

# Factors influencing face aging. Literature review

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## SUMMARY

The aim of this review is to analyze different factors which can affect natural face aging by delaying or expediting the process. Various studies shows that different factors such as ultraviolet light, gravity, habits, teeth loss may affect face appearance during aging. The articles from 1959 to 2011 related to topic were identified. 47 articles were selected for data collection.

**Key words:** face aging, aging changes, influencing factors.

## INTRODUCTION

Each person may have individual issues about what specific facial features are attractive or unattractive, they may disagree with people in other cultures about certain attributes of beauty, but much of what is considered attractive is shared across cultures [2]. During past few years there was noticeable come back of researches on the human face morphological markers, face aging changes. There are made numerous studies focused on face attractiveness, face recognition, even connection between appearance and intelligence [23]. Many scientists are interested in the factors that contribute to the attractiveness of the face, how someone's attractiveness affects others and their behavior and how it might improve or maintain facial attractiveness [14]. Dentists, genetics, plastic surgeons, antropologists, forensic experts are trying to understand face changes during humans life and how enviromental and genetic factors changes our appearance. Aging is an inevitable process. Changes in the face secondary to aging are the most apparent. Facial aging is a dynamic process involving the aging of soft-tissue and bony structures. The aim of the study is to determinate factors influencing changes in human face. Age related changes in anatomical structures are wide investigated, but still there is a lack of common data. A convenient method for assessing the morphological effects of aging is to divide the face into the upper third (forehead and brows), middle third (midface and nose), and lower third (chin, jaw line,

and neck) [11]. The major forces responsible for facial aging include gravity, soft tissue maturation, skeletal remodeling, muscular facial activity, solar changes and changes in stomatognathic system [47]. These factors can be classified into local and systemic.

The aging changes seen in the lower third of the face affect the lips, chin, lower cheeks and neck. Changes in dentition and absorption of maxillary and mandibular bone may result in an overall loss of height and volume. Aging across the mandibular border may be described by several mechanisms: fat atrophy, volume loss and loss of elasticity [37; 39]. These changes may result in the lower third of the face appearing smaller relative to the upper and middle thirds, straying from the ideal, approximately equal proportions. Aging changes from the middle third of the face may contribute to this appearance, as nasal tip ptosis may create the appearance of a shortened upper lip [43]. The constant effects of gravity combined with loss of elasticity in the tissue may allow for excess skin to drop off the mandible [11]. Some authors say that volume loss, including soft and hard tissue is at least equally important as gravity in the pathogenesis of aging [15].

There are two ways by which face, and for that matter skin ages: internally and externally. Internal aging is what's commonly referred to as the "natural" aging process. This type of aging occurs as human gets older and involves:

- Collagen production slowing (collagen contributes to skin's firmness)
- Elastin production decreases (elastin contributes to skin's elasticity)
- Fat cells begin to disappear (which can lead to sagging skin)
- Your skin losing its ability to retain moisture
- Frown lines appearing due to small muscle contractions
- Dead skin cells not being shed as quickly
- Slightly less turnover of new skin cells

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Some aspects of aging are fairly uncontrollable, and these are largely based on hereditary factors. Other factors are somewhat controllable and are largely the result of exposure to the elements and harmful habits [34].

## MATERIALS AND METHODS

The literature on face is different and very few comprehensive sources can be found. The aim was to search Medline database to identify studies and reviews related on human face aging changes. Examples of search words and phrases are: „face aging“, „lower facial third“, „age related face changes“, „face anthropometry“. The main question for our study was: What are the most important factors influencing human face aging? Using key words: face aging, aging changes, influencing factors, a literature survey was performed using Medline database. The articles from 1959 to 2011 related to topic were identified. 47 articles were selected and analyzed for data collection.

## RESULTS

### The Environment

A number of factors contribute to and in many instances accelerate the natural aging process. Prolonged or frequent exposure to environmental agents such as sunlight (ultraviolet radiation) and wind or arid climates can cause skin, particularly the more delicate skin of the face, to age prematurely [45]. In addition to the photo damage caused by sunlight, which dries and destroys the cells and underlying structure of the skin, exposure to the sun gives the skin a furrowed, thickened appearance and hastens the development of wrinkles, especially around the eyes as a product of squinting [43]. Aridity and wind likewise dehydrate the skin, contributing to the formation of wrinkles, but the effect of ultraviolet radiation from the sun on the facial tissues by far exceeds these agents in effect. Chronic sun exposure can result in numerous changes in human skin, particularly on the face, changes in photoaging include wrinkling, elastosis, actinic keratoses, irregular pigmentation [44]. With continued exposure to the sun and other elements, the color and texture of the face can change, becoming blotchy, yellowish, and leathery, with loose, inelastic, hyperpigmented skin. Blood vessels lying close to the surface of the skin may become prominent as networks called spider veins, adding to the skin's overall mottled and blotched appearance [33].

The potential detrimental effects of tobacco smoking have been widely cited. Smoking is an important determinant of macroscopic skin ageing and wrinkling in older subjects [16; 25; 27]. This evidence suggests that skin ageing does not clearly provide an objective measure of cumulative ultraviolet exposure, and caution should be exercised before it is used in this way. Impor-

tant characteristics of the aging skin are elastosis and telangiectasia [35]. Although some studies shows what role of smoking in the skin wrinkling is minor [34].

### Orthodontic Treatment

In some cases, variations in the appearance of the face can be explained by changes in the position of the teeth to orthodontic treatment. Though such treatment is mainly performed on children and teenagers, it is not uncommon in adults and may impart a greater change in appearance in these older individuals, especially as it may be used more to achieve aesthetic results. It is important that at the aging human changes lip line during speech or smiling. Mandibular tooth display in the rest position increases significantly. Upper lip length increases significantly by almost 4 mm in older subjects, whereas upper lip elevation did not change significantly. The significant increasing lip coverage of the maxillary teeth indicates that the effects of age should be included in orthodontic treatment planning [46]. The dynamic measures indicate that the muscles' ability to create a smile decreases with increasing age [13].

Most aesthetic dental work involves the extraction of premolars and molars in the upper or lower jaws. The main soft tissue differences between the patients at the end of treatment are a more retruded lower lip and a more pronounced lower labial sulcus in those patients subjected to extraction [8]. Removal of the wisdom teeth in the maxilla will cause the face to appear narrower, removing premolars from the mandible and pulling the remaining lower teeth together by means of orthodontics can markedly alter the profile of the face and lessen the effect of an inherited dominant chin. Some aesthetic treatments of this nature, especially those involving surgery and an associated restructuring of the face, may alter an individual's facial appearance. Untreated dental or surgical problems may also result in distinctively altered facial characteristics [31]. An individual with an open bite, for instance, may compensate for the situation with muscular action in the chin area; over time this condition will create grooves and wrinkles in that region. The relative changes in the position of the lips, nose, and chin, cause the lips to appear more retrusive at 46 years of age [6]. These changes should be taken into consideration when orthodontists are considering various treatment and retention options for their adult patients.

### Teeth Loss

Tooth loss is an undesirable entity which occurs due to physical injury or disease. The condition of missing teeth is medically termed as edentulism or anodontia. Loss of teeth is frequently associated with periodontal disease in older adults [26]. Aging alone does not lead to critical loss of periodontal attachment in healthy elderly persons, older patients retain their

natural teeth for longer and clinical picture consists of normal age changes in combination with pathological and iatrogenic effects [20; 29]. The effects of aging on periodontal tissues intensify teeth and bone loss in elderly patients with periodontitis [28]. Bone remodeling is linked to the functional need of an individual's body where there is a need for bony tissue, it is deposited; where it is not needed, it is resorbed. Depending on the loads and stresses placed on the skeletal system, nutrition, and other factors affecting the individual, the density and thickness of bone will vary [9]. When a human loses teeth, the demand for support in the bone surrounding the teeth will be decreased. This leads to a resorption of bone in those not active areas, a process which is more pronounced in the upper jaw than in the lower jaw. The presence of less bony tissue in the upper jaw decreases the height of the face and causes the lower jaw to appear more prominent. Reduction of facial height, most marked in the maxilla and mandible, and strongly correlated with loss of teeth [4]. The loss of support tissues in the face leads to the formation of wrinkles and affects the muscles of the lower face, which must compensate for the absence of teeth, cheeks can appear hollow [1;33]. When teeth are lost from the lateral areas of the jaw, there can be a narrowing of the face as well as a hollowing of the cheeks; anterior tooth loss will produce a concave profile. Total loss of the teeth will affect the density and thickness of the jaw bones [30], resulting reduced size of the jaw area and foreshortened facial appearance. In this way tooth loss has a significant effect on both the underlying skeletal proportions of the face and the overlying soft tissues. Therefore total face height ratio remains stable throughout adulthood among individuals who have relatively intact dentitions [12; 18; 32], or anterior face height may increase due to teeth eruption [17].

Replacement of the natural teeth with dentures may inhibit the continued resorption of bone in the upper and lower jaws to some extent, but a change in the volume of the bone tissue in the jaws will usually be visible [22;42].

With increasing age and due to periodontal disease the body resorbs much of the bone tissue composing the jaws, causing the gums to recede and the roots of the teeth to become visible the expression which can be used to describe an aged appearance. The wearing of the occlusal surfaces of the teeth over time leads to the decreasing vertical height of the face, and also can cause flattening and remodeling of the temporomandibular joint as a product of arthritis [31].

Bruxism is one of the most prevalent, complex, and destructive dental functional disorders [36]. The affects of bruxism and clenching become increasingly apparent as patients live longer. Many aging patients have worn their teeth to the degree that they cannot chew properly, and the teeth are painful [10].

### Remodeling

Throughout life, bone tissue is continuously being formed, removed, and replaced. The bones of the face retain the capacity for remodeling at any age [5]. During youth, particularly before the age of twenty and with peak velocity at puberty, the deposition, growth, and modeling of bony tissues predominates. This sequential, chronological process is physically evident in the changing shape, height, and facial structure of males and females with entry into early adulthood [31]. The facial skeleton appears to rotate such that the frontal bone moves anteriorly and inferiorly while the maxilla moves posteriorly and superiorly. This rotation causes bony angles to become more acute and likely has an effect on the position of overlying soft tissues. These changes appear to be more dramatic in women [41]. The mandible bone ageing and osteoporosis differs sufficiently from post-cranial skeletal sites it would be unwise to extrapolate from findings in the jaw to the circumstances elsewhere [7].

By age 28 the formation and growth of the human skeletal system in most individuals is complete and physical changes occurring after this developmental milestone primarily involve bone remodeling and resorption, tissue degeneration [9; 33].

### Gender

Gender differences in health, socioeconomic status, and social resources persist into advanced old age and result in variations in life trajectories and responses to the challenges of longevity [3]. Demographic changes have forced gerontologists to focus attention on the gender based character of population aging [38]. The aging process of male and female faces share many common features, attention to the particular differences in the aging man is warranted [24]. Gender differences in the male face include the presence of facial hair, increased facial vascularity, increased thickness, increased sebaceous content, hormonal influences, and potentially differing rates of fat and bone absorption during the life cycle. Women tend to develop more and deeper wrinkles in the perioral region than men; their skin contains a significantly smaller number of appendages than men [35]. Women who look young for their age have large lips, avoid sun-exposure and possess genetic factors that protect against the development of gray hair and skin wrinkles [19]. High social status, low depression score and being married are associated with a younger look, but the strength of the associations varies between genders [40].

Using literature search, we found more factors which can affect face changes, like a nutrition, genetic anomalies, internal diseases and human races, but we excluded these factors because of lack of common data. Factors like plastic surgery excluded, because we were interested in aging, not affected by medical procedures.

## CONCLUSIONS

This study shows that there are certain, noticeable hard and soft tissue age related shape and size changes. It is proven that particular biological and environmen-

tal factors can influence face aging, speeding up or delaying the process. We found in literature certain differences between genders, especially in wrinkle formation. Also there are features individual to each person that can affect different speed of aging.

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