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CLINICAL RESEARCH / KLİNİK ARAŞTIRMA

Door-related Fingertip Injury in Preschool Children: A Simple Treatment Method in the Emergency Department

Okul Öncesi Çocuklarda Görülen Kapıya Sıkışma Sonucu Parmak Ucu Yaralanması: Acil Serviste Uygulanan Basit Bir Tedavi Yöntemi

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Abstract

Objective: To present a feasible treatment method of pediatric nail and nail bed laceration, which could be performed in the emergency room.

Methods: Twenty-one pediatric patients who presented to the emergency department of our institute with a fingertip injury were analyzed retrospectively. The detached flap at the fingertip was reduced and fixed with 25-g needle tip. Four-zero prolene, PDS, silk, or monocryl were used. The wound was sutured at the bilateral edges of the paronychial region while holding the distal interphalangeal joint. An additional second suture was added from the proximal nail to the eponychium. If the nail was completely separated from the matrix, a 4th suture was added to the hyponychial region at the distal nail. Six-month patency of the fingertips following repair was the primary outcome measure of this study.

Results: During a mean follow-up of 6.4 months, no fingertip necrosis developed and revision surgery was not required in any patient. No nail deformity requiring further treatment was found at the last follow-up.

Conclusion: This study demonstrates that fingertip injuries developing because of door pinching in preschool children can be treated under local anesthesia in the emergency room without repair of the nail bed. This approach seems to be a valid and safe alternative to surgical repair under general anesthesia.

Keywords: Fingertip, nail, injury, repair

Öz

Amaç: Pediatrik tırnak ve tırnak yatağı yaralanmaları için acil serviste uygulanabilen bir tedavi yöntemini sunmaktır.

Yöntem: Enstitümüz acil servisine parmak ucu yaralanması ile başvuran 21 çocuk hasta retrospektif olarak incelendi. Parmak ucunda kopan flep orijinal yerine yerleştirildi ve 25 gr iğne ucu ile sabitlendi. Dört-sıfır prolen, PDS, ipek veya monokril kullanıldı. Distal interfalangeal eklem tutulurken yara paronişial bölgenin bilateral kenarlarından dikildi. Proksimal tırnaktan eponychiuma üçüncü bir sütür daha eklendi. Tırnak matriksten tamamen ayrılmışsa hiponişiyal bölgeye dördüncü sütür eklendi. Onarımı takiben parmak uçlarının 6 aylık takibi, bu çalışmanın birincil sonuç ölçütüydü.

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Öz

Bulgular: Ortalama 6,4 aylık takip süresinde hiçbir hastada parmak ucu nekrozu gelişmedi ve revizyon cerrahisi gerekmedi. Son kontrolde ileri tedavi gerektirecek bir tırnak deformitesi saptanmadı.

Sonuç: Bu çalışma okul öncesi çocuklarda kapının sıkışması sonucu gelişen parmak ucu yaralanmalarının acil serviste tırnak yatağı tamiri yapılmadan lokal anestezi altında tedavi edilebileceğini göstermektedir. Bu yaklaşım, genel anestezi altında cerrahi onarım için geçerli ve güvenli bir alternatif gibi görünmektedir.

Anahtar Kelimeler: Parmak ucu, tırnak, yaralanma, onarım

Introduction

Hand injuries are common in children. Most of these are crush injuries of the fingertip[1]. This type of injury is usually caused by the closure of the house doors by other siblings and pinching the fingertip on the door. The fingertip is pinched on the hinged or arm side of the door. The child's sudden withdrawal of his hand adds an avulsive direction to the injury. The injury spectrum includes a laceration of the nail and nail matrix, distal phalanx fracture, and amputation[2,3]. In children, when the fingertip is pinched in the door, the pulp is crushed due to its soft nature. Since the distal phalanx is under the nail and nail matrix, the pulp is avulsed together with the nail matrix. The root of the nail usually avulses with the matrix beneath the eponychium[4]. If the severity of crushing is high, there is bilateral laceration in the paronychium (Figure 1). This may be accompanied by distal phalanx tuft fractures. If the crush is severe, amputation may occur[3]. Surgical treatment in pediatric patients depends on the type and level of injury. In amputation cases, replantation is planned first where it is possible[5]. In case when replantation is not appropriate, the utilization of a composite graft is a valid alternative[6]. The laceration of the nail matrix and paranychium is as scary as amputation. In pediatric patient group fingertip injuries, surgical treatment is generally performed in the operating room under sedation or general anesthesia. Therefore, preoperative blood testing and iv. cannulation is performed, and the procedure is delayed to ensure that an appropriate fasting period has been passed to intervene in the patient. Following the procedure, patients were kept in the ward to observe possible complications. The management of a fingertip injury may be not only time consuming but also may load a significant burden on the healthcare system. More rapid restoration of the finger anatomy, particularly in injuries that do not require replantation or composite graft in the emergency room without the need for general anesthesia, may improve patient satisfaction and decrease healthcare costs related to prolonged hospitalization. In this study, we presented a novel treatment method for pediatric nail and nail bed laceration, which could be performed in the emergency room.

Materials and Methods

We retrospectively reviewed 21 pediatric patients who presented to the emergency department of our institute with a fingertip injury between October 2017 and February 2018. Ethics committee approval was received for the study. Patients ≤5 years with fingertip injury resulting from pinching in door were included in the study. Subjects presenting with amputation were excluded from this analysis. All surgical procedures were performed in the emergency room. None of the patients received sedation. Patients were taken to the intervention room with their parents. 1-1.5 mL of lidocaine with 25 g syringe was applied to the proximal part of the wound. The digital block was not performed in any patient. A digital tourniquet was not applied in any case. The effect of the local anesthetic agent was waited for about 10 min. The wound site was washed with sterile saline, and cleaned with povidone iodine until the wrist level. A parent was told to try

Figure 1. Bilateral laceration in the paronychium of the thumb

to calm the child on the side of the patient's healthy hand and to hold the trunk. A medical staff held the child's wrist and prevented it from moving. The surgical area was then covered with a sterile drape. First, the detached flap at the fingertip was reduced and fixed with 25 g needle tip. The needle was not advanced into the distal interfalangeal joint (DIP). After needle insertion, the length control was performed with DIP joint motion and another needle. Fluoroscopy was not used even if the distal phalanx was fractured. Because fingertip crush injuries result in tuft fractures. Since children have a high remodeling capacity, there is no risk of malunion or nonunion in very distal tuft fractures. Four-zero prolene, PDS, silk, or monocryl were used. The wound was sutured at the bilateral edges of the paronychial region while holding the distal interphalangeal joint. An additional second suture was added from the proximal nail to the eponychium. If the nail was completely separated from the matrix, 4th suture was added to the hyponychial region at the distal nail Even if there was an injury to the nail matrix, it was not repaired. Terramycin (oxytetracycline hydrochloride) was used as a dressing cream. Patients were sent home after the operation. Amoxicillin clavulanate and ibuprofen were given orally for 3 days. Age, gender, side, injured finger, and mechanism of injury were recorded. Fingertip was reevaluated at 3 weeks. If a non-absorbable suture was used, the suture was removed. Fingertips were examined for necrosis and infection. Patients with suspected infection were given oral antibiotics for 5 days. The needle for all patients was removed at 3 weeks. Even if the child had a tuft fracture , X-ray film was not ordered. The family was informed that the nail could fall after sutures were removed. Patients were reevaluated for nail disorder and fingertip contours after 6 months. Patients living in rural areas were reached by phone. On a white background, the front and side pictures of the cured finger were asked to be sent via WhatsApp® application. X-rays were not performed during follow-up. Fingertip sensory examination was not evaluated pre or postoperative period since it is impossible to make an objective examination in children and digital nerve repair is not performed.

Ethics committee approval was obtained from University of Health Sciences Turkey, Sancaktepe Şehit Prof. Dr. İlhan Varank Training and Research Hospital Ethics Committee (2021-106, date: 10.02.2021).

Statistical Analysis

In our study, the results are presented as a descriptive statistical analysis.

Results

We retrospectively examined 21 children who presented with fingertip injury resulting from sticking to the door. Preschool children aged ≤5 years were included in the study. The patients were treated with local anesthesia in the local operating room in the emergency department. The mean age of the patients was 2.3 (range 1 to 5). There were 11 male (52.3%) and 10 female (47.6%) patients (Table 1). There were 15 (71.5%) cases with right-hand injury and 6 (28.5%) cases with left-hand injury. The most injured finger was the thumb (61.9%) (Table 2).

Five patients (23.8%) had tuft fractures of the distal phalanx (Table 3). All patients had nail bed injuries. The mechanism of injury was commonly entrapment. The mean follow-up was 6.4 months. No fingertip necrosis developed, and revision surgery was not required in any patient. No nail deformity requiring further treatment was found at the last follow-up.

Table 1. Demographic characteristics

		Number
Gender	Male	11 (52.39%)
	Female	10 (47.6%)
Age	1 year	6 (28.5%)
	2 year	8 (38%)
	3 year	2 (9.5%)
	4 year	3 (14.2%)
	5 year	2 (9.5%)

Table 2. Injury definition

	Number
Left hand	6 (28.5%)
Right hand	15 (71.5%)
Thumb	13 (61.9%)
Index finger	1 (4.7%)
Middle finger	5 (23.8%)
Ring finger	2 (9.5%)
Small finger	-

Table 3. Distal phalanx fracture

		Number
Distal phalanx fracture	Yes	5 (23.8%)
	No	16 (76.2%)

Discussion

The efficacy of the technique that we used to repair fingertip injuries in the emergency department and 6 months patency of the fingertips following repair was the primary outcome measure of this study. Fingertip is described anatomically as the segment distal to the insertion of the flexor and extensor tendons on the distal phalanx[7]. Fingertip crush injuries are common in children between 0-2 years of age because of the lack of awareness of their surroundings[8]. A sensible and firm fingertip is necessary for children to discover objects. The aim of treatment in such injuries is to provide a firm and good looking fingertip with a patent tactile sensation and to prevent fine motor skills such as the pincer grip, scratching, and picking up small objects[9]. Treatment method should be determined according to the etiology and type of injury[10]. Replantation is the first treatment method in case of amputation if technically possible[11]. Composite grafts may be an alternative when replantation is not possible[12]. Composite grafts may be preferred in such cases. Fingertip injuries other than amputation are very common in children. Trapping a finger in a door is the most frequent mechanism of injury. Several kinds of injuries, including nail hematoma, nail fracture, nail matrix laceration, and tuft fractures, may occur when a finger is trapped in a door[13]. This type of injury is more frequent in play age children as they are more active. The management of a fingertip injury usually includes surgical correction under general anesthesia in the operation theater. However, this approach is not only traumatic for the subjects but also time consuming and costly. In this study, we reviewed the cases with fingertip injuries in whom the surgical management was performed in an emergency department with local anesthesia. Our findings show that injuries caused by pinching to the door at the fingertips can be effectively treated with local anesthesia in the emergency department.

This study included preschool children in whom the fingertip injury. We found that the most injured finger was the thumb followed by the middle finger. The use of the thumb to grasp the door edge can explain the high rate of thumb injuries[6]. Since the middle finger is longer than other fingers, it is more involved in fingertip injuries. Additionally, the right hand was injured more common. This may be explained by the high dominancy rate of the right hand, which is usulally used for opening the door and searching the environment. The small finger, which is shorter than other fingers and is the last one to join the grip movement, was not injured in any child.

All patients were treated within 3 h of admission to the emergency department. Local anesthesia was applied to the patients. Lidocaine was preferred for local anesthesia because of its rapid effect. In particular, 1-1.5 mL of local anesthetic was applied at the points planned to be sutured. General anesthesia or sedation was not preferred in any patient. In our study, we did not perform nail bed repair or exploration. Even if the nail bed was wounded, it was covered on the nail and sutured into the eponychium and perionychium. There were no nail deformities in the follow-up of the patients (Figure 2-4). The 4-0 surgical absorbable sutures were preferred in the surgical treatment of our cases. Prolene or silk sutures were used in cases where absorbable sutures were not available. Intervention in preschool children under general anesthesia may be considered a traumatic event for them[14]. Blood work and an average fasting period of 4-6 h delay surgical correction if general anesthesia is preferred for surgical correction. In our study, we applied the local anesthetic medication only to the proximal part of the open wound at the fingertip. We used a rapid-action local

Figure 2. Pre-and post-procedural views the distal phalanx of the middle finger following repair

Figure 3. Four-week view of the repaired fingertip

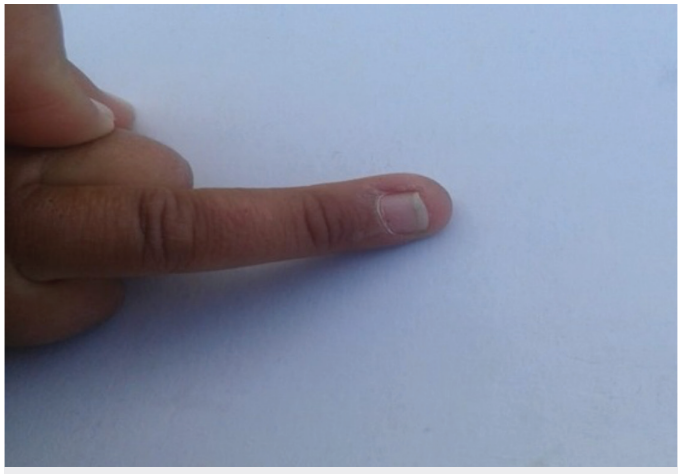

Figure 4. Six-month view of the repaired fingertip

anesthetic agen, and the process was painless for children after that. Just as the extremity of the child was held and fixed by the parents or emergency staff during surgery. Because the procedure was short, painless, and simple, we speculate that it was less traumatic for the child than for surgical correction in the operation theater under general anesthesia. The surgical correction in the emergency room was simple, rapid, and safe in our study population. Amoxicillin/clavulanate was routinely prescribed to the patients. Altergott et al.[15] found that routine antibiotic prophylaxis given after pediatric fingertip injury treatment was not associated with a reduced infection rate. The patients included in their study consisted of children living in urban life. Since our patient group was mostly children living in rural areas with high soil contact, we applied routine prophylaxis. The regenerative capacity of the fingers of preschool children is quite high[2-16]. Therefore, nail bed repair was not performed in any child. No severe nail deformity was observed during follow-up. Only 2 children had a longitudinal nail line that could not be noticed without special attention. They did not require surgical correction. Although fractures in 5 cases, X-ray film examination was not performed in the follow-up. Children have a high regeneration capacity. Even long bones (femur etc.) have tolerance in angulation and rotation. Because during height growth, the bone reshapes and corrects itself. Distal phalanx tuft fracture malunion or nonunion in children reported very rare in the literature.

Study Limitations

This original study had some limitations. First, subgroup analysis could not be performed due to low numbers in the groups. Second, the last appearance of the fingertips is somewhat subjective.

Conclusion

Pediatric fingertip injuries because of door pinching are common in areas of the high pediatric population. General anesthesia and complex surgery create serious stress on both parents and children. It also loads a serious cost on social security institutions. In this study, we demonstrate that fingertip injuries developing because of door pinching in preschool children can be treated under local anesthesia in the emergency room without repair of the nail bed. This approach seems to be a valid and safe alternative to surgical repair under general anesthesia.

Ethics

Ethics Committee Approval: Ethics committee approval was obtained from University of Health Sciences Turkey, Sancaktepe Şehit Prof. Dr. İlhan Varank Training and Research Hospital Ethics Committee (2021-106, date: 10.02.2021).

Informed Consent: Retrospective study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: T.C., Concept: T.C., Design: T.C., H.O.A., Data Collection or Processing: H.O.A., Analysis or Interpretation: H.O.A., Literature Search: T.C., H.O.A., Writing: T.C.

Conflict of Interest: No conflict of interest was declared by the authors.

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