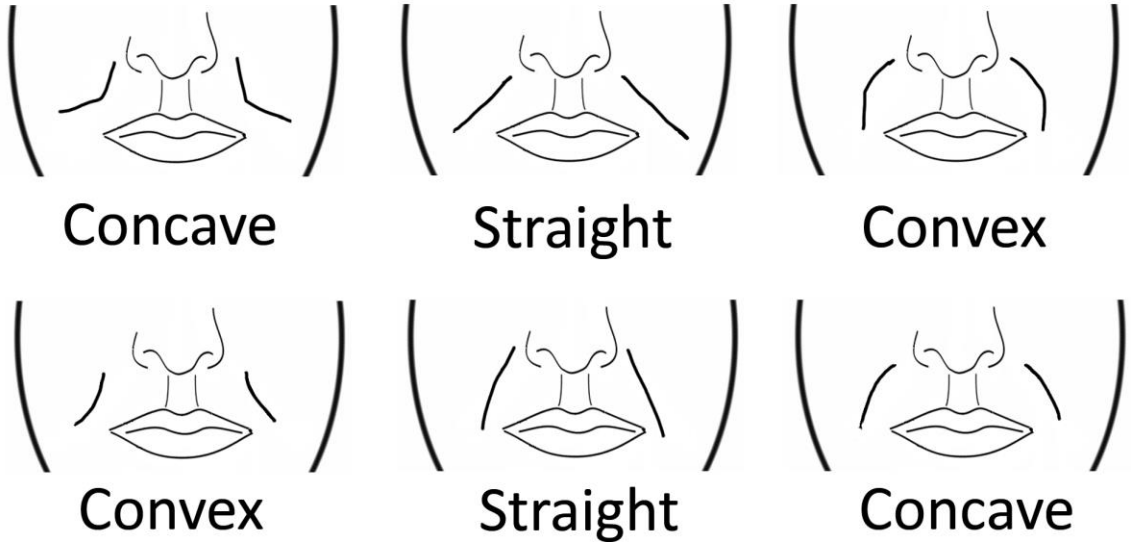

Figure 1 Modified figure showing the comparison of the nasolabial classification by Zufferey [36] (top) and Pessa, Zadoo, Adrian, Yuan [34] (bottom).

Creases around the lip region

Dunn, Harrison [37] categorized the wrinkles around the lips as the upper lip and lower lip wrinkles. The common term for upper lip wrinkles is smoker's lines, [38] while some authors mentioned it is as 'upper radial lip lines' [39]. The nomenclature 'perioral wrinkles' is also utilized to describe creases around the mouth [19]. Analysis on ten fresh cadavers between 75 and 93 years of age indicated that women have more perioral wrinkles than men, which may be due to the lack of appendages around the lip region [19]. It has to be noted that gravity may have an influence on the wrinkle morphology as the cadavers aged 70 years and above and may have lax skin. Also, the backward gravitational pull on the facial skin in a cadaver in supine position would alter the shape of the crease compared to that in a living person in upright position.

Mandibular fold

Mandibular fold, [28] variously designated as the marionette line [37], jowls [40], melomental folds [29], labiomandibular fold [41], marionette lines [27, 38], cheek-chin fold [31] or labiomental fold, [42] is a crease which originates from the corner of the mouth, usually adjacent of the cheilion superior of

the mandible and ends at the chin border. Lemperle, Holmes, Cohen, Lemperle [12] divided the labiomandibular fold into marionette lines and corner of the mouth lines. The fold may surpass the chin border if a person has lax skin. The fold becomes prominent with increased age [41]. This fold is the result of two fat compartments (submandibular and mandibular septum fat compartment) and the overlying skin [40]. The fold morphology would be altered when there are changes in facial expression [41].

Bifid Nose Wrinkle

The bifid nose wrinkle or crease is a vertical wrinkle on the tip of the nose when it is bifid. It is the only crease without an underlying bony morphology and the manifestation of this crease is due to the paired alar cartilage [43]. The columellar segments and the intervening soft tissue give rise to a smoother nose in individuals lacking this crease [43]. It has also been shown that individuals with bifid nose have a split nasal spine [44]. While Dunn, Harrison [37] called the bifid nose 'nose tip groove', Oneal, Beil, Izenberg, Schlesinger [43] and Rynn [44] did not refer to the crease in general, but stated that the absence of the soft tissue will result in the bifid appearance of the nose. The female nose tip has been categorized based on a four-grade scale in beauty magazines and the interdomal crease was stated [45].

Transverse nasal line

The transverse nasal line as indicated by Dunn, Harrison [37] is horizontal wrinkles present on the root of the nose. The wrinkle, also known as the fighter's wrinkle [46 in 47], transverse nasion lines [42] and wrinkles of the nasal root [31]. The wrinkle has also been classified as a groove between the lower third and the upper two-third of the nose [48], which is slightly lower than the crease noted by Dunn, Harrison [37]. The crease formation may be due to an anomaly present in the human gene [48]. The exact location varies among individuals. The formation of the wrinkle may be related to

the strength of attachment of the procerus muscle [49] or the depth of the eyes when the eyes are deep set [49] or due to the muscles at the glabellar region of the face [47].

Vertical glabellar line

The vertical glabellar lines [37] are also referred to as vertical wrinkles of the glabella [31], glabellar frown lines [12, 42, 50] or frown lines, [38] are creases located on the glabellar region of the forehead, usually between the eyes and above the nose. The wrinkle morphology is based on the development of the temporalis muscles, brow ridges, glabella and the relief of the occipital bone [51].

Mental crease and mental pit

The mental crease [49] that is also mentioned as lip chin fold [31] or chin crease [12] is a crease that is present on the mandible. Little research on the crease structure has been carried out by other researchers. A study was performed on linking the crease morphology with Pseudoxanthoma elasticum (PXE), an inheritable disease [52]. Skulls which have a groove in the labiomental region exhibit a strong muscle attachment in the area supporting a cleft chin in the face [49].

Creases around the eyes

There are some creases around the eyes. Lateral to the eyes are periorbital lines [12]. These are also known as the lateral canthal creases [37], temporal wrinkles [31] and crow's feet [27, 53]. These creases originate from the corners of the eyes and terminate at the lateral side of the head. It has been shown that the crow's feet can be utilized as an indicator of decreased renal function [54].

There are also creases inferior to the eyes. The crease adjacent to the eyes are called the lower eyelid [37], eye-fold below the orbit [31] or the malar crescent [42]. This crease is a crescentic crease due to the protrusion of the eyeballs. The upper eyelid, like the lower eyelid has a crease

directly above the eyes. The crease has been mentioned by few researchers [15, 17, 37, 55]. The supraorbital margin dictates the shape of the upper eyelid fold [56]. When there is an overhang in the middle of the supraorbital rim, the fold is defined more laterally and becomes thicker [56]. A medial epicanthic fold is determined by a low nasal root while an intermediate fold is determined by a low orbit with an overhang at the brow bridge. A dissection study on eight cadaver faces in the eye region revealed that the lower eyelid fat pads are individualized and do not combine with the posterior intra orbital fat [57].

The infra orbital crease is a crease which is situated inferior to the lower eyelid crease of the eyes originating from the nose region and following the lower margins of the orbital rim. It has been shown that the crease overlaps the lower border of the infra orbital foramen 52% of the time [28]. The infra orbital crease is also known as the nasojugal groove [42, 58], nose-cheek wrinkle [31], or the nasojugal fold [7, 59]. Camp, Wong, Filip, Carter, Gupta [58] defined the nasojugal grove as a crease which is bordered laterally by the mid-pupillary line and superiorly by the medial canthal line. A definition of the fold was not provided by Shaw, Katzel, Koltz, Yaremchuk, Girotto, Kahn, Langstein [59] and Sadick, Karcher, Laura [7] in their research.

Forehead Creases

Creases on the forehead are almost exclusively horizontal in pattern. The creases are either called horizontal forehead creases [2], forehead lines [27] and horizontal forehead lines [12]. Extensive research on grading the forehead wrinkles have been conducted by previous researchers [5, 12, 22, 23, 25, 27, 53]. Researchers seem to be unanimous in naming this crease as this is the only crease which is present on the facial musculature covering the frontal bone.

Periauricular Crease

The periauricular lines [12, 60] are creases around the ear region commonly occurring in the medial of the face around the tragus region. This crease is rarely studied [12, 60] and this may be due to the location of the crease on the face. The crease is nearer to the ears, which makes detection of the crease difficult when viewing the face in a frontal view. Only when the face is viewed laterally will people be able to recognize the crease.

Summary

An earlier report on standardizing the nomenclature of creases was brought out by Işcan [31] although the nomenclature prescribed did not acquire popularity among researchers. In order to simplify classification, it is proposed that a figure showcasing the crease or wrinkle of interest on the face is included in future research articles. Based on the names stated in this review, Figure 2 has been modified from a previous paper[37] with additional creases. Figure 2 has also been adopted in previous research [61].

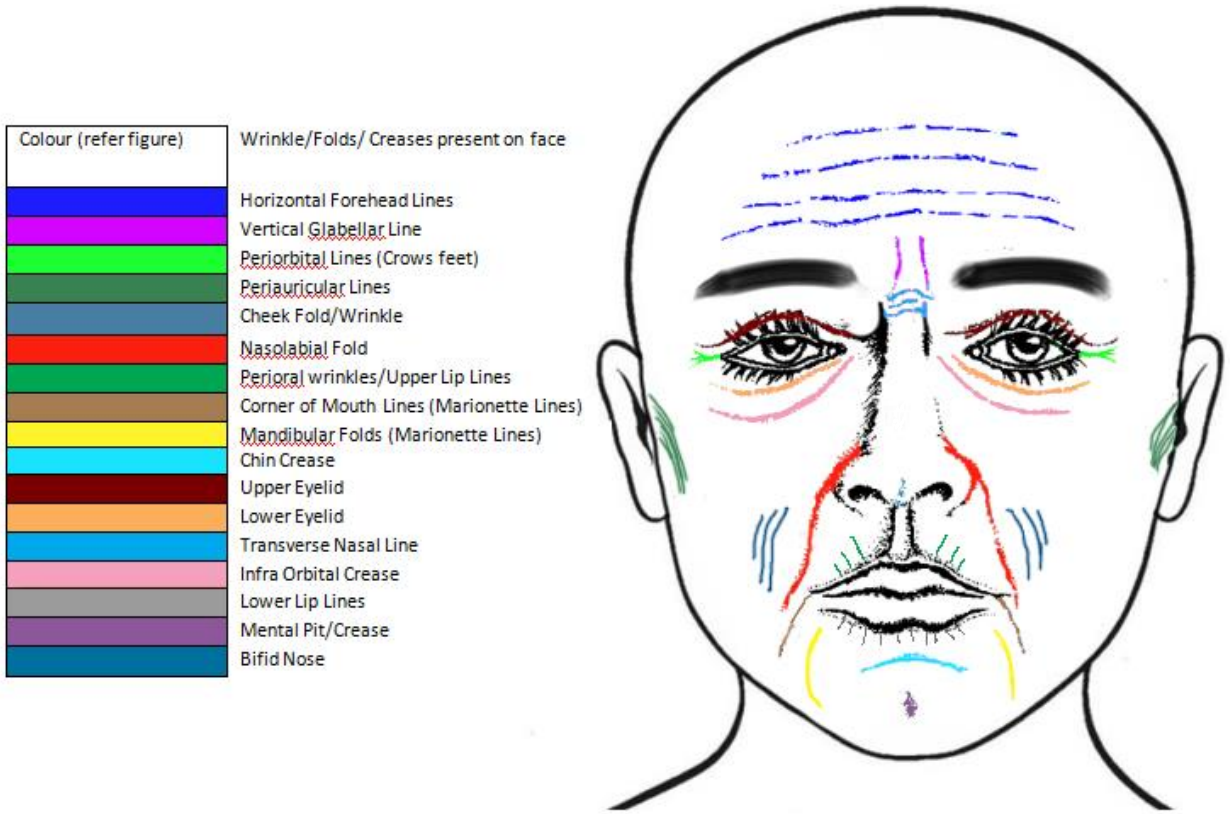

Figure 2 Common creases available on the face.

This review article brings out the difficulties in limiting the description of a crease using a single term since the use of multiple terms are common, both among scientific researchers and laypersons, for a considerably long time. The existence of such differences may also be due to the extent of the common usage of a particular terminology by researchers and the local community. However, it is still possible for researchers to include figures depicting the creases in general in their research article to ensure uniformity in recognition and for ease of identification. Ideally, limiting the terms utilized would make it easier for researchers and laypersons to refer to a specific crease without the need for figures depicting the crease morphology of interest. It is

hoped that the common terms brought forward by other researchers in this review article are utilized by future researchers.

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