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Association of facial skin aging and vitamin D levels in middle-aged white women

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Abstract

To investigate the relationship between UV-induced skin photodamage and 25(OH) vitamin D levels, we performed a cross-sectional study in 45 female subjects aged >40. Menopausal status, smoking status, skin cancer history, oral supplement use, and season of blood draw were recorded and serum 25(OH)D measured. A single-blinded, dermatologist evaluated standardized digital facial images for overall photodamage, erythema/telangiectasias, hyperpigmentation, number of lentigines, and wrinkling. Adjusting for age and season of blood collection, women with lower photodamage scores were associated with a 5-fold increased odds of being vitamin D insufficient (OR 5.0, 95% CI: 1.1, 23). Low scores for specific photodamage parameters including erythema/telangiectasias, hyperpigmentation, and wrinkling were also significantly associated with vitamin D insufficiency. Our results suggest an association between skin aging and 25(OH)D levels.

Keywords

Vitamin D; Skin aging; Ultraviolet rays/adverse effects; Skin/radiation effects

To the editor

Skin aging is a complex process influenced by genetic and environmental factors. Environmental exposure to ultraviolet radiation (UVR) promotes skin aging [1], and photoprotection (sunscreen, shade use) has been shown to reduce skin aging [1]. However, limiting sun exposure may also reduce vitamin D levels as UVR stimulates vitamin D production in keratinocytes [2]. Indeed, the American Academy of Dermatology and the Canadian Cancer Society now recommend 1000 IU/day in individuals who photoprotect [3]. Because the face is an oft-exposed area and facial skin aging is an easily visible phenotype, we investigated whether individuals with less facial aging due to photoprotection are more likely to have low vitamin D, as measured by 25(OH)D levels.

Following IRB approval, 45 healthy female subjects age >40 with Fitzpatrick skin type I or II were enrolled in this cross-sectional study [4]. Exclusion criteria included history of facial surgery, recent use of topical retinoid, recent tanning bed use, sun exposure >2 h/day, and BMI > 30 kg/m^2. Menopausal status, smoking status, skin cancer history, oral supplement use and season of blood draw were recorded as these affect clinical skin aging or 25(OH)D. A single-blinded dermatologist evaluated standardized digital facial images (Canfield Visia) for overall photodamage, a composite of erythema/telangiectasias, number of lentigenes, hyperpigmentation, and coarse wrinkling. Each parameter was assessed on a 6-point Likert

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scale (0:none, 5:very severe). Scores were dichotomized into high (3–5) versus low (0–2). Serum 25(OH)D were measured by radioimmunoassay (ARUP laboratories); vitamin D insufficiency was defined as 25(OH)D < 30 ng/ml [2]. Multivariable logistic regression was used to test the association between aging scores and insufficiency, adjusting for age and season.

The mean age of our 45 subjects was 55 years (SD 6.1), and 56% were vitamin D insufficient. There were no significant differences in the low versus high photodamage groups in BMI, supplement use, and history of skin cancer; season of blood collection did differ (Table 1). The low photodamage group had mean 25(OH)D levels −7 ng/ml lower compared to the high photodamage group ($p = 0.04$). Adjusting for age and season of blood collection, lower overall photodamage was associated with a 5-fold increased odd of insufficiency (OR 5.0, 95% CI: 1.1, 23) (Table 1). Lower scores for specific aging parameters (erythema/telangiectasias (OR 7.4, 95% CI: 1.8, 31), hyperpigmentation (OR 5.3, 95% CI: 1.3, 22), and wrinkling (OR 5.6, 95% CI: 1.3, 23) were also significantly associated with a five- to seven-fold increased odds of insufficiency. Additional adjustments for current smoking did not appreciably change this association. Although smoking has been associated with lower 25(OH)D levels in other studies [5], we did not see lower 25(OH)D levels in current smokers compared to nonsmokers (29.8 vs. 28.7 ng/ml, $p = 0.79$).

Our results suggest an association between skin aging and 25(OH)D levels. However, given the study design, we cannot establish causality or determine the direction of the observed association. We hypothesize that less facial photodamage due to avoidance of UVR would predispose these women to lower 25(OH)D and vitamin D deficiency. It is also possible that low 25(OH)D levels in women with less skin aging may reflect underlying genetic differences in vitamin D synthesis [6]. Of note, even among the high photodamage group, the mean 25(OH)D level was only 32 ng/ml, slightly above the threshold for vitamin D sufficiency (30 ng/ml). Thus, patients with pronounced photodamage do not necessarily have high 25(OH)D levels and should not be excluded from vitamin D testing. Prospective studies are needed to characterize the relationship between skin aging and vitamin D levels.

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Table 1

Characteristics of subjects with low versus high overall photodamage scores

	Low photodamage (*n* = 16)	High photodamage (*n* = 29)	*p*-value
Median age (years)	54	53	0.96
Median BMI (kg/m^2)	25	24	0.13
Post-menopausal (%)	47	69	0.16
History of smoking (%)	13	41	0.05
History of skin cancer* (%)	19	14	0.67
Concurrent use of multivitamin* (%)	13	3	0.25
Blood draw in summer or fall (%)	100	72	0.02
Mean 25(OH)D ng/ml (SD)	25 (7.7)	32 (13)	0.04
Median aging parameter scores†			
Erythema/telangiectasia	2	3	< 0.001
Hyperpigmentation	1.5	3	< 0.001
Number of lentigines	1	3	< 0.001
Coarse wrinkling	1	3	< 0.001

† Aging parameters were scored on a scale of 0–5 (0 = none, 5= severe)

* Based on *n* = 43 rather than 45, as information was not available on 2 subjects