

Class IV Laser in Nail Matrix Ablation Pilot Study

Seeking Modern Alternatives to Phenol Matrix Ablation; Laser, a Novel Approach in Nail Surgery.

A Pilot Study.

by **Ciaran Canney**
MFPM RCPS (Glasg) MInst Pod



Conflict of interest declaration

This study was supported by K Laser UK in the provision of the sapphire crystal surgical heads used in the ablation procedures. Other brands of laser therapy are available. The author has received no payment or benefit in kind of any other description for agreeing to undertake this study.

ABSTRACT

Background: Nail disorders are frequent among the geriatric population, and repeat avulsion procedures often result in complications. Phenol matricectomy is the most commonly applied technique in treating onychocryptosis. Given recent changes in guidance in its use following safety concerns outlined in the national patient safety alert in August 2021 (NHS National patient safety alert, Aug 2021) relating to multi-use phenol containers, this study explores if a safer and equally effective method can be found.

Objective: To utilise laser in partial and total matricectomy procedures for permanent nail ablation and evaluate its effectiveness.

Methods: Total nail ablation was performed on 12 toenails of the hallux (10 patients) using a K laser Class IV laser machine. The degree of pain reported by the patient postoperatively was compared with the preoperative stage using the Visual Analog Scale (VAS). Additionally, patient satisfaction with the final cosmetic appearance and the overall procedure was evaluated through follow-up interviews at six months post-surgery.

Results: All patients reported 'too much' or 'severe' pain prior to surgery, and 90% reported 'no pain' six months post-surgery. The majority of patients were pleased with the cosmetic results, and all reported that they were 'very satisfied' or 'strongly satisfied' with the procedure during follow-up. One procedure was deemed unsuccessful, and one patient was lost to follow-up.

Limitations: The study had a limited number of participants across an extensive timeframe.

Conclusion: Laser nail ablation using K laser cube 4 cos IV laser is safe, effective, and has a high rate of patient satisfaction.

Introduction

Overview of Nail Surgery

Nail surgery is a common procedure performed by podiatrists to treat various nail pathologies, with the most common being ingrown toenails (onychocryptosis), which is one of the most commonly occurring and disabling foot conditions (Haneke, 2013). This condition occurs when the edge of a toenail, usually on the big toe, starts growing into the surrounding skin, leading to pain, inflammation, and possible infection. Many of these conditions will be resolved by permanent ablation. The most important factor in successful matricectomy is the total removal or destruction of the matrix tissue, and although dystrophic sequelae can frighten the clinician, a good knowledge of anesthesia techniques, nail anatomy, and surgical procedures are prerequisites for successful nail surgery with almost no pain and minimal scarring (Reilly, 2014; Monheit, 1985; Richert et al., 2019).

Ingrown toenails affect individuals of all ages but are more prevalent in adolescents and young adults, often caused by trauma from footwear (Cohen & Scher, 1992).

Risk Factors

- **Improper Nail Trimming:** Cutting toenails too short or rounding the edges encourages the nail to grow into the surrounding skin.
- **Footwear:** Tight-fitting shoes or high heels that place excessive pressure on the toes can push the nail to grow into the tissue.
- **Trauma:** Injury to the nail bed, repetitive or sudden trauma, like stubbing the toe, can contribute to onychocryptosis.
- **Genetics:** Some individuals may be predisposed to ingrown toenails due to the natural shape and thickness of their nails.
- **Foot Hygiene and Health Conditions:** Poor foot hygiene or excessive sweating can soften the skin around the nails, making it more susceptible to penetration by the nail. Conditions like fungal infections or toe deformities can also predispose individuals to ingrown toenails.

Demographics and Incidence

While ingrown toenails can occur at any age, they are particularly prevalent in younger populations, possibly due to lifestyle factors such as physical activity and wearing ill-fitting shoes. Studies suggest that males are more likely to suffer from ingrown toenails than females, which may be associated with different types of footwear worn, occupational exposure, and perhaps less attention to foot care and nail trimming practices (Singh et al., 2005).

Methods

Participants and Procedure

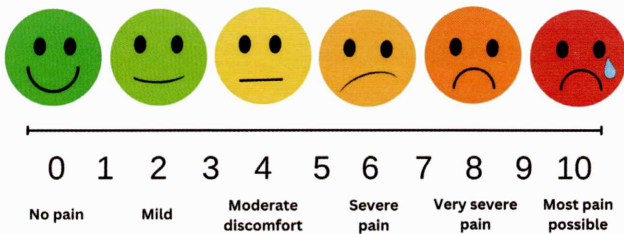
Total nail ablation was performed on 12 toenails of the hallux (10 patients) using a K laser Class IV laser machine. Laser was delivered at 10W peak average 5W on 50% duty cycle, or continuous 4-6W power setting. The selection criteria included patients with chronic or recurrent onychocryptosis, those who had previously failed other treatments, and those seeking a permanent solution.

Pain and Satisfaction Assessment

The degree of pain reported by the patient postoperatively was compared with the preoperative stage using the Visual Analog Scale (VAS). Additionally, patient satisfaction with the final cosmetic appearance and the overall procedure was evaluated through follow-up interviews at six months post-surgery.

Visual Analog Scale

Rate your pain or point to the face that describes how you are feeling



Results

All patients reported 'too much' or 'severe' pain prior to surgery, and 90% reported 'no pain' six months post-surgery. The majority of patients were pleased with the cosmetic results, and all reported that they were 'very satisfied' or 'strongly satisfied' with the procedure during follow-up. One procedure was deemed unsuccessful, and one patient was lost to follow-up.

Discussion

Laser nail ablation using K laser cube 4 cos IV laser is demonstrated to be a safe and effective method for treating onychocryptosis, with high patient satisfaction rates. This study suggests that laser therapy may be a viable alternative to phenol matricectomy, offering reduced postoperative complications, including phenol burn and associated wound maceration, faster recovery times, and better cosmetic outcomes.

However, the study's limitations include a small sample size and the need for long-term follow-up to assess the durability of the results. Further research with larger sample sizes and standardised protocols is necessary to confirm these findings.

Conclusion

In conclusion, laser nail ablation using the K laser cube 4 cos IV laser offers a promising alternative to traditional phenol matricectomy for the treatment of ingrown toenails. The procedure is associated with high patient satisfaction, reduced pain, and improved cosmetic outcomes. However, further research is required to establish long-term efficacy and develop best practice guidelines.

1

HM - Left 1st Medial Aspect Onychocryptosis with PNA Laser Ablation



- **Patient:** 71-year-old male
- **Medical History:** Prostate cancer
- **Medications:** Finasteride, Alfuzosin
- **Presentation:** Painful 1st toe to the right foot. Previously treated by a local foot health practitioner without resolution.
- **Desired Outcome:** Pain relief
- **Procedure:** YouTube Video
- **Results:** Left 14-day post-op, right 14-day post-op, right 76-day post-op, left 76-day post-op
- **VAS Pre Op : 7 Post Op : 0**

2

VH - Total Nail Avulsion with Onychomycosis, Subungual Infection, and Paronychia - Laser Ablation



- **Patient:** 50-year-old female
- **Medical History:** Hypothyroidism
- **Medications:** Levothyroxine
- **Presentation:** Onychomycosis and subungual bacterial infection with associated paronychia to the right 1st toe. Multiple courses of oral antibiotics without resolution.
- **Desired Outcome:** Pain relief
- **Procedure:** YouTube Video
- **Results:** Right 188 days post-op
- **VAS Pre Op : 9 Post Op : 1**

3

NC - Left 1st Medial Aspect with PNA Laser Ablation



- **Patient:** 33-year-old male
- **Medical History:** Nil
- **Medications:** Nil
- **Presentation:** Trauma to the left 1st toe likely caused by injudicious nail cutting and exacerbated by the impact on the toe related to ice climbing.
- **Desired Outcome:** Pain relief and prevention of recurrence in remote climbs
- **Results:** Left 14-day post-op, right 14-day post-op, right 76-day post-op, left 76-day post-op
- **VAS Pre Op :** 8 Post Op : 2

4

JD - Left 1st Medial Aspect with PNA Laser Ablation



- **Patient:** 33-year-old male
- **Medical History:** Nil
- **Medications:** Nil
- **Presentation:** Chronic history of onychocryptosis. Multiple clinicians tried to manage conservatively. Severe pain affecting daily working.
- **Desired Outcome:** Reduction of pain and return to normal working duties
- **Results:** Resolved without regrowth, infection, or complication.
- **VAS Pre Op :** 8 Post Op : 0

CASE STUDIES > > >

5

JD - Left 1st Lateral Aspect with PNA Laser Ablation



- **Patient:** 28-year-old male
- **Medical History:** Nil
- **Medications:** Nil
- **Presentation:** Chronic history of onychocryptosis. Site appeared slightly infected at presentation.
- **Desired Outcome:** Reduction of pain.
- **Results:** Resolved without regrowth. Longest healing time among participants. Patient was on a week-long course of amoxicillin 250mg.
- **VAS Pre Op :** 7 Post Op : 0

6

AC - Left 1st Lateral Aspect with PNA Laser Ablation



- **Patient:** 23-year-old female
- **Medical History:** Nil
- **Medications:** Nil
- **Presentation:** History of onychocryptosis secondary to injudicious cutting.
- **Desired Outcome:** Reduction of pain in preparation for her hen party
- **Procedure:** YouTube Video
- **Results:** Resolved without regrowth. Patient very satisfied with the cosmetic outcome and reported no pain post-op.
- **VAS Pre Op :** 8 Post Op : 0

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