

Supplemental digital content 1 - Longitudinal intra-personal studies of aging facial changes

	Authors & Year	Study Design & Methodology	Conclusion	Level of Evidence
Fat Compartments	Yang CS, et al. 2021 [13]	<ul style="list-style-type: none"> - 63 patients (46 men, 17 women) with MRI at least 4 years apart (first MRI: 31 to 68 y) (Second MRI: 36-76 y) - Analyzed fat compartments of superficial temporal, subcutaneous temporal, and buccal fat pad 	<ul style="list-style-type: none"> - Thickness of subcutaneous temporal fat did not change significantly - Superficial temporal fat compartment became thinner and elongated - Buccal fat compartment lengthened and aggravated the labiomandibular fold 	IV
	Boehm LM, et al. 2021 [12]	<ul style="list-style-type: none"> - Retrospective study evaluating 19 individuals aged 30 to 65 y who underwent facial CT followed by second CT greater than or equal to 10 years later - initial BMI 27.1 kg/m² and final BMI 27.2 kg/m² - Superficial midface, deep midface, and buccal fat volumes quantified 	<ul style="list-style-type: none"> - Significant volume loss observed from both superficial and deep facial fat compartments over a mean 11.3 y - Patients lost 11.3 % of their initial superficial fat volume and 18.4 % of their initial deep fat volume 	IV
	Cevik Cenkeri H, et al. 2020 [11]	<ul style="list-style-type: none"> - 70 patients, mean age 60 y (range: 33-82 y) and median elapsed time of 44.5 months (range: 32-64 m) between 2 MRIs - Determine volumetric and dimensional changes in midfacial superficial fat compartment retrospectively 	<ul style="list-style-type: none"> - Aging is associated with significant decrease in superficial midfacial fat tissue volume and thickness both in women and men, but increase in lower compartment suggesting volume shift - No significant difference between men and women 	IV
	Tower JI, et al. 2020 [20]	<ul style="list-style-type: none"> - 109 patients (51 male, 58 female) with facial CT - Ages ranged from 21.7 to 91.1 y - 23 subjects identified for longitudinal analysis. - Mean ages at initial and final imaging time points were 50.0 and 60.3 y 	<ul style="list-style-type: none"> - Linear regression analysis: increasing age was associated with increasing deep cheek fat volume - Fat gain with aging more pronounced in caudal aspect of cheek than in the cephalad - Average gain of 0.23 mL over 10.3 years (P = 0.03) in deep fat compartment 	IV
	Tower J, et al. 2018 [21]	<ul style="list-style-type: none"> - Retrospective study of 14 adult (5 male, 9 female) (mean initial age 50.9 y; mean final age 60.4 y) who underwent multiple facial CT timed at least 8 years apart - Superficial cheek fat volumes measured and compared to track changes that occurred with aging. 	<ul style="list-style-type: none"> - Superficial cheek fat remained stable as subjects aged from approximately 50 to 60 y old, with no change in total volume or redistribution within a radiographically defined compartment 	IV
Facial Skeleton	Garib D, et al. 2021 [66]	<ul style="list-style-type: none"> - Lateral cephalograms of 21 subjects with normal occlusion (11 male, 10 female), taken at 17 (T1) and 61 (T2) y of age - Assess craniofacial changes from early adulthood to the seventh decade of life in individuals with normal occlusion 	<ul style="list-style-type: none"> - Maxillary and mandibular anterior displacement, and facial and ramus height increased from T1 to T2 - Soft tissue changes: decreased nasolabial angle, upper and lower lip retrusion, decreased upper lip thickness and increased lower lip and soft chin thickness - Males presented counterclockwise mandible rotation, whereas females showed mandibular clockwise rotation and backward chin displacement 	IV

	Fourgeot E, et al. 2021 [32]	<ul style="list-style-type: none"> - Analyze the intra-individual evolution of the facial skeleton - Retrospective study of 56 (29 male, 27 female) patients who underwent 2 separate facial CT (T1 and T2) with a minimum gap of 7 years. Mean ages at T1: 50 y; T2 59 y - with 3-D reconstructions, 7 facial angles and 6 facial distances were measured and compared 	<ul style="list-style-type: none"> - Significant decrease in facial angles at the midface - Significant increase in all facial distances for the overall population and for men - For women, all distances increased, but only piriform and zygoma distances showed significant changes - Bone remodeling appeared earlier in women 	IV
	Paskhover B., et al. 2017 [34]	<ul style="list-style-type: none"> - Case series study (n=14) (5 men, 9 women) from hospital records - Facial CT at least 8 years apart in adults initially aged 40-55 y 	<ul style="list-style-type: none"> - Changes in glabellar, piriform, and maxillary angles and piriform height and width 	IV

Cadaver studies describing aging facial changes by age groups

	Authors & Year	Study Design & Methodology	Conclusion	Level of Evidence
Retaining Liaments	Minelli L, et al. 2023 [45]	<ul style="list-style-type: none"> - Anatomical dissections of 49 cadaver heads (16 embalmed, 33 fresh, mean age 75 years) - Macro-sectioning, and series of standardized layered dissections performed, complemented by histology, sheet plastination and micro-CT 	<ul style="list-style-type: none"> - Hypermobility with lengthening of short elastic subcutaneous connective tissue over mandibular lower lip depressor muscles attachment occurs entirely in the subcutaneous layer to allow the mandible to move largely independent from the skin. - Development of sub-cutaneous and dermal redundancy constitutes the jowl in this location. 	IV
	Fat Compartments	Cotofana S, et al. 2019 [46]	<ul style="list-style-type: none"> - 40 fresh frozen Caucasian cephalic specimens, 17 male, 23 female (mean age: 76.9 ± 13.1 y; mean BMI: 23.6 ± 5.3 kg/m²) - CT and MRI with injection of contrast having rheologic properties similar to soft-tissue fillers - Anatomical dissections were performed to guide conclusions 	<ul style="list-style-type: none"> - Location is not influenced by age or by amount of injected material when estimated by position of the inferiormost and superiormost aspects of each visualized compartments - Increasing volume in deep midfacial fat compartments did not cause inferior displacement
		Mertens A, et al. 2016 [47]	<ul style="list-style-type: none"> - 40 fresh cadavers. Anatomical dissection of superficial and deep facial fat compartments after injection with methylene blue, then weighed - Age (2 groups: ≤75 or >75) - Sex, and BMI (3 groups: <20, ≥20≤25, or >25) 	<ul style="list-style-type: none"> - Weight of the deep compartments was significantly lower in subjects aged > 75 years - No statistically significant difference in mean weight of superficial compartments - Deep-to-superficial fat ratio was largely significantly lower in subjects with BMIs < 20

Live subject studies describing aging facial changes by age groups

	Authors & Year	Study Design & Methodology	Conclusion	Level of Evidence
Retaining Ligaments	Okuda I, et al. 2023 [48]	- 96 adult Japanese female participants (aged 20-79 y) - Participants divided into 3 age groups: Y, M, and E, comprising 20-39, 40-59, and 60-79 y, respectively - SMAS was quantified using multi-detector computed tomography (MDCT)	- SMAS thickness in groups M and E was significantly lower than that of group Y - SMAS gradually became thinner with aging - A statistically significant correlation was not found between SMAS thickness and BMI	IV
	Okuda I, et al. 2019 [49]	- 15 females (aged 21-57 y) divided into two age groups: one below the mean age (Group Y, 30) and one over it (Group O, 27 subjects) - Posture Change (PC)-induced SMAS Laxity Index measured using reconstructed CT images, and the relationship between this Index and age was analysed	- SMAS laxity increased with age	IV
	Yang E, et al. 2022 [29]	- MRI of healthy Han Chinese women with BMI 18.5-23.9 kg/m ² were collected and stratified by age - Analyze aging-related changes in lower eyelid tissue structure	- With aging, thickness of orbicularis decreased while its width increased - Radian of orbicularis in the tarsal portion protruding to the skin increased - Gradual shifting of subcutaneous fat to middle and lower regions	IV
	Bruneau S, et al. 2016 [30]	- 95 Caucasian adults divided in 3 groups: 20-39 y, 40- 59 y, and 60-79 y - Photos were made using standardized protocol - Eyebrow position evaluated from the intercanthal line to four points along upper margin of eyebrow	- No significant differences found when comparing eyebrow height above medial canthus, pupil, lateral sclero-corneal limbus, and lateral canthus between groups - This results from physiological muscular compensation with significant increase of frontal muscle activity with aging	IV
	Papageorgiou KI, et al. 2012 [10]	- 52 CT scans (24 men and 28 women) from hospital records were retained for analysis - 3D reconstruction used to analyze and calculate volumes of retroorbicularis oculi fat (ROOF), galeal fat (ROOF and subcutaneous fat), and soft tissue muscles	- Overall eyebrow volume does not change with age, but relative contribution of fat and soft tissue to total volume does seem to change - This pattern differs between males and females - As women age, fat volume increases and soft tissue volume decreases. In men, the shift from soft tissue volume to fat volume is less pronounced	IV
Platysma and Facial	Frank K, et al. 2024 [51]	- 76 subjects (30 males and 46 females), age range (19-80 y), mean BMI of 24.6 (3.7) kg/m ² (range 18-35) - sEMG (muscle aging), Cutometry (skin aging), and 3D skin displacement analyses (subdermal connective tissue aging)	- sEMG signal of investigated muscles decreased - Skin firmness increased - Skin elasticity decreased ($p < 0.001$), - Midfacial mobility remained unaltered	IV
	Alfertshofer M, et al. 2023	- 76 Caucasian volunteers (30 male, 46 female), mean age 42.2 y, mean BMI 24.58 kg/m ² - Upper facial regions analyzed for skin firmness and elasticity with cutometry, vertical and horizontal skin vector	- In older age (>42.2 y) there is increased skin firmness; decreased skin elasticity; increased vertical skin mobility; and decreased surface-derived EMG signal of frontalis muscle	IV

	[50]	displacement with 3-D imaging, and muscle activity with surface-derived EMG		
	Engerer N, et al. 2022	- 77 young-, middle- and old-age individuals - Objective outcome measures: 3-D imaging, cutometry and surface EMG	- Mean skin firmness and gross elasticity decreased significantly from young to old individuals - Mean skin displacement increased from young to middle-aged and old - Mean signal-to-noise ratio decreased significantly from young to middle-aged and old	IV
	[52]			
	Cotofana S, et al. 2021	- 32 volunteers with a mean age 42.6 y (21-82 y) and mean BMI 23.9 kg/m ² (range, 18.5-29.7 kg/m ²) - Surface-derived, noninvasive facial EMG - 9 facial muscles investigated bilaterally, resulting in a total of 1632 measurements of signal, baseline noise, and signal-to-noise ratio of these muscles.	- Age does not significantly influence signal, baseline noise, or the signal-to-noise ratio in a gender- and BMI-matched statistical model - Exceptions were zygomaticus major muscle (reduced activity), procerus muscle (increased activity), and corrugator supercilii muscle (increased activity)	IV
	[4]			

Fat Compartments & Soft Tissues	Zhang M, et al. 2024	- Quantitative sonographic assessment in 51 patients (40 female, 11 male) with a mean age of 39.7 years (19-64 y) - Total soft tissue thickness (the skin and superficial fat compartments) measured at 8 sites along the jawline and 4 sites at the neck	- With aging, soft tissue thickness changes with high region-specificity	IV
	[15]			
	Jiang M, et al. 2024	- Retrospective study of 90 Asian females, underwent facial CT (3 age groups: three age groups: 20-39 y, 40-59 y, ≥ 60) - 3-D model of soft tissue in apple zone (aesthetic unit of infraorbital cheek, with soft tissue between the lateral wall of the pyriform aperture and the zygomatic major muscle) - Age-related changes in fat volume and pyriform aperture area quantified using Mimics software	- Superficial fat volume decreased significantly with age and bone remodeling occurs - Significant difference in total fat volume between young and old groups	IV
	[57]			
	Estler A, et al. 2023	- 87 patients (18-81 y) Men (n = 28), women (n = 59) - Superficial and deep fat compartment volumes measured on MRI - Statistical analyses performed using SPSS and SAS statistical software	- Superficial and deep fat compartment volumes of the cheek increase with BMI - Superficial fat volume remains constant with age; deep fat volume decreased. Volume loss not significant - No significant difference of superficial or deep fat compartments found between men and women	IV
	[17]			
Eid L, et al. 2023	-Ultrasound of facial soft tissues on 9 female volunteers to demonstrate change in superficial facial fat compartments from upright to supine position - (18 hemifaces) 2 age groups: Group A (<35 y n=5), Group B (≥35 y n=4)	- Increase in fat thickness at interior and exterior medial cheek, superior middle cheek points; decrease of superior and inferior nasolabial, inferior middle cheek, jowl points in both age groups in supine position - Changes in medial cheek, nasolabial and superior middle cheek in Group B significantly greater indicating that degree of fat mobility may be affected by age	IV	
[22]				
Wang D, et al. 2022	- CT of of 200 Han Chinese subjects (100 men and 100 women) - Thickness of facial soft tissue measured at 20 anthropological landmarks of the skull	- Soft tissues in different areas of the face are selectively thickened or thinned with aging	IV	
[23]				
Sarigul Guduk S, et al.	- 262 patients (mean age: 46 years; median time between 2 CT imagings, 56 m)	- Total volume of SCF and inferior compartment significantly increased	IV	

2022 [16]	-Measurements of medial part of the superficial cheek fat (SCF) – 3 compartments - Results compared between males and females, and between three age groups: <45, 45-54, and ≥55 years.	- Upper and middle compartment volumes decreased with age ($p < 0.05$). -Thickness decreased in the upper and middle compartments but not in the lower compartment - Results were similar for both sexes and all age groups	
Paluch Ł, et al. 2020 [62]	- 89 females (age: 18-63 y, mean: 45.9 ±14.2 y) with intact facial skin - Quantitative analysis of facial fat tissue elasticity, using the example of the deep medial cheek fat compartment (DMCFC) with shear-wave elastography (SWE)	- Elasticity of the DMCFC decreases significantly with age - Tissue elasticity might be an indirect indicator of metabolic and structural properties of facial adipose tissue and its extracellular matrix	IV
Wen LH, et al. 2019 [24]	- 60 Asian females in defined age categories - Thickness of infraorbital fat, nasolabial fat, and the cheek fat compartments measured using CT - Analysis of correlations between midfacial grooves and related fat compartments	- Different midfacial fat compartments tended to undergo selective hypertrophy or atrophy with aging	IV
Tower JI, et al. 2019 [19]	- 109 patients (51 male, 58 female) with facial CT - Ages ranged from 21.7 to 91.1 y - Superficial cheek fat volumes measured, and multiple linear regression analysis performed to model relationships between cheek fat and corresponding sex, age, and BMI data	- Females had significantly greater mean total superficial cheek fat volume - Together, age, sex, and BMI explained 50.8% of variance in cheek fat volumes - Age predicted the greatest gain of fat in caudal subdivision of cheek whereas BMI predicted the greatest gain in cephalad subdivision	IV
Sandamini H, et al. 2018 [95]	- Facial soft tissue thickness (FSTT) measured at 23 standard anthropological landmarks using MRI of 243 adult individuals (male: 121, female: 122) of the Sri Lankan population	- In both males and females FSTT at mid philtrum and upper lip margin gradually decrease with the age - In females the FSTTs at supra orbital, jugale, zygomatic arch and supra glenoid landmark increase with age	IV
Kurosumi M, et al. 2018 [96]	- 3D analysis of faces of 280 Japanese women aged 20-69 y - Establish shape features that characterize individual differences - Evaluate relationships between each feature and age	- Changes in facial shape in middle age: decreased volume upper face and increased volume of whole cheeks and around the chin - Changes in older people: increased volume of lower cheeks and around chin, sagging skin, and jaw distortion - Increase or decrease in cheeks caused by soft tissue or skeletal-based changes	IV
Linden OE, et al. 2018 [97]	- Photogrammetric facial images of 191 volunteers (46 male, 54 female) (age range: 0.3-88 y)	- Statistically significant positive correlation between increasing age and facial asymmetry	IV
Foissac R, et al. 2017 [14]	- 100 faces of female Caucasian patients prospectively studied using high-resolution magnetic resonance imaging - Group 1 (18-30); Group 2 (30-60 y); Group 3 (>60 y) -Superficial temporal and central forehead compartments measured for volumes and dimensions by group	- Subcutaneous facial fat fluctuates with aging, increasing in the upper face and promoting ptosis through basal compartmental expansion	IV
Jang MS, et al. 2015 [18]	- 80 CT of patients of 4 age groups (20s, 40s, 60s, and 80s) - Measurements of total facial thickness (TFT) and midfacial fat thickness (FT) at 7 consistent points in the midface	- No significant difference in the TFTs of each point among age groups (all $P>0.05$) - FTs of the four points (infraorbital and nasojugal area) showed a significant increment in elderly	IV

			-FTs of mid-cheek exhibited almost no change among the age groups	
	Watanabe M, et al. 2015 [64]	- Prospectively enrolled 38 subjects (20 M, 18 F) (age range: 0.5-97) to investigate location-specific, age-related changes in facial soft tissues using quantitative MRI analysis	-Significant non-uniform age-related changes were within most facial musculatures and fat areas, with the exception of subcutaneous cheek fat -Masseeter and orbicularis oris muscles remain relatively constant, while relaxometry of zygomaticus major demonstrated significant age-associated changes that may be reflective of fatty atrophy and modification of facial muscle contour. In the lower eyelids, changes are indicative of fat hypertrophy, while buccal fat remains constant	III
	Wysong A, et al. 2014 [31]	-2037 MRIs screened from 30 male subjects divided into young, middle-age, and old groups to quantify and compare soft tissue in men in temporal, infraorbital, and medial and lateral cheek regions	- A steady and significant decline in soft tissue thickness was noted at all measured sites in men over time, without an obvious time of accelerated loss. The greatest reduction was observed in the infraorbital area over time.	III
	Iblher N, et al. 2014 [27]	- 3 different investigations performed to evaluate complex 3-dimensional changes during perioral aging - Photomorphometric study: Perioral proportions of 182 standardized subject photographs measured in a and correlated to age - Cranial MRI scans of 30 women aged 20-35 and 30 women aged 65-80 relevant anatomical dimensions measured - Histological cross cuts of upper lip complex of 20 individuals in two age groups, young (< 40 years, n = 10) and old (> 80 years, n = 10), analysed	- All studies showed a statistically significant lengthening of the aging upper lip - photomorphometric study showed increase of prolabium skin at the cost of a decreasing visible upper lip vermilion. MRI showed decrease in thickness and redistribution towards length increase but no total volume loss. Histomorphometric analysis revealed statistically significant thinning of cutis, thickening of subcutis and a degeneration of elastic and collagen fibers	IV
	Wysong A, et al. 2013 [98]	-2037 MRIs screened from 58 women divided into young, middle-aged, and older groups - A blinded radiologist measured temporal, infraorbital, medial and lateral cheek areas	- Facial soft tissue undergoes significant deterioration over time, with the most dramatic changes between the ages of 30 and 60 in the temporal, infraorbital, and lateral and medial cheek areas	III
	Papageorgiou KI, et al. 2012 [10]	- 52 CT scans (24 M, 28 F) analysed with 3D reconstruction to calculate volumes of the retroorbicularis oculi fat (ROOF), galeal fat (ROOF and subcutaneous fat), and soft tissue muscles.	- As women age, the fat volume increases and the soft tissue volume decreases. In men, shift from soft tissue volume to fat volume is less pronounced -Preservation of eyebrow volume with age, combined with apparent orbital hollowing, accentuates impact of light reflections and shadows on the eye and creates a false impression of eyebrow ptosis	IV
	Camp MC, et al. 2012 [28]	- 3D image data sets acquired of 42 mother daughter matched pairs (83 individuals). Changes in facial structure secondary to aging measured using volumetric comparisons of periorbital tissues in daughter and mother. Age range of the individuals imaged range from 15 to 91 years	- Consistent pattern of atrophy and regression of soft tissues associated with medial canthus and nasojugal groove. Histogram depth analysis of soft tissue shows greatest atrophy in the medial canthal region and soft tissues caudal to the lower lid	IV
	Darcy SJ, et al. 2008	- High resolution MRI of 40 subjects (17 M and 23 F) were examined. Scans obtained in clinical studies of strabismus and in clinical research involving the extraocular muscles	- All area measurements showed a relative increase with age	IV

	[25]	- Bony orbit and periorbital fat measured	- There is an increase in total orbital fat, inferior periocular fat, and inferior periocular fat anterior to the orbital rim,	
	Gosain AK, et al. 2005 [26]	- MRI of 20 healthy Caucasian female volunteers (16 - 30 y) and old (>59 y) age groups. -Images obtained at 1-mm intervals through midface -Quantitative analyses of cheek fat pad overlying levator labii superioris and zygomaticus major	- For both muscles, there were no significant differences between young and old subjects in muscle length, thickness, or volume - No significant differences between age groups in fatty infiltration of the muscle - Volumes of medial and lateral cheek fat pad were significantly greater in old than in young subjects ($p < 0.05$)	IV

Facial Skeleton	Lohakitsatian P, et al. 2025 [35]	- Retrospective study involving 118 patients (79 female, 39 male) (236 periorbital areas) aged 18-91 y who underwent brain MRI	- Decrease in the anteroposterior (AP) dimension of globe with age, indicating an enophthalmic tendency. However, there was no change in globe position in the vertical plane - No statistically significant correlation between age and the volume of anterior, posterior, or total upper orbital fat - Males had larger volumes of posterior upper, total upper, posterior lower, total lower, and total orbital fat	IV
	Nur Kuzan B, et al. 2024 [36]	- Retrospective study of nontraumatic CT of 280 Turkish adults - Participants divided into 7-decade groups with the age ranging 20-89 y - Measurements of face and calvaria were recorded, and calvarial volume calculated	- Significant differences observed in all facial and calvarial measurements, except the transverse diameter of the head, with increasing age in both genders - Regardless of age, no significant differences between genders - Significant decrease in calvarial volume in both genders after seventh decade	IV
	Okuda I, et al. 2023 [37]	- Analyze configuration of bony orbit and orbicularis oculi muscle (OOM) with CT - 220 orbits of 110 Japanese participants (55 males, 55 females) aged 20-87 y	- Age-related changes of the bony orbit in Japanese individuals are the same as those in Caucasians, but different in the degree of changes observed. -New finding in Japanese: OOM not only thins with aging, but also gradually loosens from the facial bone. In elderly, only nasal side of OOM was attached to bone	IV
	Jeon A, et al. 2020 [98]	- Data collected from CT of orbits and facial bones from 107 Korean (55 M and 52 F) categorized according to sex and age: young group (20-35 y), old group (>60)	- No significant enlargement of the orbital rim with increasing age in Koreans	IV
	Ching JA, et al. 2020 [38]	- 70 facial CT facial of adults randomly chosen from an institutional database and 3-D reconstructed; (35 female, 35 male), age 20-88 y - total of 140 orbits analyzed	- Orbital volume similar between an individual's left and right side - Difference observed in vertical orbital height, orbital width, inferior orbital rim position, orbital roof length, orbital width, and medial orbital wall length - Males averaged larger orbital volume, medial wall length, and orbital volume	IV

			- Volume did not correlate with patient age, suggesting that signs of periorbital aging are not due to bony orbital changes	
	Frank K, et al. 2019 [39]	- Cranial CT from 157 Caucasians (10 males and 10 females from each decade: 20-29 y, 30-39 y, 40-49 y, 50-59 y, 60-69 y, 70-79 y, 80-89 y, and of 8 males and 9 females aged 90-98 y) - Frontal bone thickness and forehead distance measurements	- Frontal bone shape varies in young individuals of different genders and undergoes complex changes with age because of bone remodeling - Bone thickness of lower forehead increases slightly in both genders with age - In upper forehead, bone thickness decreases significantly in males but no statistically significant change in females - With increasing age, size of male forehead reduces until no significant differences to female forehead is present at old age	IV
	Kim J, et al. 2018 [40]	- 60 Patients with CT to diagnose nasal sinusitis - Evaluate relationship between ageing of bony orbit and intraorbital fat herniation in 60 patients (31 females, 29 males), age from 60-69 y - Evaluate age-related changes in orbital fat density in 205 patients (410 orbits), (106 male, 99 female) 6 age groups: 21-30, 31- 40, 41-50, 51- 60, 61- 70 and 71 80 y	- Age-related changes in the bony orbit may contribute to intraorbital fat herniation - In males, fat herniation was positively correlated with globe displacement and orbital rim inclination - In females, fat herniation was positively correlated with globe displacement, length of orbital floor, length of orbital floor divided by length of orbital roof, and orbital rim inclination - A strong and significant negative correlation between orbital fat density and age in both males and females	IV
	Cotofana S, et al. 2018 [41]	- 150 white individuals (10 male,10 female in each decade: 20-29 y, 30-39 y, 40-49 y, 50-59 y, 60-69 y, 70-79 y, 80-89 y, and 8 male, 9 female aged 90-98 y) - CT with measurements in all three anatomical axes and in alignment to the sella-nasion (horizontal) line	- Midfacial skeleton aging changes occur independently of gender, but at various time points in different locations - Pterygoid angle decreases with increasing age; this is a counterclockwise rotation of bony structures posterior to maxilla - Changes seem to be driven by bone resorption center located in the posterior maxilla, rather than by a rotational movement of the facial skeleton	IV
	Cotofana S, et al. 2018 [60]	- Study designed to investigate cranial changes that occur with aging and to propose a mechanism for loss of support for overlying soft tissues - 150 white individuals (10 male,10 female in each decade: 20-29 y, 30-39 y, 40-49 y, 50-59 y, 60-69 y, 70-79 y, 80-89 y, and 8 male, 9 female aged 90-98 y)	- Constant changes of the calvaria occur throughout lifetime - Females are prone to increase or maintain bone thickness, especially in the temporal and frontal regions. - Decrease in sagittal diameter and increase in transverse diameter leads to a lateral skull expansion, favoring a skeletonized appearance of the face in elderly individuals	IV
	Richard MJ, et al. 2009 [43]	- Retrospective review of CT scans of 100 consecutive patients (25 younger F (18 –30 y), 25 younger M, 25 older F (55–65 y), and 25 older M) - Three-dimensional bony reconstructions were used to record the angular measurements of 4 bony regions: glabellar, orbital, maxillary, and pyriform aperture	- Facial skeleton remodels throughout adulthood. Relative to the globe, facial skeleton rotates: frontal bone moves anteriorly and inferiorly while maxilla moves posteriorly and superiorly. This causes bony angles to become more acute and likely has an effect on the position of overlying soft tissues	IV
	Kahn DM, et al. 2008	- Facial bone CTs obtained from 60 white subjects (30 F, 30 M). 10 M and 10 F subjects in each of 3 age categories.	- Significant superior orbital rim recession with age. Inferior orbital rim receded significantly laterally in female	IV

	[44]	Each CT scan underwent 3-D reconstruction with volume rendering	<p>population, while male subjects had a recession of the entire inferior orbital rim</p> <ul style="list-style-type: none"> - Bony orbit changes dramatically with age, and this, coupled with soft tissue changes, can lead to the appearance of the aged eye and orbit 	
	<p>Mendelson BC, et al. 2007</p> <p>[99]</p>	<ul style="list-style-type: none"> - Facial CT scans performed for 62 patients ranging (21 - 70 y), divided into three age groups: 21-30 y, 41-50 y, and 61-70 y. Patients also grouped by gender Lengths of orbital roof and floor and angle of anterior wall of the maxilla recorded 	<ul style="list-style-type: none"> - Lengths of orbital roof and floor showed no significant differences between age groups. When grouped by gender, lengths were statistically longer for males. - Angle between anterior maxillary wall and orbital floor was found to have a statistically significant decrease with advancing age among both sexes 	IV