# Comparison between the Efficacy of Intense Pulsed Light (IPL) versus Photodynamic Therapy with Methylene Blue in the Treatment of Nail Psoriasis

*Thesis*

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بسم الله الرحمن الرحيم

وَقُلِ اعْمَلُوا فَسَيَرَى اللَّهُ
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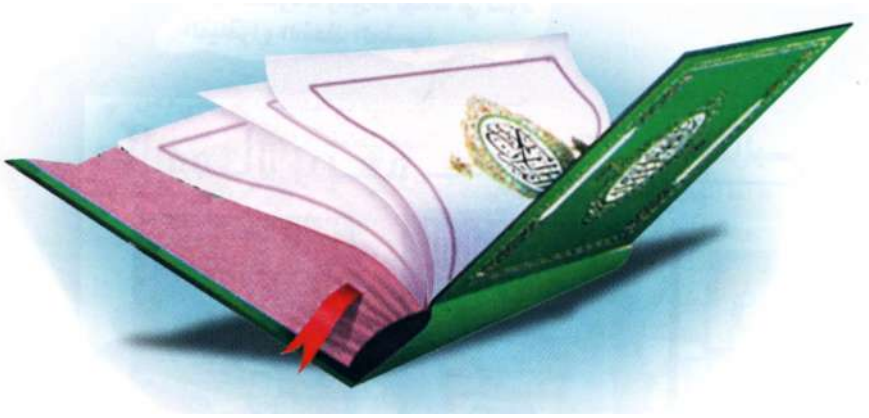

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# List of Abbreviations

| Abb. | Full term |
|---|---|
| *5-FU* | *5-fluorouracil* |
| *AK* | *Actinic Keratosis* |
| *ALA* | *Aminolevulinic acid* |
| *Anti IL-17 and IL-23* | *Anti interleukin 17 and interleukin 23.* |
| *Anti IL-17* | *Anti interleukin 17.* |
| *Anti IL-23* | *Anti interleukin 23.* |
| *Anti-TNF α* | *Anti tumor necrosis factor alpha.* |
| *BCC* | *Basal cell carcinoma* |
| *cAMP* | *Cyclic adenosine monophosphate.* |
| *CD25/CD4* | *Regulatory T cell (T cell suppressor).* |
| *CL* | *Cutaneous leishmaniasis* |
| *DIP* | *Distal interphalangeal* |
| *DNA* | *Deoxyribonucleic acid* |
| *FDA* | *Food and Drug Administration* |
| *HLA-Cw*0602* | *Major susceptibility gene located in human leukocyte antigen region on chromosome 6, close to HLA-Cw6 gene.* |
| *Hp* | *Hematoporphyrin* |
| *HPD* | *Hematoporphyrin derivative.* |
| *HSV1* | *Herpes simplex virus type 1.* |
| *HSV2* | *Herpes simplex virus type 2.* |
| *hβD- 3* | *Human beta defensing 3* |
| *hβD-2* | *Human beta defensin 2* |
| *IL-10* | *Interleukin 10* |
| *IL-12B* | *Interleukin 12B* |
| *IL-17* | *Interleukin 17.* |
| *IL17A* | *Interleukin17A* |
| *IL-17F* | *Interleukin 17F* |
| *IL-22* | *Interleukin 22* |
| *IL-23* | *Interleukin 23.* |
| *IL-23R* | *Interleukin 23 receptor* |
| *IL-6* | *Interleukin 6* |
| *IL-8* | *Interleukin 8* |

# List of Abbreviations cont...

| Abb. | Full term |
|---|---|
| *IPL* | *Intense pulsed light* |
| *JAK* | *Janus kinase.* |
| *LED* | *Light-emitting diode* |
| *LL 37* | *Little peptide 37 only member of the human cathelicidin* |
| *MAL* | *Methyl aminolevulinate.* |
| *MB* | *Methylene blue* |
| *mNAPSI* | *Modified nail psoriasis severity index.* |
| *MRI* | *Magnetic resonance imaging.* |
| *MTX* | *Methotrexate.* |
| *Nd:YAG* | *Neodymium-doped yttrium aluminium garnet.* |
| *NMSCs* | *Non-Melanoma Skin Cancers* |
| *N-NAIl* | *Nijmegen-Nail Psoriasis Activity Index* |
| *NPASI* | *Nail psoriasis severity index.* |
| *NSAID* | *Non-steroidal anti-inflammatory drugs* |
| *O2* | *Oxygen.* |
| *PDL* | *Pulsed dye laser.* |
| *PDT* | *Photodynamic therapy.* |
| *PIH* | *Post-inflammatory hyperpigmentation* |
| *PNF* | *Proximal nail fold* |
| *PpIX* | *Protoporphyrin IX.* |
| *PS* | *Photosensitizer* |
| *PsA* | *Psoriatic arthritis* |
| *PUVA* | *Psoralen ultra violet therapy* |
| *QOL* | *Quality of life.* |
| *ROS* | *Reactive oxygen species.* |
| *SCC* | *Squamous cell carcinoma* |
| *T-cell* | *Lymphocyte T cell.* |
| *Th 17* | *Lymphocyte T helper 17.* |
| *TNFα* | *Tumor necrosis factor alpha.* |
| *US* | *Ultrasonography* |
| *US* | *United states.* |
| *UV* | *Ultra violet* |
| *VD* | *Videodermatoscopy* |

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# INTRODUCTION

Nail disease is seen in up to 50 % of patients with skin psoriasis with an estimated lifetime incidence of 80 to 90%. Conversely, up to 5% of patients have isolated nail psoriasis without skin manifestations. However, it is often overlooked as the nails are largely asymptomatic in the early stages of disease ***(Schons et al., 2015).***

The prevalence of nail psoriasis in men is about 11% higher than in women ***(Augustin et al., 2010).***

Nail disease is significantly associated with distal interphalangeal (DIP) joint involvement, a sign of more severe arthritis, so the routine assessment of a patient with nail psoriasis should include an enquiry about symptoms of inflammatory joint pain ***(Tan et al., 2012).***

The primary trigger of nail psoriasis is still unclear. Nail psoriasis is often associated with an inflammation at the insertion points of tendons and ligaments giving rise to enthesitis. Thus, the nail lesions were believed to represent an abnormal response to tissue stressing of the integrated nail-joint apparatus. In addition, certain infections, such as bacterial and fungal infections, especially Candida albicans have been shown to be involved and to play a role in the exacerbation and maintenance of the disease ***(Waldman et al., 2001; Taheri et al., 2014).***

There is an increased expression of IL-10, tumor necrosis factor (TNF)-α, nuclear factor-kappa B, LL-37, IL-6, and IL-8 in psoriasis-affected nails ***(Saulite et al., 2017).***

Although the milieu of some of the characteristic inflammatory cytokines and chemokines appears to be consistent with the described in psoriatic skin lesions, there seems to be some distinctive peculiarities for nail psoriasis ***(Saulite et al., 2017).***

The lesions in nail psoriasis can arise from the nail matrix (pitting, leukonychia, trachyonychia, red spots in lunula and nail plate crumbling) and/or nail bed (subungual hyperkeratosis, onycholysis, splinter hemorrhage, and salmon patches). Others features of nail psoriasis include paronychia and acropustulosis ***(Tan et al., 2012).***

The most common clinical manifestation is pitting, although others are more severe and can greatly impact the function of the patient ***(Haneke, 2017).***

In most cases, nail psoriasis follows cutaneous psoriasis and is therefore easy to diagnose. However, ~5% of nail psoriasis occurs isolated and may pose diagnostic challenges. In these cases, histopathology is usually diagnostic ***(Haneke, 2017).***

Histopathological features of nail psoriasis show similarities with skin psoriasis as mouds of parakeratosis and

neutrophilic microabcesses in the nail plate as well as vasodilatation and neutrophilic infiltrate in the nail bed ***(Grover et al., 2012).***

Various treatment options are emerging for the treatment of nail psoriasis such as intense pulsed light ***(Tawfik, 2014).*** Intense pulsed light (IPL) is a device that emits high-intensity, polychromatic (between 400 and 1200 nm), non-coherent and non-collimated light, that target specific chromophores ***(González-Rodríguez et al., 2015).***

The mechanism of action of IPL is based on the capture of energy by certain target tissues – the chromophores – through the principle of selective photothermolysis as described by Anderson and Parrish in 1983 ***(Anderson and Parrish, 1983).***

Methylene blue (MB) is a phenothiazine dye, hydrophilic photosensitizer, with low molecular weight and positive charge ***(Moreira et al., 2012).*** The photodynamic mechanism of MB is complex. It is well known to generate singlet oxygen. In addition, it has been suggested that MB mediates cell cytotoxicity by generation of hydroxyl radicals which change the intracellular calcium homeostatic mechanisms ***(Lee and Wurster, 1995).*** The mitochondrial localization of this drug induced cell death by apoptosis during photodynamic therapy (PDT) ***(Noodt et al., 1998).***

To the best of our knowledge, the MB assisted photodynamic therapy have not been assessed before in the treatment of nail psoriasis.