

Aging in the Male Face: Intrinsic and Extrinsic Factors

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BACKGROUND Gender is one of the most significant factors that influence facial anatomy and behavior, both key factors in the aging process.

OBJECTIVE To review male facial anatomy, physiology, and behavior and how it contributes to sexual dimorphism in facial aging.

METHODS A MEDLINE search was performed for publications on gender differences in facial anatomy, aging, cutaneous physiology, and behavior.

RESULTS There are differences in both intrinsic and extrinsic aging factors in men. Men have a thicker epidermis and dermis with more active cutaneous appendages including hair growth. Male skin has a reduced antioxidant capacity and increased ultraviolet-induced immunosuppression. The male face is larger and has a unique square shape with less subcutaneous soft tissue, especially at the medial cheek. Men are also more prone to smoking and exhibiting poor sun-protective behavior. The differences in intrinsic and extrinsic aging factors contribute to poor facial aging in men. Men develop more severe rhytides in a unique pattern, show increased periocular aging changes, and are more prone to hair loss.

CONCLUSION This review provides insight into the factors contributing to accelerated male facial aging. Understanding gender differences in aging will help physicians tailor cosmetic treatments for men and minimize extrinsic aging factors.

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Aging is the result of progressive changes to both the skin and underlying tissues through intrinsic and extrinsic factors.¹ Intrinsic aging refers to the effects of genetic, hormonal, and biochemical changes over time. Extrinsic factors such as smoking and sun exposure accelerate facial aging through changes to skin including epidermal dysplasia and loss of elastic fibers and collagen. The combination of intrinsic and extrinsic factors leads to the clinical features of an aging face including dyschromia, wrinkles, dermatochalasis, bony resorption, protruding lower eyelids, and volume loss.

Although the changes associated with aging are well described, the rate and pattern of change vary depending on the individual's behavior, genetic composition, and anatomic structure. Because gender

is one of the most significant factors that determines facial anatomy and behavior, it plays a critical role in the aging process. This review describes male facial anatomy, physiology, and behavior and how it contributes to sexual dimorphism in facial aging.

Intrinsic Factors

Sex Hormones

As humans age, there is a reduction in sex hormone production because of decreased functional reserves of the endocrine organs. The hormonal changes in aging women are well documented. Women experience a rapid decline in serum levels of estrogen after menopause.² The normal sex hormone profile for an aging

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male is less clear. Most aging men experience a gradual decrease in circulating testosterone averaging 1% per year beginning at age 30, but this decline varies substantially among men.³ Because men lack a major decrease in hormonal status, comparable to menopause in women, the characterization of normal male aging endocrine status is challenging. The decrease in testosterone is critical to intrinsic aging because of its wide ranging interactions with the male body, skin, and behavior.⁴ Aging men may experience decreases in sexual drive, intellect, lean body mass, erectile function, body hair, and cutaneous function.

Cutaneous Physiology

Skin is a steroidogenic tissue through its ability to both metabolize and react to sex hormones.⁵ The quantitative gender differences of sex steroids lead to sexual dimorphism in cutaneous physiology. Male skin is thicker at all ages,⁶ but the difference varies with anatomical region.⁷ Mirroring the gradual decrease in testosterone, male skin thickness decreases linearly with age, whereas women experience a rapid decrease in thickness after menopause.⁸ Gender differences in skin thickness are believed to be due to differences in dermal collagen content and fibril size. The total hydroxyl-proline content in females is less than men at all ages.⁹ In mouse models, electron microscopy showed statistically significant differences in the collagen fibril diameter between male and females.¹⁰ Additional studies support the link between the androgen receptor pathway and increased collagen content in men.¹¹

Male cutaneous appendages show greater activity with men having an increase in sebum and sweat production. The increased sebaceous gland activity may contribute to the larger pore size found in men. There are significant differences in hair distribution because the growth of sexual hair is dependent on androgens. Androgens convert small, straight, nonpigmented vellus hairs into coarse, pigmented, terminal hairs. Androgen-dependent areas include the chin, upper lip, chest, breasts, abdomen, back, and anterior thighs. In men, beard growth and male-pattern hair loss are eliminated when testosterone is removed.¹² The increase in terminal hair growth in men contributes to their unique facial vascular pattern.¹³ A Doppler flow perfusion study of

male versus female facial skin documented increased perfusion in men, because of the larger number of microvessels present.¹⁴ A dense plexus of arteries supports the hair follicle, and hair follicles with a large diameter tend to have a larger number of capillaries that pass through the dermal papilla.¹⁵ Thus, the greater vascularity of the male face may be attributed to the presence of coarse facial hair. The enhanced vascularity of the male face may also contribute to the increased incidence of postoperative bleeding complications in males undergoing facial plastic surgery.¹⁶

Antioxidant Capacity

One of the most important causes of skin aging is the damage caused by excess radical oxygen species (ROS) produced from endogenous and exogenous sources.¹⁷ Endogenous ROS are byproducts of cellular metabolism, whereas exogenous sources develop primarily from ultraviolet (UV) radiation and pollution. The body has an innate antioxidant defense system to neutralize ROS through the production of antioxidant enzymes, such as superoxide dismutase, catalase, and glutathione peroxidase.¹⁸ In both genders, ROS levels rise and antioxidant activity declines with advancing age.¹⁹

In numerous studies, men have demonstrated higher levels of oxidative stress than women.²⁰ The gender differences in oxidative stress are believed to be due to decreased innate antioxidant protection in men. Glutathione peroxidase and superoxide dismutase have greater expression and activity in female mitochondria compared with male mitochondria. Estrogen upregulate nuclear gene expression of these antioxidant enzymes in females,²¹ allowing increased protection against ROS.²² Male mice have lower cutaneous levels of antioxidant enzymes and a 10-fold lower antioxidant capacity compared to females. This gender difference in oxidative capacity extends to other organ systems including heart, kidney, and liver.²³

Facial Anatomy

Anatomical gender differences are wide ranging and are reflected in the differences in external genitalia, greater musculature, and a larger skeletal anatomy of males relative to females. Sexual dimorphism in facial anatomy is also well documented.

Because the bony elements of the face provide the framework on which the soft tissues rest, craniofacial shape has a substantial impact on facial aging. The male skull is not only unique in its overall larger size²⁴ but also in its unique shape. Men have prominent supraorbital ridges,²⁵ which provide an anatomical landmark for the eyebrow position. In men, the eyebrow is flat and sits lower along the orbital rim when compared to women.²⁶ Men have a greater glabellar projection, whereas females remain relatively flat at the glabella.²⁷ Both the forehead height and width are greater in men with an increased backward slope. The orbital size of males is larger than that of females, as measured by computed tomography (CT).²⁸ Men also have a wider and larger chin with forward prominence.²⁹ Prominent flexure of the mandibular ramus is typical of the male jaw.³⁰ The skeletal differences between genders contribute to the “square” features of the aging male face.

Facial muscles are unique in that their primary role is to move skin for facial expressions. Their importance in aging is due to the lines and grooves formed in the skin during muscle contraction, which can lead to static wrinkles over time. Gender differences in facial musculature, therefore, influence wrinkle patterns. Men have significantly more skeletal muscle mass when compared to women.³¹ Although no study has examined differences in the muscle mass of facial mimetic muscles, there are gender differences in facial muscle movement with men having greater facial movement after adjusting for differences in facial size.³² Men also have been shown to have a greater upward vertical movement capacity in facial expressions.³³

A key contributor to facial shape is the amount and distribution of subcutaneous fat. The subcutaneous adipose layer is not only thinner in men irrespective of age but also has a different distribution.³⁴ Three-dimensional reconstructed CT models have demonstrated that men have less soft tissue in the cheeks.^{35,36} Women have an additional 3 mm of subcutaneous tissue in the medial malar area when compared with men.³⁷ The ratio of medial to lateral cheek thickness is 1.5:1 in women and 1.1:1 in men resulting in an increased anterior projection of the medial cheek in

women compared with men. Clinically, this difference corresponds to flatter, more angular cheeks in men. Lower eyelid prominence is another important feature of the aging face. The presence and expansion of orbital soft tissue play a key role in the development of lower eyelid prominence. In men, the total orbital fat is larger than women.

Extrinsic Factors

Men are more likely to participate in high-risk health behaviors that contribute to aging. Men have consistently underutilized preventive health care services including dermatology care³⁸ compared with women.³⁹ Extrinsic aging factors range from exposure to sunlight, pollution, cigarette smoke, repetitive muscle movements, and diet.⁴⁰ The 2 greatest exogenous factors are smoking and exposure to UV light.

Smoking

Smoking causes cutaneous injury by decreasing capillary blood flow to the skin, which is deprived of oxygen and nutrients. Smoking results in fewer collagen and elastin fibers in the dermis, which causes skin to become less elastic. A dose–response relationship between wrinkling and smoking has been identified, with smoking being a greater contributor to facial wrinkling than sun exposure.⁴¹ Smoking was found to be an independent risk factor for premature facial wrinkling even after controlling for sun exposure, age, sex, and skin pigmentation.⁴²

Men are more likely to smoke increasing their risk for cutaneous aging. In 2012, the worldwide prevalence of smoking in men was 31.1% and 10.6% in women.⁴³ In the United States, the prevalence of men who were cigarette smokers was 20.5% in comparison to 15.3% in women.⁴⁴ Smoking is strongly associated with the development of facial elastosis and telangiectasias in men.⁴⁵

Ultraviolet Light Exposure

Ultraviolet light exposure accelerates cutaneous aging through the degradation of the collagen matrix. Sun exposure is estimated to account for up to 90% of visible skin aging. The highly gendered nature of

employment results in men being more likely to be employed in outdoor occupations resulting in more UV light exposure.⁴⁶ When men are outdoors, they are less likely to adopt sun protective behaviors.⁴⁷ Men use sunscreen less frequently than women.⁴⁸ One study found that 41% of men never apply sunscreen.⁴⁹ In fact, men are less likely to apply any skincare product to their skin and are more likely to forget topical medications.⁵⁰ Although females are more likely to sunbath and indoor tan more frequently, men are more likely to develop sunburns.⁵¹ A survey found that men exhibited a significantly higher frequency of sunburn, used fewer sun-protective measures, and demonstrated less knowledge concerning sun safety information and skin cancer than women.⁵²

Men's skin is also less equipped to handle the damage induced by UV radiation. Men not only have reduced innate antioxidant capacity but also are more prone to greater UV-induced immunosuppression.⁵³ A study found that men develop more immunosuppression even when UV dose, minimal erythema dose, skin color, and age were matched. Male gender is also an independent risk factor for immunosuppression after surgical procedures.⁵⁴ The reduced antioxidant capacity and enhanced UV-induced immunosuppression may contribute to the increase incidence of skin cancer in men. Men are more prone to skin cancer, with squamous cell carcinomas being twice more common in older men.⁵⁵ The prevalence of melanoma is higher in older men and more lethal with mortality rates twice as high compared to women.⁵⁶

Male Aging Face

The differences in intrinsic and extrinsic aging factors lead to the aging differences between genders. In general, men tend to age more poorly than women. Men have been found to appear 0.37 years older than their age and women 0.54 years younger.⁵⁷ Gender aging differences vary substantially between ethnicities, but most studies examine aging in subjects of European descent. Although the aging processes of the male and female face share many common features, attention to the particular differences in the aging man is warranted.

Wrinkles

Rhytides are the hallmark clinical sign of skin aging. A combination of several mechanisms contributes to skin wrinkling, including oxidative stress, UV radiation, and mechanical stress.⁵⁸ Muscle contraction creates repeated mechanical stress allowing a temporary wrinkle to evolve into a persistent wrinkle.⁵⁹ Ultraviolet radiation accelerates facial wrinkling by reducing skin elasticity and thus its ability to accommodate mechanical stress. Because of the difference in male facial musculature and UV exposure, men exhibit a different onset and pattern of persistent facial wrinkles.

Wrinkles tend to be more severe and develop earlier in men. The forehead is the most susceptible area for early severe wrinkles in men.⁶⁰ The perioral area is the only area where women develop deeper rhytides, which is believed to be due to the significantly smaller pilosebaceous units in the oral region.⁶¹ The gender difference in wrinkle severity has been exhibited in different ethnicities where extrinsic UV-induced damage may have less of a role. A study of 173 Japanese men and women documented that men tend to have more severe facial rhytides than women.⁶² Gender differences in wrinkle intensity disappear with advancing age. Postmenopausal women's wrinkle intensity is the same as or greater than that of men suggesting that female hormones protect against wrinkle development.

Not only are wrinkles more severe in men but they also develop a different pattern. The male wrinkle pattern is largely influenced by gender differences in facial musculature. The glabellar wrinkle pattern differs between genders with men more likely to have a "U" pattern because of increased contribution of the procerus muscle.⁶³ The lateral orbicularis oculi muscle creates a unique contraction pattern at the lateral canthi in men. More than 50% of men have downward fan pattern at the crow's feet area, whereas women have central, full, or downward fan pattern in equal proportions.⁶⁴ The predominance of lower fan wrinkle pattern in men may reflect the greater recruitment of cheek elevators posing a treatment challenge with neuromodulators.

Volume Loss

Volume loss in the aging face results from both craniofacial remodeling and atrophy of superficial and deep fat.⁶⁵ Clinically, volume loss contributes to formation of rhytides, jowls, and temporal, infraorbital, and medial and lateral cheek hollowing. Multiple studies indicate that rate and timing of volume loss differ between the genders. In men, a steady atrophy of soft tissue occurs in all anatomic areas over time, without a rapid decline.⁶⁶ This male pattern of volume loss differs from women who experience a sharp reduction in soft tissue thickness in the perimenopausal period.³⁷ Histomorphometric studies demonstrate that men lose bone mass linearly with age, but the rate of decline is less than in women.⁶⁷

Periocular Aging

The periorbital area is a cosmetically important area of the aging face. Youthful periocular skin is important to an overall youthful appearance. For the lower eyelid, the ideal is a smooth contour from brow to cheek. For the upper eyelids, sagging eyelids are a cosmetic concern and can cause visual field loss. Given male differences in periocular skeletal and adipose anatomy, men tend to have more pronounced periocular changes.

Men develop more age-related changes to the lower eyelid. Although sagging severity increased with aging in both male and female faces, sagging at the lower eyelid in males was much more severe.⁶⁸ This downward shift is larger in men suggesting an increase in lower eyelid laxity. Not only do men experience a larger downward shift of their lower eyelids but also the lower male eyelid becomes more prominent with time. Magnetic resonance imaging has identified that men develop more soft tissue atrophy and infraorbital fat enlargement. Male infraorbital thinning and increased periocular fat magnify the appearance of infraorbital hollowing associated with aging.

Sagging upper eyelids are considered a feature of the aging process of skin.⁶⁹ Although men tend to have decreased risk of mild upper eyelid sagging, they are at increased risk of severe sagging.⁷⁰ The observed sex difference is likely explained by multiple biological variations between the sexes, including skeletal shape.

The male orbital aperture increases with age, in both area and width. Resorption is, however, uneven and site specific. The inferomedial quadrant of the male orbit tends to recede more commonly and may contribute to the gender differences in periocular aging.⁷¹

Hair Loss

Hair is an important feature of youth by providing a frame to the face. The loss of one's hair is commonly associated with the loss of youth, vitality, strength, and sexual attraction.⁷² Studies have shown men who suffer from hair loss are 75% less confident, especially when interacting with the opposite sex.⁷³ Androgenetic alopecia is a common age-dependent feature with 50% of white men show at least some signs of hair loss by age 50.⁷⁴ The present cultural emphasis on youthful appearance has further strengthened the value of abundant hair. Studies have associated balding with overestimations of age.⁷⁵

Conclusion

This review provides insight into the factors contributing to the unique pattern of an aging male face. Men represent a growing segment of cosmetic practices, representing 9% of all cosmetic procedures in 2012. More than one million minimally invasive procedures were performed in men, an 8% increase from 2011.⁷⁶ Male interest in cosmetic procedures is also increasing. A survey of 25,000 men found that more than 40% of men were interested in having a cosmetic surgical procedure.⁷⁷ Despite the increased interest of male patients, few studies have examined the importance of gender in aesthetic treatments.⁷⁸ Understanding gender differences in aging can help physicians tailor cosmetic treatments for men and reduce the extrinsic factors leading to accelerated aging. Future studies are needed to evaluate how aesthetic procedures, including dermal fillers, botulinum toxins, and laser and other aesthetic treatments, can benefit the aging male face.

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