Relation between Androgenic Alopecia and Insulin Resistance in Young Men and Women.

Thesis

Submitted for Fulfillment of Master Degree in Dermatology and Venerology

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ABSTRACT

The condition in which normal amounts of insulin are inadequate to produce a normal insulin response from fat, muscle and liver. It is believed to be origin of metabolic syndrome and type II diabetes.

Aim of work is to identify relation between IR in patients with AGA compared to a control group.

KEY WORDES

Relation

Alopecia

Resistance

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LIST OF ABBREVIATIONS

1,25 /OH/D3	1,25-Dihydroxyvitamin D3
AGA	Androgenic alopecia
bFGF	Basic fibroblast growth factor
BMI	Body Mass Index
DHEA	Dehydroepiandrosterone
DHEAS	Dehydroepiandrosterone sulfate
DHT	Dihydrotestosterone
EGF	Epidermal growth factor
GLUT4	Type 4 glucose receptors
GTT	Glucose tolerance test
HDL	High density lipoprotein
HOMA- IR	Homeostatic Model Assessment
HREs	Hormone response elements
IGF	Insulin –like growth factor
IGFBPs	Insulin –like growth factor-binding proteins
IKK-β	Inhibitor of nuclear factor kappa-b kinase subunit beta
IL-1α	Interleukin1- α
IR	Insulin resistance

LIST OF ABBREVIATIONS

IS	Insulin sensitivity
KGF	Keratinocyte growth factor
LMNA	Lamin A/C (lamin family of proteins)
MCP-1	Chemokine monocyte chemotactic protein -1
Mg	Magnesuim
MPB	Male pattern baldness
NAFLD	Nonalcoholic fatty liver disease
PCOS	Polycystic ovarian syndrome
PDGF	Platelet-derived growth factor
PG	Prostaglandin
PTH	Parathormone hormone
QUICKI	Quantitative Insulin Sensitivity Check Index
SH	Sub-clinical cushing's syndrome
SHBG	Sex hormone binding globulin
sLDL	Small low density lipoprotein
SULT2A1	Sulfotransferase
T	Testosterone
TGFF-β	Transforming growth factor beta
TNF-α	Tumor necrosis factor – alpha
VEGF	Vascular endothelial growth factor

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Hair

Introduction:

Hair is much more complicated than it appears. It helps transmit sensory information and creates gender identity. Hair is important to the appearance of men and women. There is hair on all the major visible surfaces of the body .A developing fetus has all of it's hair follicles formed by week 22. At this time there are 5 million follicles on the body. One million of those are on the head, and 100,000 are on the scalp. This is the largest number of follicles we will ever have - follicles are never added during life. As the size of the body increases as we grow older, the density of the hair follicles on the skin decreases. **(Pecararo et al.,1971)**

Hair Biology:

Hair consists 90% of α-helically coiled protein – α-keratin, and about 10% water, which modifies its mechanical properties. α-keratins form long protofibrils of about 100 μm in length and 3 μm in width. Many of these protofribrils associate to form one strand of hair, which is covered with cuticle scales. The end of each keratin chain is high in the amino acids proline and cysteine. Adjacent keratin chains are strongly linked by disulfide bonds**.(Lee &Barden,1975)**

Hair-follicle cycling:

Hair grows in cycles which are not synchronized in human beings; each hair enters phases of the growth cycle at a different time. Hair grows in cycles of various phases .**fig .(1).**: anagen is the growth phase; catagen is the involuting or regressing phase; and telogen, the resting or quiescent phase.Normally up to 90% of the hair follicles are in anagen phase while, 10–14% are in telogen and 1–2% in catagen. The cycle's length varies on different parts of the body. For eyebrows, the cycle is completed in around 4 months, while it takes the scalp 3–4 years to finish; this is the reason eyebrow hairs have a much shorter length limit compared to hairs on the head.(**Kligman ,1959)**

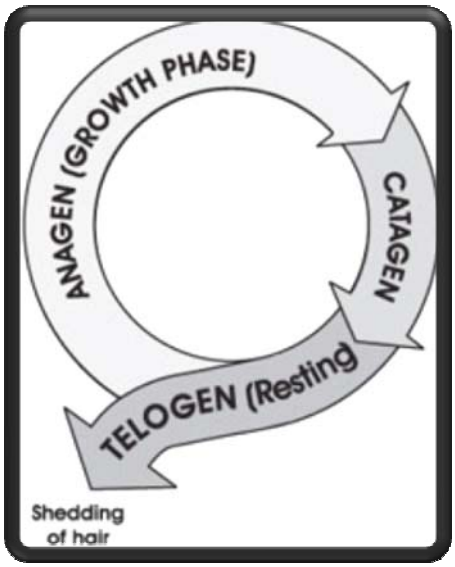

Fig .(1): Hair grows in cycles of various phases**.(Saitoh et al., 1970)**

Anagen phase:

Anagen is the active growth phase of hair follicles, extends from the termination of the inactive phase, telogen, to the beginning of the regressing phase, catagen. Anagen further subdivided into proanagen, mesanagen and metanagen. .Proanagen marks initiation of growth with RNA and DNA synthesis in a follicle which then quickly progresses through mesanagen to metanagen and maximum follicle length and girth. In this mature state of proliferation and differentiation, the hair follicle consists of a total of eight concentric layers of different cell types and melanogenesis occurs within pigmented hair follicles. The cells in the root of the hair are dividing rapidly, adding to the hair shaft.

So anagen involves the complete re-growth or regeneration of the lower, cycling portion of the follicle, i.e., the hair shaft factory. The epidermal cells surrounding the dermal papilla form the germinal matrix or root of the hair are constantly dividing, and as new cells are formed they push the older ones upwards and eventually out. **fig .(2)**. During this phase the hair grows about 1 cm every 28 days**.((Saitoh et al.,1970)**

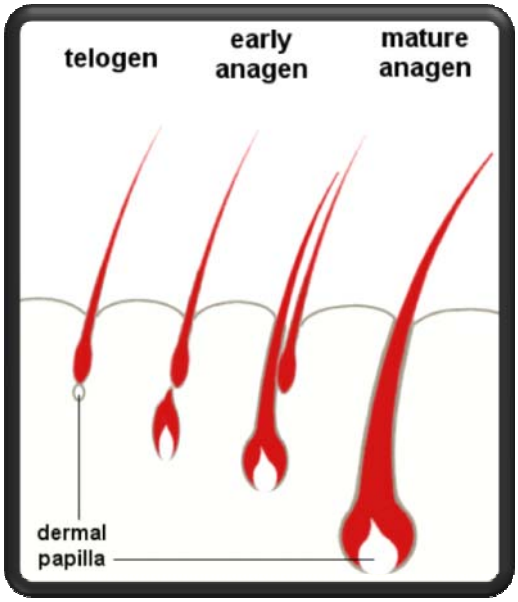

Fig .(2): A resting hair follicle returning from resting telogen to growing anagen. If the old fiber has not already fallen out it is pushed out by the new hair fiber growing underneath**.(Paus &Castarelis ,1999)**

Catagen phase:

Catagen is a short transitional phase in the hair growth cycle , It signals the end of the active growth of a hair . Catagen is a highly regulated event, in its initiation, development, and termination. The purpose of catagen is to delete the old hair shaft factory and to initiate the stem cells of the bulge and the papilla to set the stage for the formation of a new follicle. There are chemical and structural changes that take place in the