



Hand trauma under six years of age

Trauma alla mano sotto i sei anni

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Summary

Introduction. The use of the hand in daily activities undergoes an increase in the first years of age in relation to their increased interaction with their surroundings. For this reason, hand injuries are among the leading causes of access to pediatric emergency rooms.

Although the majority are minor trauma, there is a percentage of cases with risk of long-term outcomes such as retracting scars, sensitivity disturbances, and reduced residual growth.

The literature is poor with studies focused on pediatric hand trauma, especially in preschool age. The purpose of the study was to analyze the incidence of these injuries in a pediatric population under 6 years of age.

Materials and methods. The authors performed a review of patients presented at the pediatric emergency department of the Gaslini Institute in Genoa during the period from 2015 to 2021.

Inclusion criteria in the study were:

- trauma distal to the wrist (distal radius and carpus excluded);
- age less than 6 years;
- no previous treatment.

Results. Out of 1356 patients evaluated for trauma involving the hand, 390 of these met the inclusions criteria.

The male was involved more than the female; the main trauma was finger-cutting injuries, followed by crushing and palmar wounds.

The main traumatic mechanisms found were accidental closing of the fingers in a door or car door or chairs, wounds following accidental knives use and animal bites. The index finger was found to be the mainly injured, followed by the thumb and ring finger.

The age group between 1 and 4 years was prone to have the majority of patients. 362 children were treated in the emergency room while only 28 required hospitalization and surgery.

Conclusions. Analysis of the study data allows the authors to conclude that, although these are frequent injuries, they are often minor and do not require hospitalization. However, there is a need for the implementation of educational prevention programs that make both adults and children aware of the potential risks present in both home and non-domestic and school environments.

Key words: hand trauma, fingertip injuries, pediatric trauma

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Conflitto di interessi

Gli Autori dichiarano di non avere alcun conflitto di interesse con l'argomento trattato nell'articolo.

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Riassunto

Introduzione. L'uso della mano nelle attività quotidiane subisce un netto incremento nei primi anni di vita dei bambini in relazione alla loro maggiore interazione con l'ambiente circostante; per tale motivo le lesioni della mano sono tra le principali cause di accesso presso il pronto soccorso pediatrico.

Nonostante la maggioranza degli accessi sia per traumi di lieve entità, esiste una percentuale di casi con rischio di esiti a lungo termine quali cicatrici retraenti, disturbi di sensibilità, ridotta crescita residua.

La letteratura è povera di studi focalizzati sui traumi della mano pediatrica, soprattutto in età prescolare; scopo del presente lavoro è stato analizzare l'incidenza di queste lesioni in una popolazione pediatrica al di sotto dei 6 anni di età.

Pazienti e metodi. Gli autori hanno eseguito una revisione degli accessi presso il Pronto Soccorso pediatrico dell'Istituto Gaslini di Genova nel periodo compreso tra il 2015 ed il 2021.

I criteri di inclusione nello studio sono stati:

- traumi distali al polso (radio distale e carpo esclusi);
- età inferiore a 6 anni;
- nessun precedente trattamento.

Risultati. Nel periodo in esame, 1356 pazienti sono stati accettati per traumi riguardanti la mano; 390 di questi sono stati inclusi nello studio.

Il sesso maschile è stato coinvolto maggiormente del femminile; il principale trauma è stato rappresentato dalle lesioni da taglio delle dita, seguite da schiacciamento e ferite del palmo della mano.

I meccanismi traumatici principalmente riscontrati sono stati la chiusura accidentale delle dita in una porta o portiera di auto o sedie, le ferite da taglio con coltelli ed i morsi di animali.

L'indice è risultato il dito principalmente leso, seguito da pollice ed anulare.

La fascia di età tra 1 e 4 anni è stata quella in cui si localizzavano la maggioranza dei pazienti.

La maggioranza dei pazienti (362) sono stati trattati in pronto soccorso mentre solo 28 hanno necessitato di ricovero ed intervento chirurgico.

Conclusioni. L'analisi dei dati dello studio permette di concludere che, seppur trattandosi di traumi frequenti, sono spesso di lieve entità e non richiedono ospedalizzazione.

È tuttavia necessaria la realizzazione di programmi educativi di prevenzione che rendano sia gli adulti che i bambini consapevoli dei potenziali rischi presenti sia in ambiente domestico che extradomestico e scolastico.

Parole chiave: traumi della mano, mano pediatrica, lesioni apicali

introduction

The hand involvement in daily activities increases during the first ages of life, achieving the children to learn new skills in order to react to new challenges; it is by using the hand, kids can improve their brain functions allowing motor and sensitive areas to organize themselves¹. Hand injuries continues to be among the most common trauma in childhood; when fingers are injured many daily activities, such as eating, playing or making schoolwork, are restricted or unexecutable with a negative impact on the entire family life. Boys are usually more at risk of injury as a result of their more reckless characters and home seems to be the place where the majority of injuries happens; however, different mechanisms of trauma in places other than homes may result from different social and cultural contexts.

In spite of the majority of patients suffer from minor traumatic injuries, there is the potential risk of permanent morbidities such as scar contracture, loose of sensation, growth disturbance with functional and aesthetic long term impacts².

Although the high frequency of these traumas, the literature is relatively poor in reports on the subject and even less so for those involving children in pre school-age. The aim of the paper is to analyze the trauma of the hand in a population of children under 6 year of age, reporting on trauma mechanism and common option of treatment.

Materials and Methods

A retrospective analysis of hospital institutional database (tertiary pediatric care center) was carried out searching for the patients with hand trauma admitted at emergency room; the registers between 2015 and 2021 were analyzed using the ICD9 code for the research.

The inclusion criteria was:

- trauma distal to the wrist (distal radius and carpus excluded);
- age under 6 years;
- any previous treatment.

Patients with trauma at levels or proximal to the wrist, age over 6 years and children admitted for second opinions after a treatment carried out in a spoke center were excluded. Considering the nature of the study, the approval of ethical committee or IRB was not mandatory.

Results

Out of 1356 hand trauma managed during the period of the study, only 390 met the inclusion criteria.

Male was affected in 59% (231 cases) of cases and female in the remnant 41% (159 cases).

Fingers cutting injuries represented the main trauma (183 cases) followed by fingers crushes (88 case) and hand cutting injuries (60 cases) (Fig. 1).

Fingertip was injured in 31 children while 25 suffered from isolated fractures of metacarpals or phalanges; finally 3 patients were affected by amputation, PIP dislocation and sprain. The most common mechanisms of injury were getting a finger stuck in a door, cutting the hand with glass, knives or scissors and crushing a finger inside a chair; another paramount causes were animal bites such as dogs, rabbits, cats, squirrels. Index was the most injured finger (33%) followed by thumb (23%) and long finger (22%) whereas ring and little fingers were the least affected (15% and 8%). Figure 2 shows the rate between number of trauma vs patients



Figure 1. Shows four type of common hand injuries in pre school age.

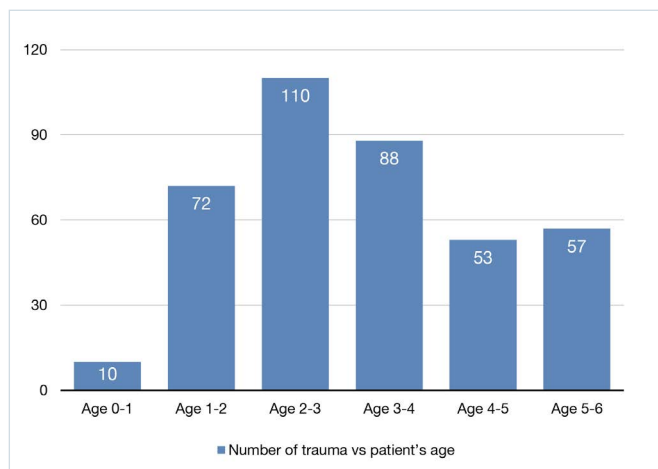


Figure 2. The rate between number of trauma vs patients ages.

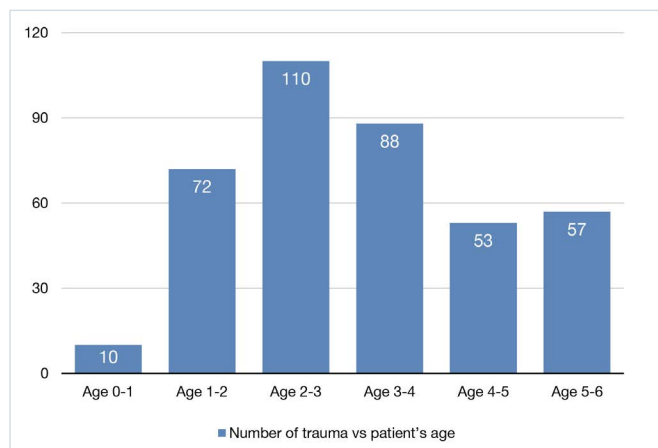


Figure 3. Number of surgeries vs patient's age.

Table I. Types and numbers of treatment carried out in emergency room with or without local anesthesia.

| Treatment in emergency room | |
|-----------------------------|-----|
| Dressing | 107 |
| Skin suture | 90 |
| Steristrip placement | 77 |
| Skin suture & nail repair | 49 |
| Dressing and cast | 33 |
| Others | 6 |

ages. All the children were treated; out of 390 children, 362 were treated in emergency room: Figure 3 reports on the per-

Table II. Types and numbers of surgical procedures performed under general anesthesia.

| Surgical procedures | |
|---|---|
| Flexor tendon suture | 6 |
| Skin suture | 5 |
| Osteosynthesis | 3 |
| Advancement flap | 4 |
| Extensor tendon suture | 2 |
| Extensor tendon suture + osteosynthesis | 2 |
| Tendon graft + local flap | 2 |
| Flexor tendon suture + local flap | 2 |
| Flexor tendon suture + digital nerve suture | 2 |

formed procedures. The remaining 28 patients underwent surgeries which are listed in Table I; furthermore, Table II shows the number of surgical procedures related with patient's age.

Discussion

Despite not being the first reason of admission in emergency room, pediatric hand trauma still represents a paramount because of their potential interference with the daily life of the children and their family.

A child who experienced pain and immobilization reduces his daily activities such as eating, playing, making school activities; moreover, it could create a potential anxiety about recovery of function and long term sequelae.

Although the real incidence of hand trauma in children is still unknown, several authors reported on these injuries, highlighting how family, home, social and cultural environment could influence the risk of injuring the hands^{3,4}.

To our knowledge, this analysis is the second one exclusively focused on a population under six years of age; it may be considered the period with higher risk of accidental hand trauma, especially at home, due to the fact children can easily escape the parental control guided by their poor judgment and high curiosity.

In the analyzed cohort, the ages between one and four seems to be more at risk than the first year and the period four to six, according to what reported by a retrospective study on

a population of 344 injured hand in patients younger than 16 years of age⁵.

Cutting injuries affected the fingers and the palmar region in the majority of cases; glasses, knives, scissors and blades were the most common sources of wounds due to their wide presence in each home, where, eluding the parental control, children are often able to take possession of them⁶.

The second cause of trauma were crushing, firstly arising from getting the fingers stuck in home or car doors which must be considered as a hazard for children.

On the one hand they can close the door without being careful their fingers are free; on the other hand it is not uncommon a parent or relative are closing the door while the baby's fingers are still inside⁷.

When analyzing the location of the injuries in the cohort, index fingers was the most common site, followed by thumb and long fingers; it differs from other series where long finger and thumb were the main affected^{8,9}.

Animal bites showed to be an additional source of trauma, with children being victims in more than half of cases; despite dogs continues to be the main source of bits, the spread of different pets, such as rabbits, cats, squirrels, explains how nearly one-third of animal bites in our cohort do not come from dogs¹⁰.

The therapeutic approach was little discussed in the articles published on the topics; in the analyzed series, 93 % of patients were managed in emergency room and followed in outpatients clinic while only 7 % underwent surgery.

All the surgical procedures regarded patients with tendon injuries, displaced fractures, wide fingertip injuries as well as children with simple wounds but so rambunctious that they cannot be managed under local anesthesia.

The analysis of the type of therapeutic procedures performed in the 390 children included in the study allows the authors to affirm that, although hand injuries are common in children in pre school age, they are often not so serious allowing to treat it without hospitalization.

In conclusion, hand injuries in pre school age are still common especially in home environment but, despite the relative high frequency, their management is often easy enough not to require hospitalization or lengthy treatment.

Educational programs against pediatric hand trauma should be created by institutions in order to make both adults and children aware of the mechanism and causation as well as potential long term repercussions both on function and esthetics of fingers and hand.

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