ORIGINAL ARTICLE

Fingertip injuries in paediatric patients — experiences at an emergency centre in Saudi Arabia

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Abstract

Objectives: To investigate the etiological factors, intensity of injuries and the possible preventive measures of fingertip injuries and to avert such calamities.

Methods: A study was undertaken retrospectively on 200 children who had presented with fingertip injuries to the Paediatric Emergency Department of the King Saud bin Abdulaziz University for Health Sciences, during the years 2010-2011. The markers analyzed included age and sex of the patients, period when the injury occurred (vacation and/or non-vacation), accommodation, where the children dwelled, source of injury, localization of the injury, fracture or tendon damage, and modality of treatment.

Results: The frequency of injuries was highest among younger children (< 5 years). Majority of injuries were found to occur during vacation period among patients who dwell in apartments and villas at residential compounds. House doors were the most common mode of crush injuries. The frequency of fractures was found to be more frequent in boys vs. girls. Suturing and conservative treatment were common mode of treatments. Of the total, 188 patients who attended the emergency had proper movement and alignment by the end of their treatment, while 12 patients demonstrated complications.

Conclusion: Children below 5 years age were involved in fingertip injuries in a large number. Injuries were more common in vacations and in children living in appartments. Preventive measures are necessary to avoid these accidents.

Keywords: Fingertip injuries, Etiological factors, Treatment, Safety, Prevention. (JPMA 63: 675; 2013)

Introduction

Fingertip injuries can occur unintentionally, or by accident in infants and children causing infliction ranging from a simple cut to a fracture and amputation of the finger. These include any wound in the area at the tip of the finger which consists of the uppermost phalanx with surrounding tissue, muscle, sensory nerves and nail. Below the nail plate is the nail bed and opposite the nail is the area of soft tissue. When the mishap occurs, any or all parts of the fingertip may be involved causing infliction ranging from a simple bruise or scrape to a fracture and amputation of the finger.[1-3]

A large number of reports are published on different types of fingertip injuries and their causes. The tip of straight finger gets a blow from an external source, which results into an injury. In one of the studies,[4] reported crushing injuries due to jamming of the fingertip in doors, windows of home or door of the car, injuries by sharp objects, falls and punches of sharp objects as the possible causes of fingertip injuries. Crushing injuries can also result from hitting by a hammer or rock. These injuries can cause bleeding under the nail plate and are very painful. Under extreme conditions, the nails can be torn off and the fingertip bone also can be broken. The fingertip and nailbed trauma, in addition to soft tissue injury is caused when the fingers are either shut in the door or window itself or are trapped in the hinge as the door is closed.[5,6] The cuts by glass, knives or other sharp objects cause soft tissue injuries that result in lacerations. In a knife cut the perpetrator can unintentionally injure his own hand, if the knife does not have an adequate handguard and the tip of the blade hits a solid, mostly bony structure while being violently thrust into the victim's body. The injuries occurring under these conditions are localized on the flexor side of the knife-holding hand and may include the index, middle, ring and little fingers.[7] Baby walkers have been implicated in many forms of paediatric trauma, ranging from fingertip entrapment to severe injury.[8] Stringer and Seymour,[9] reported that the possible source of fingertip injuries to be entrapment in woolen/synthetic mittens (a glove with one covering for the thumb and one covering for the four fingers). Such cases happened at home and neonatal units. Exercise bicycles were also reported to be a source of finger injuries to children. The most dangerous parts of the exercise bike were the wheel, the chain and the sprocket wheel.[10] Jensen et al.,[11] reported entrapment of fingers of children in a shopping cart causing injuries.

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Fingertip injuries are extremely common and diverse. They are the result of accidents occurring at play, school or in the home. It is interesting to note that the different etiological factors for injury have a definite type of pathology. The different types of fingertip injuries include lacerations, tendon/nerve injuries, fractures and nail bed trauma.[4,5,12] Fingertip damage was found to cause amputation of the nail matrix that might result in double nail deformity.[13] A serious injury entails non stop bleeding, a broken bone or a dislocated joint, skin is split open, accumulation of blood clot under the nail, large swelling, fingernail is torn and difficult to open the finger joint associated with severe pain. Serious injuries including deformities due to amputation, that involve replantations, and/or injuries to muscles, tendons and bones are given referrals to Plastic surgeons[14] and Orthopaedic surgeons,[2] while most of the treatment that involve the paediatric emergencies constitute (suturing, conservative treatment, exploration with suturing, re-implantation and realignment. In the follow up the injury is managed by silver sulphadiazine dressings[15] and the hyphecan cap, an occlusive biological dressing for fingertip injury.[16] Antibiotic tablets and ointments are given, in addition, to pain relieving medicine, including acetaminophen or ibuprofen. If the fingertip injuries are not treated properly using antibiotics, they may cause serious infection.[17] The fingertip injuries, when they occur, may lead to important and immediate problems such as pain, inability to sufficiently use the finger, restriction of children to participate in various activities such as eating, dressing, playing and doing school home work.[18] A large number of papers are published on the types of fingertip injuries, their pathologies and treatment. However, little is known about the importance of prevention as to how precautions can be taken to avert the accidents or adopt remedial measures of protection from the source of injuries. Some of the preventive measures include design modifications and education of parents about the risks for children. In view of this catastrophe of fingertip injuries, the present study was conducted on 200 children presenting with fingertip injury at the Paediatric Emergency Department, King Saud bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia. The objective of the study was to determine the etiological factors, magnitude of infection and possible preventive factors in fingertip injuries in children.

Patients and Methods

A retrospective chart review was carried out on 200 children less than 14 years of age who presented with fingertip injuries to Paediatric Emergency Department of King Saud bin Abdulaziz University for Health Sciences, during the years 2010-2011. The study included children with finger injuries but excluded those with thermal injuries, bite injuries, infections and additional injuries elsewhere in the hand. The markers analyzed included age and sex of the patients, the period when the injury occurred (vacation and/or non-vacation), accommodation, where the children dwell, source of injury, localization of the injury, fracture or tendon damage, and modality of treatment. The protocols of diagnosis and management of fingertip injuries of Wang and Johnson[19] and Leggit[20] were followed. The diagnosis and management of fingertip injuries are significant to preserve length and shape, maintain sensation, mobilize and return function. Treatment of a subungual haematoma (bleeding beneath the nail) required subungual decompression. This was done by making small holes in the nail. Nail bed laceration was managed by removing the nail and suturing. Often a general musculo-skeletal examination and radiography reveals tendon and ligament injuries and fractures of distal phalanx. Splinting and taping are effective treatments. Treatment would restrict the motion of injured structure, while allowing uninjured joints to remain mobile. Open and/or intra-articular fractures of the distal phalanx warrant referral. Mallet finger patients cannot extend the distal interphalangeal joint. The differentiation between tendinous and bony mallet types is done with the help of radiographs, healing is achieved within six weeks.

Results

Data were collected from emergency physicians' notes, triage notes as well as orthopaedic and plastic surgeons' notes. Mean age was 5.8±1.1 years (6.3±1.09 years for boys and 5.3±1.69 years for girls). The frequency of boys was 119 (59.5%) and girls was 81 (40.5%). The occurrence of injuries among boys was significantly (P<0.001) more than girls.

The distribution of patients by age is shown in Figure-1. The incidence of fingertip injuries among younger children (< 5 years) were significantly (P<0.001) more than the age groups of 3-5 years, 5-7 years and >7 years.

The period when the injury occurred (vacation and/or non-vacation) was recorded in the school-going age group (5-14 years, n=123 patients). Most of the injuries occurred during the vacation period for the schools (n=60; 73.17%) against the injuries occurring during the non vacation period (n=22; 26.83%). The frequency of injuries that occurred during vacation period were significantly (P<0.001) more as compared to those of the non vacation period.

Accommodations was recorded in the age group (3- 14 years, n=123). Most of the injuries occurred in the patients dwelling in apartment/villa of residential compounds (n=69; 56.09%) against those living in apartments (n=29; 23.58%) and villas (n=25; 20.33%). The frequency of injuries among children living in apartment/villa in the residential compounds were significantly (p <0.001) more

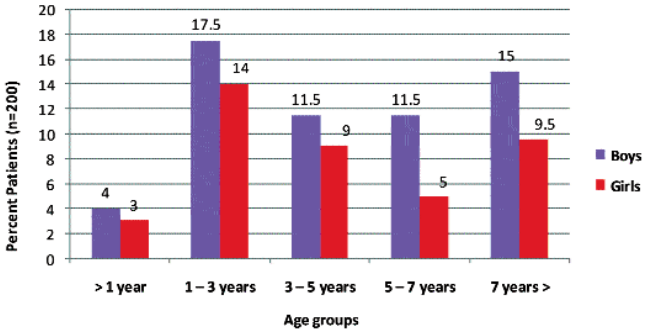

Figure-1: Distribution of patients according to age and sex.

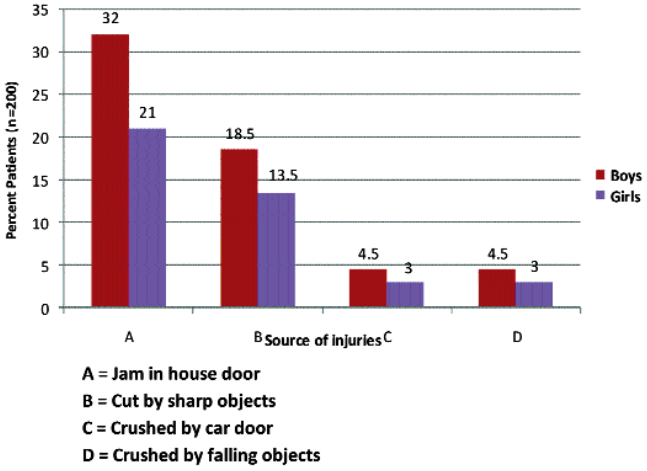

Figure-2: Distribution of patients according to the source of Injury.

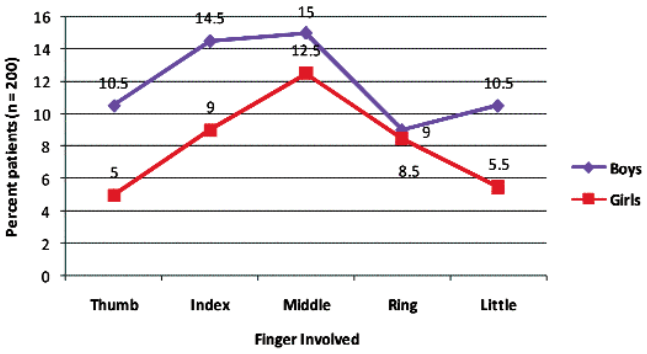

Figure-3: Distribution of patients according to sex and localization of injury.

than those living in apartments and villas.

Fingers were jammed/crushed in age groups less than five years for both the genders. Crush injuries were significantly more than the cut injuries in boys ($p < 0.001$) than ($p < 0.05$) among girls. The differences between the car door crush and object failing were statistically insignificant ($p > 0.05$), (Figure-2).

Most patients had right hand injured (n=102; 51.0%). The injuries in different fingers were as follows: Middle finger of boys (n=30; 15.0%) and girls (n=25; 12.5%); Index finger of boys (n=29; 14.5%) and girls (n=18; 9.0%); Thumb injuries in boys (n=21; 10.50%) and girls (n=10; 5.0%); little finger injuries in boys (n=21; 10.5%) and girls (n=11; 5.50%); Ring finger injuries of boys (n=18; 9.0%) and girls (n=17; 8.5%). Statistical comparisons between the incidence of injuries between middle and index finger for boys and girls was insignificant ($p > 0.05$); between middle and thumb fingers for boys and girls were significant ($p < 0.01$), between index and thumb fingers for boys and girls were insignificant ($p > 0.05$); between middle and little fingers of boys and girls were insignificant ($p > 0.05$); between ring finger and little finger were insignificant ($p > 0.05$) for boys and girls; between index finger and ring finger were also insignificant for boys and girls ($p > 0.05$); between thumb finger and ring finger were significant ($p < 0.05$) for boys and insignificant ($p > 0.05$) for girls; between little finger and ring finger were insignificant ($p > 0.05$) for both boys and girls (Figure-3, n=200).

Regarding the frequency of relationship between fracture and source of injury, the intensity of severity was depicted by referrals to radiology department. Total referrals were 84 (42.0%) for injuries caused from door jam, 14 (7.0%) resulted from car door jam and an equal number were caused by falling objects. while cut by sharp objects caused 25 (12.5%) referrals. The difference between injuries from door jam and those from car door jam and caused by falling objects were statistically insignificant ($p > 0.05$), the difference due to cut by sharp objects was statistically significant ($p < 0.001$), as compared to door jam, but insignificant ($p > 0.05$) as compared to car door jam. Fractures resulting in door jam were 25 (12.5%) and 5 (2.5%) for boys and girls respectively, the incidence was significant ($p < 0.001$) more in boys as compared to girls. In the group of car door jamming caused injuries, the fracture among the boys was 1 (0.5%) and no girl was involved. In the third category of falling objects, 5 (2.5%) boys and 2 (1.0%) girls suffered fractures, the difference between boys and girls was statistically insignificant ($p > 0.05$). The cut by sharp objects caused in 7 (3.5%) boys and 4 (2.0%) girls, the difference between boys and girls was statistically insignificant ($p > 0.05$).

Partial amputation with nail bed injury occurred in 101 (50.5%) children, total amputation were in 5 (2.5%) children. Fifty (25.0%) patients had a simple soft tissue injury and 44 (22.0%) patients had a nail bed injury. The statistical differences of total amputation, soft tissue injury and nail bed injury with partial amputation were significant ($p < 0.001$). One hundred and thirty seven

children had radiological investigations, among those 88 (64.23%) did not have bone injuries, while 44 (32.12%) had simple fractures and 5 (3.65%) had open fractures. The difference between bony and non bony fractures was statistically significant (p <0.001). Suturing was the most common mode of treatment and was done for 95 (47.5%) patients. Conservative treatment was needed for 75 (37.5%) patients, while the rest needed exploration with suturing, re-implantation and realignment.

One hundred and eighty eight (94.0%) patients had proper movement and alignment after injury, while 12 (6.0%) patients demonstrated complications.

Discussion

In most of the industrialized countries, including United States of America and Canada, unintentional injuries rank as the leading cause of hospitalization for children, morbidity and mortality.[21] The present study identifies fingertip injuries caused unintentionally, imprudently and /or by accident in children of age (<1 to 14 years) both boys and girls attending paediatric emergency. This study has analyzed diverse considerations, including age, sex period (vocational and/or non vocational) when injury occurred, dwelling place, source and localization of injury, intensity of injury (wound, tendon damage, fracture) and modes of treatment.

The results have clearly shown that fingertip injuries are more common in boys, as compared to girls. These results are analogous to the study by Haggerty,[22] who found boys to lead the number of accidents. It is suggested that personality, motor skills, and child rearing of boys might be a causal factor. The results of the study on dwelling place revealed majority of the patients lived in apartments/villas house in residential compounds. The place of dwelling of the patients with injuries, including fingertip is of paramount importance. This is because there are enormous opportunities for the children to mix up with same age kids in the spacious residential compounds, where they will be excited to reveal their maneuvers to their friends. This apparently reveals that children are more vulnerable to fingertip injuries at home, rather than at school. Injuries, including finger and hand will be common during holidays. This is the time when, the children are either indoors or visit exciting locations, outdoor. They spend their time among friends and relatives of their age. The data revealed that the children were more prone to injuries during the vacation period as compared to non vacation period. This is due to the fact that most of the time, the children are indoor and hence there is an increased probability of accidents taking place at home. Homes are described as a haven of safety for young children, however; they symbolize the most frequent site of injury occurrence.[23] Furthermore, the records of United Sates Department of Health, Education and Welfare also emphasize home accidents to account for 58 and 38 per cent of all accidental emergencies in the age group of <1 and < 15 years, respectively.[22] These results confirm the observation of Ljungberg et al.,[4] who reported higher number of injuries occurring during vacation period.

The data on etiology of fingertip injury showed crush injuries as the most frequent. These injuries are caused when the fingers are either shut in the door or window itself or are trapped in the hinge. Such injuries are also caused by hit of a hammer or a rock. Fingertip and nail bed trauma caused by doors are common in children.[5] Literature reports suggest that the crushed/jammed injuries by opposing surfaces of home doors predominated as the most common source of fingertip injury among boys and girls between 1-5 years.[4,18] The resultant pathologies were lacerations, tendon/nerve injuries, fractures, nail bed trauma and amputations of the nail matrix resulting into double nail deformity. Such pathologies, responsive of the etiological factors have been confirmed by reports in the literature.[4,5,12,13] The other injuries resulting from car door or falling of an object are not significant. It is surprising to note that some of the sources of injuries, such as, knife cut, baby walkers, entrapment in woolen/synthetic mittens, exercise bicycles and shopping carts reported in literature,[8-10] did not become the part of attendance as paediatric emergencies in our hospital. Nevertheless, such sources could become future emergencies, hence, it is noteworthy to take precautions against these sources as preventive measures. Most of the injuries were found to occur in right hand and middle finger. The exact mechanism of the vulnerability of the middle finger is not known, however, the length of this finger, might be the possible reason, why the other fingers were not accessible to the injury.[4] Radiological investigations were done on children with suspected bony injuries. One hundred and thirty seven children had radiological investigations, very limited had simple fractures and open fractures. The observation on limited open fractures contradicts one of the earlier reports,[24] which demonstrated comparatively more number, mostly boys, having the infliction of open fractures. The discrepancy may be due to limited restrictions on boys in the latter study.

The different modalities of treatment adopted at our department, included suturing and conservative treatment, exploration with suturing, re-implantation and re-alignment. In the follow up of the treatment at

emergency, the injury is managed by dressings and antibiotics.[15] These modalities of treatment are comparable to reports in the literature.[25] For the serious type of fingertip injuries, those that require re-implantation of amputations, referrals are given to specialized clinics of plastic surgeons[14] and those involved in injuries to tendons, muscles and bones are referred to orthopaedic surgeons.[2] The different strategies in the management of subungual haematoma, nail bed laceration, reimplantations, radiography, splinting and taping were followed as per the treatment protocol of Wang and Johnson[19] and Leggit.[20]

The fingertip injuries, when they occur, may lead to important and immediate problems such as pain, inability to sufficiently use the finger, restriction of children to participate in various activities such as eating, dressing, playing and doing school home work.[18] In addition, the injuries can cause psychological trauma for both children and parents. The reason may relate to the anxiety it causes for parents and their children about the possible disability, deformity, finger shortening and recovery of function for future daily activities.[18]

Conclusion

Fingertip injury was encoutnered in a higher frequency in children less than 5 years age. Injuries were more common in the vacations and in children living in apartments and villas. Most children had full alignment after treatment.

Recommendation

Continuous education for prevention methods and information on safety precautions should be provided to parents and guardians to increase their knowledge on injuries and their etiologies. Preventive measures include design modifications about the risks for children, may introduced by enforcing legal procedures. The families may be advised to take steps to make sure their children's surroundings are safe. Vertical and horizontal automatic sliding doors which are hydraulically controlled at home should be avoided.

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