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# The effects of hair regrowth with intravenous immunoglobulin (IVIG) therapy. Two case reports

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**Abstract**

Intravenous immunoglobulin (IVIG) is an immune modulating treatment used in a variety of immune mediated diseases. We report, two patients of different demographics, treated with IVIG for different neurological diagnoses who reported significant hair growth after starting IVIG treatments. To date, there have been no reports of using IVIG as a treatment for hair loss due to androgenic alopecia (AGA).


*Keywords:* Hair loss; IVIG; Cosmetic; Androgenic alopecia

## 1. Introduction

Intravenous immunoglobulin (IVIG) is a therapeutic compound derived from a pool of human plasma donors consisting of healthy antibodies. IVIG is used to treat a wide variety of immune deficient, autoimmune and inflammatory diseases (Kaveri et al., 2011). IVIG is a collection of highly purified polyvalent antibodies consisting of greater than 95% IgG which is pooled from several thousand healthy blood donors (Kaveri et al., 2011). Several mechanisms have been postulated to explain the immunomodulatory effects of IVIG on different disease processes. It is suspected that IVIG works on many levels and plays both a passive and an active role in modulating the patient's immune system. Administration of IVIG in autoimmune or inflammatory conditions neutralizes pathogenic antibodies as well as contributes to longer term modification of the patient's own immune system. What effects IVIG has on the hair follicle and pattern of hair loss are not fully understood and have not been thoroughly studied.

Male pattern baldness or androgenetic alopecia (AGA) can affect up to 70% of men and 40% of women within their lifetimes (Santos et al., 2015). In the USA more than 3.5 billion dollars are spent yearly on treating hair loss (Santos et al., 2015) with AGA being by far the most common type. A genetic predisposition along with changes in free androgens and androgen receptors has been implicated in AGA. The prevailing hypothesis in the pathophysiology of AGA involves alteration in hair cycle development, miniaturization of the hair follicle and follicular inflammation. We know that AGA is common in men with lower total testosterone and increased free or unbound testosterone including dihydrotestosterone (DHT), a downstream androgen product. Increased levels of DHT are found in balding scalp compared to non-balding scalp (Cranwell, xxxx). We also know that the 5 alpha reductase enzyme that

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converts testosterone into DHT is found 50 times more in the scalp of an adult male than that of a male fetus (Santos et al., 2015) lending more evidence that androgens play a significant role in the initiation and maintenance of AGA. Other proposed pathophysiologic mechanisms include Reduced Insulin Growth Factor (IGF) activity around the hair follicle; newly discovered signaling molecules; reduced blood flow, oxygen content and free radical formation. Some studies suggest that inflammation plays a role in AGA though its significance is debated (Jawarski et al., 1992). Furthermore, activated T-cells have been demonstrated around the hair follicle in scalp biopsies (Sueki et al., 1999) supporting this claim.

Treatments for AGA so far have focused on reducing free or unbound testosterone, reducing total DHT levels via different mechanisms or by stimulation of hair growth secondary to increase vasodilation and increased cutaneous blood flow via activation of ATP-sensitive potassium channels within the hair follicle. Both FDA approved treatments provide only transient effects with hair loss resuming quickly after the cessation of current treatments. While there have been reports of IVIG and hair growth with autoimmune types of alopecia (Boonyaleepun et al., 1999; Smith et al., 2001) to our knowledge IVIG has never been reported or studied as a treatment for AGA. We present two cases where IVIG was used as a therapeutic treatment for different neurological diseases in which rapid and significant hair growth was observed after a few treatments.

## 2. Case presentations

### 2.1. Case 1

A 43 year old African American male with AGA received off and on IVIG treatments for idiopathic Chronic Inflammatory Demyelinating Polyradiculoneuropathy (CIDP) starting in 2014. He reported significant but temporary hair regrowth during each of his treatments. He was started on IVIG in 2014 though had been lost to follow-up for several years. After re-presenting in 2015 with worsening weakness and sensory disturbance, he was restarted on periodic IVIG treatments starting with 2 g/kg divided over three days as an induction followed by 400 mg/kg monthly infusion administered over one day. After two treatments he reported significant hair regrowth in both the scalp and arms. The photographs were taken over a two month period and show increased density of scalp hair. The patient did experience self-limiting, hemolytic anemia after the second dose of IVIG. Despite this, we continued with follow-up treatments and repeat hemolysis did not occur. The patient was lost to follow-up after the 3rd IVIG treatment.

Before the initiation of IVIG

After 2 IVIG treatments 1 month apart

### 2.2. Case 2

An 80 year old white male with AGA was started on IVIG for refractory Myasthenia Gravis starting in 2015. He received an initial induction of 2 g/kg divided over 3 days and was continued on monthly treatments of

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