

Therapeutics

Controlled nail trephination for subungual hematoma[☆]

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Abstract An injury to a finger or toe can result in a collection of blood under the nail plate that if unrelieved can cause extreme discomfort due to pressure. In this case, a 47-year-old man developed a subungual hematoma of the right thumb due to a crush injury. Controlled nail trephination was performed using a uniquely designed drill that penetrated the nail plate without breaching the nail bed. The subungual hematoma was successfully drained, and there was a substantial relief in pain over the subsequent 8 hours. This technique appears to be a quick and convenient method of evacuating subungual hematomas with minimal discomfort and minimal risk.

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1. Introduction

A subungual hematoma is an accumulation of blood that collects in the space between the nail plate and the nail bed and is often the result of a crush injury to a digit. Decompression of the hematoma can produce immediate relief; however, the decompression methods currently available can cause a significant amount of discomfort. The PathFormer (Fig. 1; Path Scientific, Carlisle, Mass), a novel device currently approved by the Food and Drug Administration for controlled nail trephination, enables precise control of depth and therefore can relieve the

[☆] Although we have not received funding for this case report, we have previously done studies for Path Scientific (Carlisle, Mass), the company that developed the PathFormer (the device used in this case report). Thiruvallur R. Gowrishankar, one of the authors of this case report, is an employee of Path Scientific.

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Fig. 1 The PathFormer device.

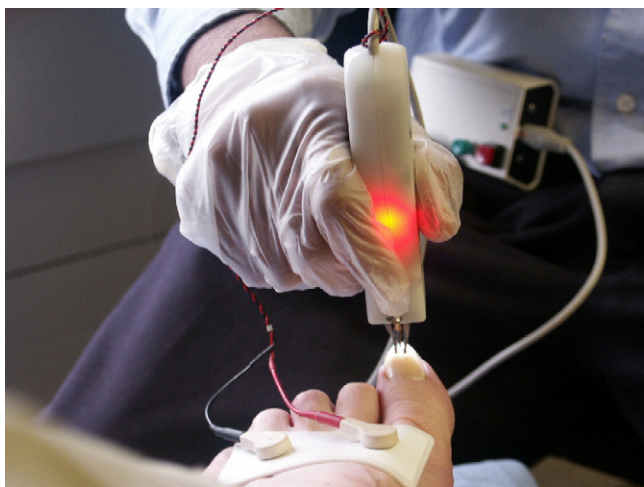


Fig. 2 The mesoscession procedure.

pressure without affecting the underlying nail bed or creating associated pain [1].

2. Case

A 47-year-old healthy man was using a 30-in crow bar to move a central vacuum unit when the crow bar slipped and the hand holding the bar smashed into a heavy metal item. The right thumb was crushed between the crow bar and the metal item creating a subungual hematoma. The patient immediately ran cold water for 5 minutes on the injured thumb, and then, despite his discomfort, proceeded with his home renovations for another 1 to 2 hours. Four hours after the injury he noticed that the pain was increasing in intensity and over the next 2 hours, the pain became so extreme that he was unable to sleep. Decompression was attempted with a 4-mm punch biopsy, but was unsuccessful because of unbearable pain, even after application of a topical anesthetic (EMLA cream, Astra Zeneca, Wilmington, DE) and the administration of oral narcotics. At this point, the patient declined further intervention. The next morning the thumb appeared slightly edematous with no gross deformities and no visible breaks in the skin. There was a blue-black discoloration of approximately 75% of the central nail bed; the edges were well demarcated and the lateral portions of

the nail bed were spared. The patient was unable to move the digit and even the slightest external pressure caused enormous discomfort.

Three 400- μ m-diameter holes were drilled in the nail plate of the patient's right thumb using the trephination device (Fig. 2). After each drilling, blood immediately flowed freely from the holes (Fig. 3) indicating that the drill had successfully punctured the full thickness of the nail plate. The patient had minimal, momentary discomfort with each of the drillings. X-rays were performed that ruled out any underlying fracture. The patient reported that the pain was significantly reduced over the 8 hours immediately after the drilling; it was completely absent 48 hours after the procedure (Fig. 3).

3. Discussion

Subungual hematomas occur frequently after a crush injury to a digit. They can cause extreme discomfort due to the buildup of pressure under the nail plate. Drainage of the hematoma provides immediate and lasting relief, whereas analgesics only provide temporary relief. The pain incurred by the current methods of drainage limit their applicability. These methods include using a heated paper clip, electrocautery, or a presterilized needle to bore a hole in the nail plate, as well as nail plate removal [2-4]. Not only are these methods painful, but some may cause heat-induced coagulation and consequent incomplete evacuation of the hematoma [5].

The design of the device described in this report eliminates many of the shortcomings associated with these older methods. Its advantage over other devices is that it uses the electrical resistance of the nail bed as feedback to stop and retract the drill when it has penetrated through the nail plate [1]. This avoids penetrating the nail bed, which is vascular and contains nerve endings. Potential complications of breaching the nail bed include pain, infection, permanent nail deformation, and the conversion of a closed fracture to an open fracture [2]. Another advantage to the device is the elimination of the need for anesthesia. Because the nail bed is not penetrated and there are no nerves in the nail plate, the patient feels minimal pain and tolerates the procedure quite well.

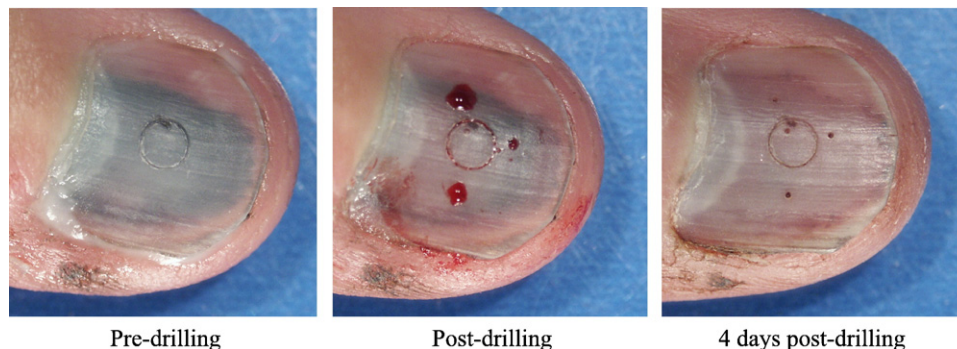


Fig. 3 Before and after hematoma evacuation — 3 mesoscession holes and remnants of punch biopsy.

In conclusion, controlled nail trephination appears to be a quick and convenient method of treating subungual hematomas. There is minimal discomfort, anesthesia can be avoided, and there does not appear to be any risk of significant cosmetic deformity.

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