Vertex balding, plasma insulin-like growth factor 1, and insulin-like growth factor binding protein 3

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Background: A recent report suggested that men with vertex balding have higher levels of plasma insulin-like growth factor 1 (IGF-1). The association of this [illegible] with male pattern baldness has not been examined.

Methods: Participants were 431 male members of the Health Professionals Follow-up Study who responded to a question in 1992 on their hair pattern at 45 years of age and who were 47 to 81 years old when they provided a blood specimen in 1993-1994. Odds ratios (ORs) of vertex balding associated with [illegible] controlling for age at blood draw.

Results: Of the 431 men, 128 had vertex balding at age 45. Compared with men who were not balding, for a 1 standard deviation increase in plasma IGF-1 level (72.4 ng/mL), the OR for vertex balding was 1.31 (95% CI, 0.95-1.81). For a 1 standard deviation increase in plasma IGFBP-3 (957 ng/mL), the OR for vertex balding was 0.62 (95% CI, 0.44-0.88).

Conclusion: Older men with vertex balding have lower circulating levels of IGFBP-3 and higher levels of IGF-1 when controlling for IGFBP-3 level.

Male scalp hair pattern in adulthood has long been known to be influenced by andro[illegible] However, other factors [illegible] explored recently for a role in mediating the transition of the hair follicle through its cycle of growth, senescence, and regeneration. Signorello et al[2] evaluated the relation of serum insulin-like growth factor 1 (IGF-1) and male pattern balding in a case control study among 51 Greek men older than 65 years and found that men with vertex balding had higher circulating levels of IGF-1 [illegible] balding. Per 59 ng/mL increase in IGF-1, the relative risk of vertex balding was 1.6 (95% confidence interval [CI], 0.9-3.2) after adjusting for age and 2.0 (95% CI, 1.0-4.6) after also adjusting for steroid hormone concentrations. Serum insulin-like growth factor binding protein 3 (IGFBP-3), the major carrier protein for IGF-1, was not measured in the Greek study. [illegible] circulating IGF-1 levels in men with vertex balding [illegible] reduces IGF-1 bioavailability, is associated with a reduced risk of vertex balding among middle-aged and elderly men.

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MATERIAL AND METHODS

Participants for this analysis were selected from among members of the Health Professionals Follow-up Study [illegible]

Table I. Plasma concentrations of IGF-1 and IGFBP-3 according to vertex balding* at age 45: Health Professionals Follow-up Study 1994

Plasma constituent	Vertex balding	Not vertex balding	P value†
No. of men	128	303	
Age at blood draw in 1994 (y)	64.7 ± 8.3	63.8 ± 8.2	.3
Unadjusted			
IGF-1 (ng/mL)	185.0 ± 71.4	190.2 ± 72.4	.5
IGFBP-3 (ng/mL)	3049 ± 871	3285 ± 957	.02
Mutually adjusted‡			
IGF-1 (ng/mL)	194.4 ± 44.4	186.2 ± 50.3	.11
IGFBP-3 (ng/mL)	3084 ± 536	3270 ± 664	.002

Data are presented as mean ± standard deviation.
*Modest, moderate, or substantial vertex balding as self-reported using pictograms in 1992.
†For comparison using the *t* test.
‡By residuals analysis.

Table II. Relation of vertex balding* with plasma IGF-1 and IGFBP-3: Health Professionals Follow-up Study 1994

	Tertile†					
	1	2	3	Unit‡	OR§	*P* value§
IGF-1‖						
Cases/controls	47/102	35/102	46/99			
Median (ng/mL)	123.1	181.9	251.2	72.4		
OR	1.00	1.00	1.86		1.31	.09
95% CI	Referent	0.56-1.78	0.93-3.70		0.95-1.81	
IGFBP-3‖						
Cases/controls	53/101	43/101	32/101			
Median (ng/mL)	2429	3195	4149	957		
OR	1.00	0.69	0.42		0.62	.008
95% CI	Referent	0.39-1.23	0.21-0.86		0.44-0.88	

*Modest, moderate, or substantial vertex balding as self-reported using pictograms in 1992 versus no or little hair loss or receding hairline only.
†ORs from a logistic regression model with plasma level entered as two indicator variables and adjusted for age at blood draw (continuous). Tertile cut points for plasma levels of each factor were determined from the distribution of levels among the controls.
‡One standard deviation.
§From a logistic regression model with plasma level entered as a continuous variable and adjusted for age at blood draw (continuous).
‖Mutually adjusted.

IGF-1, we mutually adjusted for these two plasma levels and controlled for age at blood draw. Compared with men in the bottom tertile of IGF-1, the OR for vertex balding in the top tertile of IGF-1 was 1.86 (95% CI, 0.93-3.70) (Table II). Men in the top tertile of IGFBP-3 had a statistically significantly 58% lower risk of vertex balding than men in the bot-

IGF-1 of 72.4 ng/mL, the OR for vertex balding was 1.31 (95% CI, 0.95-1.81; $P = .09$). For a 957 ng/mL increase in IGFBP-3, the OR for vertex balding was 0.62 (95% CI, 0.44-0.88; $P = .008$) (Table II). These

receding hairline only (IGF-1: OR = 1.26, 95% CI [0.90-1.77]; IGFBP-3: OR = 0.61, 95% CI [0.42-0.89]). There was no evidence that the risk of balding associated with IGF-1 or IGFBP-3 was stronger with increasing extent of vertex balding at age 45 in an analysis limited only to men with vertex balding.

Because smoking may influence the IGF axis, we

increments). The OR for vertex balding modestly increased to 1.02 (95% CI, 0.57-1.84) and 2.00 (95% CI, 0.99-4.04) for the middle and top tertiles of IGF-1 and decreased to 0.66 (95% CI, 0.37-1.18) and 0.40

IGF-1 adjusted for IGFBP-3 was not as great as shown for IGF-1 by Signorello et al.[2] Differences in the two studies that might contribute to the disparity in the strength of the association between IGF-1 and vertex balding include different IGF-1 assays, older average age in the Greek study, interviewer-assessed balding in the Greek study versus self-report in our study, and IGF-1 and balding assessed concurrently in the Greek study versus 2 to 36 years apart in our study.

[redacted] and sex hormone binding globulin enhanced the [redacted]

samples that we included in this analysis, adjustment for sex steroids and sex hormone binding globulin did not appear to alter our estimates for the relation

these methodologic and population differences between the two studies, both the study in elderly Greek men[2] and our study indicate that the IGF-1

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