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Study of Efficacy of Tofacitinib, a JAK Inhibitor in the Treatment of Alopecia Areata

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Abstract:
Alopecia Areata (AA) is an autoimmune condition causing patchy hair loss on the scalp, beard, eyebrows, and, in rare instances, even the body hair. Tofacitinib, a JAK3 inhibitor, is a promising treatment for severe and resistant instances of AA/totalis/universalis. The aim of our study is to show the effectiveness of oral tofacitinib in the treatment of alopecia universalis (AU). In our study 8 patients with resistant AA were included after informed consent and proper pre JAK evaluation tests. All 8 patients received tofacitinib orally at doses ranging from 5 mg twice day, with follow-ups every three weeks. Hair analysis including the basic profile, hormonal, hair test, Trichrogram and Dermascopy were used to assess the effectiveness. Patients were followed up on for 8 months after therapy ended to look for any signs of a disease recurrence. Each of our eight patients responded remarkably to oral tofacitinib. Patients were examined and the results were assessed every three weeks. All of the patients exhibited noticeable hair regrowth after 10 weeks. Our results suggested that tofacitinib significantly reduced AU in our patients without causing any serious negative side effects. To establish safety and validate efficacy, we advise performing further controlled study.
Keywords: Alopecia Areata, Tofacitinib, JAK3 inhibitor, alopecia universalis, Trichrogram and Dermascopy.

Introduction:
Alopecia areata (AA) is a common autoimmune disorder characterized by rapid and unpredictable hair loss, typically affecting the scalp but can also involve other body areas. It is estimated that AA affects approximately 2% of the population globally, with both genetic and environmental factors contributing to its onset[1]. The disease is believed to result from an autoimmune attack on the hair follicle, wherein T-cells mistakenly target the hair follicles, leading to hair loss in small, round patches. Traditional treatments for alopecia areata include corticosteroids, topical immunotherapy, and, in severe cases, systemic therapies[2]. However, these treatments often have limited efficacy and substantial side effects[3]. In recent years, Janus kinase (JAK) inhibitors have emerged as a novel class of drugs capable of altering immune pathways involved in AA[4]. Tofacitinib is an oral JAK inhibitor that selectively targets JAK1 and JAK3, which are involved in the cytokine signaling pathways crucial for immune cell activation[5]. Preclinical and clinical studies have demonstrated the potential of Tofacitinib in reversing hair loss in patients with AA, making it a promising treatment option[6]. This study explores the current evidence regarding the use of Tofacitinib in alopecia areata, focusing on its efficacy, safety, and potential as a therapeutic agent.

Materials and Methods:

In our study 8 patients with resistant AA were included after informed consent and proper pre JAK evaluation tests. The patients were presented with onset of patchy hair loss involving almost the entire scalp, for the past 6 months Fig.A 1&2 and Fig.B.1. There were no known comorbidities present and no significant family history. Their previous treatment history included topical and intralesional steroids, topical minoxidil, pulse therapy, immunosuppressants which failed to show response to treatment. The dermatological examination of the scalp showed multiple well defined oval to round smooth slightly erythematous patchy hair loss of varying sizes present diffusely over the entire scalp predominantly over occipital region. All 8 patients received Tofacitinib orally at doses ranging from 5 mg twice day, with follow-ups every three weeks. Hair analysis including the basic profile, hormonal, hair test, Trichrogram and Dermascopy were used to assess the effectiveness. Patients were followed up on for 8 months after therapy ended to look for any signs of a disease recurrence. At the baseline blood investigations like Complete blood count, liver and renal function tests, metabolic profile, lipid profile, serology, serum electrolyte levels were analysed.

Results:

Each of our eight patients responded remarkably to oral tofacitinib. Patients were examined and the results were assessed every three weeks. All of the patients exhibited noticeable hair regrowth after 10 weeks. Fig.A.3, Fig.B.2.

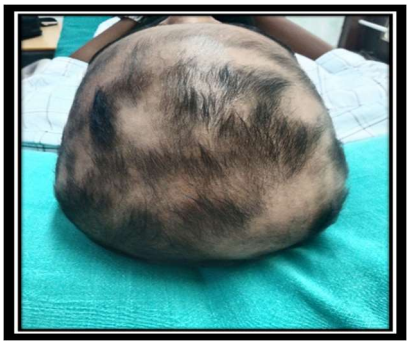

Fig.A.1: Patient with patchy hair loss involving almost the entire scalp

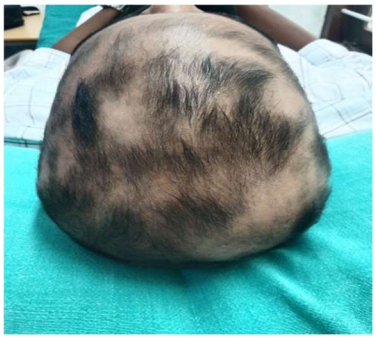

Fig.A.2: Pretreatment photograph taken at baseline (scalp)

Fig.A.3: Post treatment at 5 months after starting tofacitinib

Fig.B.1: Pretreatment photograph taken at baseline (scalp)

Fig.B.2: Post treatment at 5 months after starting tofacitinib

Safety and Tolerability:

In terms of safety, Tofacitinib was generally well-tolerated, with mild to moderate adverse effects. The most common side effects were upper respiratory tract infections, headache, and transient liver enzyme elevations[6, 7]. Serious adverse events were rare but included gastrointestinal issues, skin infections, and an increased risk of opportunistic infections. Long-term safety data remain limited, though the current evidence suggests that tofacitinib is a relatively safe option for patients with alopecia areata, especially when monitored appropriately[8].

Patient-Reported Outcomes:

Patient-reported outcomes from the studies indicated that tofacitinib not only improved hair growth but also significantly enhanced the quality of life for patients. Many participants reported improved self-esteem and reduced anxiety related to their hair loss, highlighting the psychosocial benefits of effective treatment.

Discussion:

In one patient who was off medicine for five months, there was no recurrence. Three months after quitting tofacitinib, AA patches appeared on the brows of a second patient. Topical medications were used to treat acneiform outbreaks in three patients. The findings from this study suggest that tofacitinib represents a promising therapeutic option for alopecia areata, particularly in patients with moderate to severe disease who have not responded to conventional treatments[9]. Its ability to target the JAK-STAT signaling pathway, which plays a critical role in the immune-mediated hair follicle destruction in AA, likely underpins its efficacy in promoting hair regrowth. This novel mechanism of action offers hope for patients with alopecia areata who have limited treatment options[10]. The long-term safety of tofacitinib in alopecia areata is still uncertain, and further studies are needed to assess its safety profile over extended periods[11]. Additionally, the optimal dosage and treatment duration for achieving sustained results remain to be determined. It is also important to explore whether tofacitinib can be combined with other treatments for a synergistic effect. The psychological impact of alopecia areata should not be underestimated, and effective treatment with tofacitinib has the potential to improve not only hair growth but also patients' emotional well-being[12]. This makes tofacitinib a valuable addition to the armamentarium of treatments for alopecia areata.

Conclusion:
Tofacitinib has demonstrated significant efficacy in the treatment of alopecia areata, with a robust clinical response in terms of hair regrowth and improvement in patient quality of life. Although it is generally well-tolerated, further research is needed to establish the long-term safety and optimal treatment protocols for this medication. Given the encouraging results from our study, Tofacitinib represents a promising therapeutic option for individuals with moderate to severe alopecia areata, particularly those who have failed to respond to conventional therapies.

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Availability of data and materials:
All data and materials are presented in this manuscript. No additional materials are available.

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Competing interests:
Authors declare no competing interest

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