COMPARATIVE STUDY BETWEEN FRACTIONAL CO_2 LASER VERSUS INTRALESIONAL STEROIDS IN TREATMEANT OF ALOPECIA AREATA

Thesis

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Abbreviation	Description
AA	Alopecia Areata
ADTA	Acute diffuse and total alopecia
AFP	Ablative fractional photothermolysis
AT	Alopecia Totalis
AU	Alopecia Universalis
BD	Becton Dickinson
CCCA	Central centrifugal cicatricial alopecia
CO2	Carbon Dioxide
DNCB	Dinitrochlorobenzene
FP	Fractional photothermolysis
HLA	Human leukocyte antigen
ILCs	Intralesional Corticosteroids
LASER	Light Amplification by Stimulated Emission of Radiation
LLLT	Low-level laser therapy
MEND	microscopic epidermal necrotic debris
MHC	Major histocompatibility complex
MISP	Mean Improvement Score by Physician
MTZ	Micro thermal Treatment Zones
PDGF	Platelet-derived growth factor
PMNs	Polymorphonuclear cells
PRP	Platelet Rich Plasma
PUVA	Psoralen plus UVA
SALT	Severity of Alopecia Tool score
TE	Telogen effluvium
VAS	visual analogue scale

INTRODUCTION

Alopecia Areata (AA) is a common non-scarring alopecia which affects 0.1-0.2% of the population and accounts for 0.7-3% of all cases seen in dermatology practice ***(Alkhalifah, 2013; Sinclair, 2014).***

AA affects all races and both genders (male and female) equally although it is thought that there may be a male predominance in the adult population ***(Kyriakis et al., 2009).***

This inflammatory disease affects hair follicles and can also affect the nails in up to 66% of patients. Genetic predisposition, autoimmunity, and environmental factors play an important role in the etiopathogenesis of AA ***(Kutner and Friedman, 2013).***

Alopecia areata is characterized by sudden appearance of round or oval, non-scarring, flat, single or multiple areas of alopecia, which may coalesce forming large patches of alopecia ***(Estefan et al., 2015b).***

Patchy type is the most common form of AA, other types of AA include classic forms (AA in unifocal patch, AA in multifocal patches, ophiasic AA, Alopecia Totalis (AT) and Alopecia Universalis (AU)) in addition to atypical forms (sisaifo or inverse ophiasis, reticular AA and diffuse AA) ***(Pratt et al., 2017).***

Atopy and autoimmune thyroiditis are the most common associated medical conditions. Peribulbar and intrabulbar lymphocytic inflammatory infiltrate resembling "swarm of bees" is characteristic on histopathology ***(Seetharam, 2013).***

Trichoscopy and phototrichogram using a folliscope are recent methods which are very useful in diagnosis and assessment of treatment for AA. They are non-invasive, easy

and painless methods that enable objective assessment of the disease activity ***(Brzezinska-Wcislo et al., 2014)*.**

There are different modalities for treatment of alopecia areata including corticosteroids, minoxidil, anthralin, topical immunotherapy, phototherapy, prostaglandin analogues, sulfasalazine, mesotherapy, platelet rich plasma (PRP) and fractional CO_2 laser ***(Farhangian et al., 2015)*.**

Corticosteroids, because of their anti-inflammatory activity, have been considered the main line of treatment for AA. Topical steroids are preferred as a first choice in the treatment of AA. ILCs have been used since 1958 in the treatment of AA. It is the most effective treatment in patients with limited AA and a shorter duration of disease, with success rates of 60-75%. However, Patients with extensive AA or AT and longer duration of the disease (> 1 year) showed poor response **.**Systemic corticosteroids have been used in daily, weekly, and monthly pulses with good outcome in patchy AA and less favorable outcome in ophiasis, AT, and AU ***(Kar et al., 2005; Kassim et al., 2014; Gupta et al., 2017)*.**

Fractional photothermolysis is a newly introduced laser technique. Its action depends on the production of a unique thermal damage pattern called ‘microthermal treatment zones (MTZ)’ and characteristically spares the tissue surrounding each MTZ. It keeps the strarum corneum intact and induces ‘fractional’ microscopic thermal columns to the dermis, which leads to a healing process that includes inflammatory cells, such as lymphocytes ***(Manstein et al., 2004)*.**

There are many dermatological applications for fractional CO_2 laser e.g. improves scars, fine lines, dyspigmentation, striae and wrinkles ***(Goel et al., 2011)*.**

Recently, Fractional CO_2 laser can be applied in treatment of AA. Ho Yoo and colleagues found that fractional

photothermolysis induces complete hair growth after 6 months in a patient with patchy alopecia of the scalp ***(Yoo et al., 2010)*.**

So the aim of our study is to assess the efficacy of fractional CO_2 laser in comparison to intralesional steroid injection in treatment of alopecia areata.

I. ALOPECIA AREATA

Definition and Epidemiology:

Alopecia areata (AA) is a common non cicatricial, autoimmune, inflammatory disease, which is characterized by hair loss on the scalp and or body, It accounts for 0.7% to 3.8% of dermatology clinics visits ***(Wasserman et al., 2007)*.**

AA affects both genders (male and female) equally ***(Kyriakis et al., 2009)*.** The most commonly affected age group are the children where they constitute about 20% of AA patients ***(Nanda et al., 2002)*.**

Pathogenesis:

Hair growth depends on 3 phases of hair cycle, anagen (active growth phase), catagen (involution phase), and telogen (resting phase). Normally, hair sheds out after the resting phase when the new hair anagen growth starts (exogen). In alopecia, hair loss happens even before the anagen phase starts leaving the hair follicle empty (kenogen). So, AA is in general a disease of hair cycling and is considered to be a state of kenogen (Fig. 1) ***(Seetharam, 2013)*.**

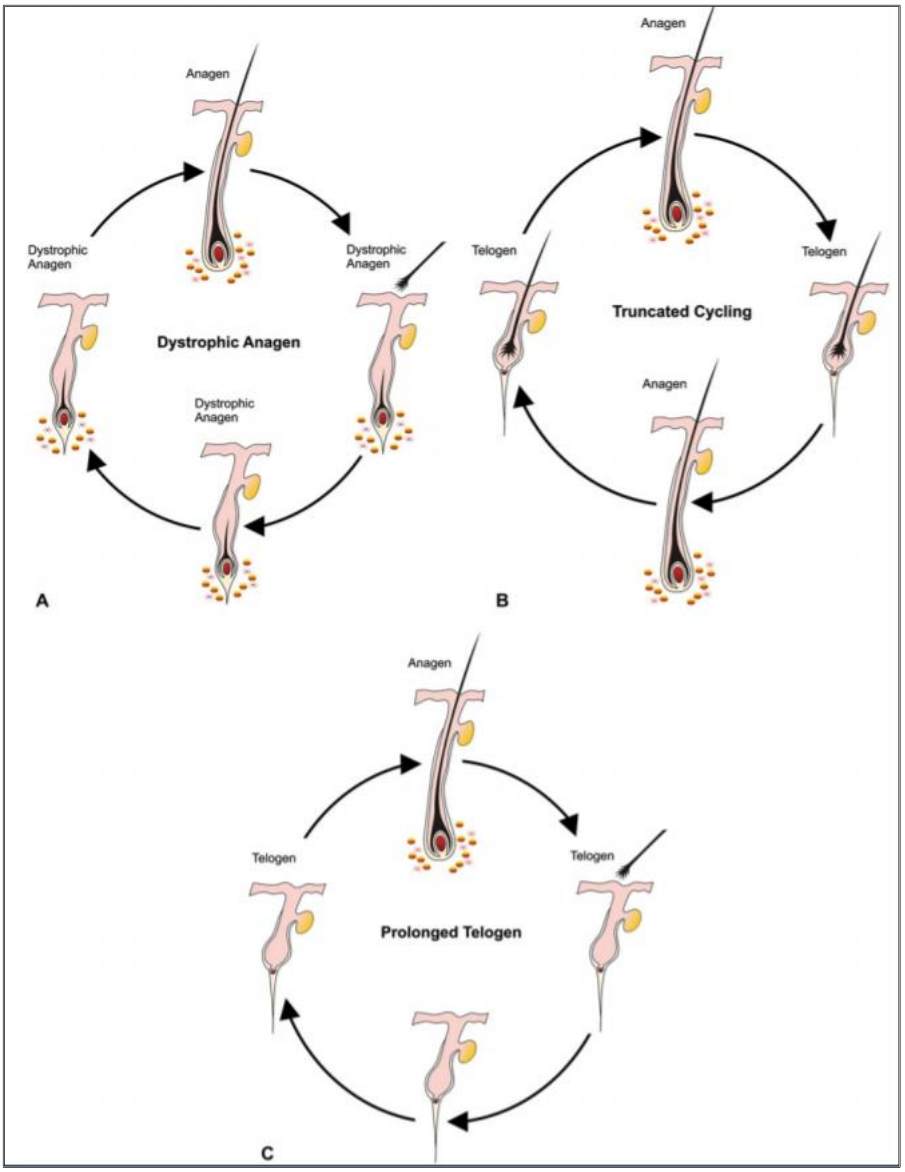

Figure 1: Hair growth cycle patterns in alopecia areata. **A**, Hair follicles held in dystrophic anagen by mild inflammatory insult unable to produce significant hair fiber. **B**, Anagen growth phases truncated by moderate inflammatory insult resulting in rapid cycling and brief hair fiber growth. **C**, Hair follicles enter prolonged telogen dormancy with development of chronic alopecia areata ***(Alkhalifah et al., 2010a)*.**

AA has a multifactorial etiology; it is most likely an organ-specific autoimmune disease. Gene association studies confirm a genetic predisposition. Environmental triggers have been postulated, but none have been confirmed and this means that alopecia areata have a multifactorial etiology (Fig. 2) ***(Perera et al., 2015).***

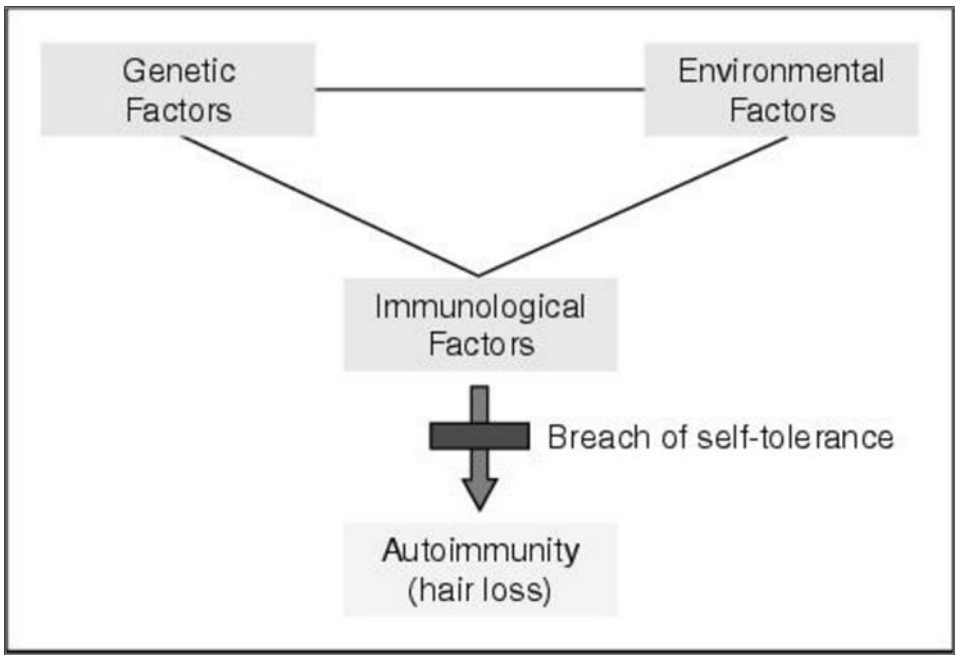

Figure 2: Multifactorial etiology of Alopecia Areata ***(Alexis et al., 2004).***

Autoimmunity is thought to play an important role in the development of AA. It is regarded as a tissue-specific immune disease of hair follicles, mediated by T-helper (Th1) cell response (Fig. 3) ***(Kuwano et al., 2007).***