

## A Case of Digital Ring Entrapment: A Review of Ring Removal Techniques in the Emergency Setting

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### Abstract

Ring entrapment on swollen digits is frequently encountered in urgent and emergent settings. Various removal methods have been described. Special tools and techniques are required to remove rings and bands from fingers in order to prevent finger ischemia and necrosis. Non-cutting removal techniques are preferable, but when unsuccessful, cutting or destructive techniques may be necessary. Techniques are material dependent and directly related to hardness and malleability. We present a case of digital entrapment in the lug hole of a tire, extricated utilizing a Dremel tool and provide a summary of other ring removal techniques.

**Keywords:** *Ring; Dremel; Trauma*

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### Case Report

An Eight-year-old boy placed his non-dominant index finger through the lug hole of a spare tire wheel. The finger became swollen and incarcerated (Figure 1).



**Figure 1:** The finger became swollen and incarcerated.

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Fire rescue evaluated him at the scene and were unable to extricate the finger using lubricant. They used an acetylene torch to remove the wheel segment containing the lug hole and transferred him to a regional hand center for evaluation and treatment. Upon evaluation the finger was swollen, but well perfused with 2 points discrimination of 4 mm. After obtaining informed consent and performing a digital block with 2% polocaine and 0.5% Marcaine, suture wrapping technique was unsuccessful.

Ultimately, a Dremel Multipro tool with a diamond disk blade was utilized to free the incarcerated finger (Robert Bosch Tool Corporation, Mount Prospect, IL). (Figure 2A and 2B) A malleable metal tissue protector was placed beneath the bearing to protect the skin from the diamond tip. Ice water irrigation was applied during cutting to mitigate heat generation. We removed a wedge of metal large enough to extricate the finger.



**Figure 2A & 2B:** A Dremel Multipro tool with a diamond disk blade was utilized to free the incarcerated finger.

## Discussion

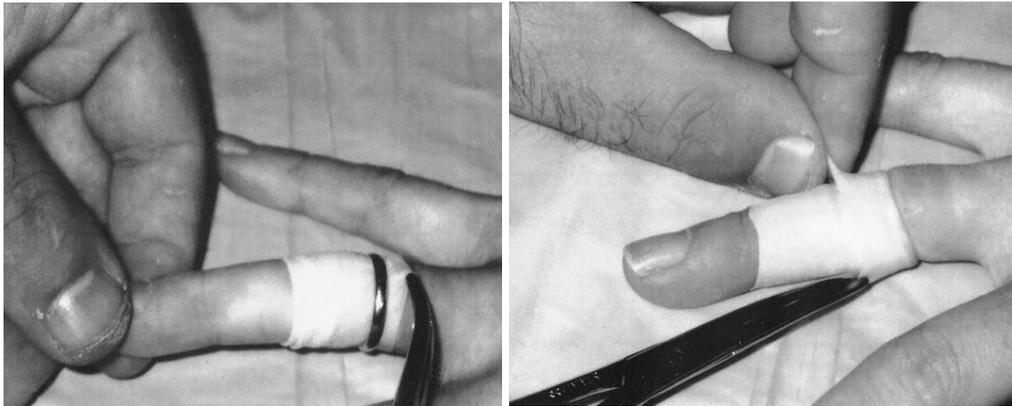
Ring removal following trauma is essential to protect from digital ischemia and necrosis. Untreated tourniquet syndrome resulting from a constricting finger bands can cause distal edema, pain, discoloration and ultimately digital compromise [1].

The simplest and least invasive technique for ring removal is the utilization of lubricant [2]. Surgical lubricant or water soluble gel is typically used [3]. Ice and elevation may also be utilized to reduce swelling and provide mild pain relief. The skin proximal to the ring is gently pulled towards the hand while the ring is gently pulled towards the tip of the finger [2]. When lubricant fails, non-cutting removal techniques are used. Digital block may be used to provide anesthesia [4].

Multiple techniques have been described to remove rings without cutting. The suture or winding technique as described by Pomeroy consists of suture thread, dental floss, or tape wrapped circumferentially around the finger from the distal tip of the finger to the ring, which is then wrapped under the ring. The end proximal to the ring is pulled distally while stabilizing the distal suture end. This step usually needs to be repeated several times as the ring is pulled distally. As the string unwinds, the ring is moved distally [2].

A surgical glove may also be used in order to remove ring without damage. Kalkan et al. [5] described cutting one finger of a surgical glove both at the proximal and distal ends to result in a latex cylinder. Surgical lubricant is applied and the elastic is

wedged underneath the ring using forceps. The proximal segment of the latex is then pulled over the ring distally sliding the ring off the digit (Figure 3A and 3B).



**Figure 3A and 3B:** The proximal segment of the latex is then pulled over the ring distally sliding the ring off the digit.

Ring cutting is employed when conservative treatments are unsuccessful or when open wounds and or fractures are present. Standard ring cutters have a safety guard that is passed beneath the ring to protect the skin from damage (Figure 4). A serrated toothed saw then cuts the ring over the safety guard (Figure 5). Steel cutting pliers may also be used to cut rings made of softer metal [5].



**Figure 4:** Standard ring cutters have a safety guard that is passed beneath the ring to protect the skin from damage.



**Figure 5:** A serrated toothed saw then cuts the ring over the safety guard.

Titanium and tungsten carbide rings have become increasingly popular. With tungsten carbide having a hardness rating of 8.5-9.0 scale and titanium having a rating of 6.0 on the 10.0 Moh's hardness scale, removal with standard cutting techniques is difficult. Standard ring cutters are unable to cut titanium and tungsten carbide, posing a dilemma when non-cutting techniques fail to remove the ring in the emergency department [6].

Diamond tipped dental drills may be used to cut through rings made of virtually any material [7]. Taylor et al. describes a ring removal from a 17-year-old's finger using a dental drill. The tool was described as having an electric motor with revolutions per minute reaching up to 25,000 with the circular diamond grinding disc measuring 15 mm in diameter. Cooling irrigation and a protective device beneath the ring are essential.

Locking pliers or vice grips may also be used to break tungsten carbide rings. Rings are removed by progressively tightening the screw of the vice grip. Usually a three to four turn of the screw is sufficient. The technique can produce small projectiles, so patient and physician shielding including eye protection is necessary. Finger abrasion and laceration can also occur [8].

## **Conclusion**

Emergency physicians are often faced with the challenge of removing constricting bands from patient's digits following trauma to the upper extremities. It is important to remove rings following trauma in order to prevent ischemia and further digital damage. While non-cutting ring removal methods are often successful including usage of lubricant, suture technique, and glove technique, ring-cutting techniques is necessary when conservative techniques fail. Standard ring cutters are commonly found in most emergency departments, however, problems may arise when a patient present with rings made of very hard material. Diamond tipped dental drills may be employed. Tungsten rings can be fractured using a vice grip or locking pliers. In our case, ring salvage techniques were unsuccessful in extricating a finger from a lug hole. A Dremel tool with a diamond disk blade was used to successfully cut the surrounding wheel and free the finger.

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## **References**

1. Peckler B and Hsu CK (2001) Tourniquet syndrome: A review of constricting band removal. *The Journal of Emergency Medicine* 20(3): 253-262.
2. Pomeroy M (2010) Techniques for removing rings from injured fingers. *Emergency Nurse* 18(8): 19.
3. Cresap CR (1995) Removal of a hardened steel ring from an extremely swollen finger. *The American Journal of Emergency Medicine* 13(3): 318-320.
4. Baker A, Rylance K, Giles S (2010) The occasional ring removal. *Canadian Journal of Rural Medicine* 15(1): 26-29.
5. Kalkan A, Kose O, Tas M, et al. (2013) Review of techniques for the removal of trapped rings on fingers with a proposed new algorithm. *The American Journal of Emergency Medicine* 31(11): 1605-1611.
6. Gardiner CL, Handyside K, Mazzillo J, et al. (2013) A comparison of two techniques for tungsten carbide ring removal. *The American Journal of Emergency Medicine* 31(10): 1516-1519.
7. Ricks R (2010) Removal of a tungsten carbide wedding ring with a diamond tipped dental drill. *Journal of Plastic, Reconstructive & Aesthetic Surgery* 63(9): e701-e702.
8. Allen KA, Rizzo M, Sadosty AT (2012) A method for the removal of tungsten carbide rings. *The Journal of Emergency Medicine* 43(1): 93-96.