

Zipper injuries: Extrication technique

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Abstract

Introduction: Zip injuries are the second most common cause of genital injuries in children. Several management techniques are reported. However these techniques are difficult and potentially dangerous, requiring general anaesthesia. “Rolling back” technique is an easy and safe method of extrication, without any mechanical device or anaesthesia.

Objectives: To categorise zip injuries, to elucidate the principle behind the “Rolling back” technique, to educate the clinicians on how to extricate zip injuries and to prevent zip injuries by educating their parents.

Method: Simulative experiments were conducted by entrapping cloth in the zip and extrication by “Rolling back” technique. Children in the age group 1 to 18 years with zip injuries presenting to the outpatient department (OPD) or emergency room (ER) were studied for 3 years. “Rolling back” technique has two components. If the skin is entrapped while closing the zip, then extrication is to open the zip. If entrapment occurs while opening the zip, then the technique is to close the zip.

Results: Of 35 cases, 34 (97.2%) were boys and one (2.8%) was a girl. Twenty eight (82.4%) boys were uncircumcised and 06 (17.6%) were circumcised. Twenty five (71.4%) had anterior entrapment and 10 (28.6%) had posterior entrapment. In both types, uncircumcised boys had higher risk of entrapment. All were successfully managed by the “Rolling back” technique.

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Conclusions: Of 35 zip injuries seen in this study 71% had anterior entrapment and 29% had posterior entrapment. All zip injuries were successfully managed by the “Rolling back” technique.

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(Key words: Zipper, children, zip injuries)

Introduction

Zip was first conceived in mid-1800 by Whitcomb Judson, but it is Gideon Sunback who is considered to have developed the modern zip in 1913. The zipper or zip subsequently became popular globally as a method of closure of trousers¹. Trouser zips are reported to be a common cause of injuries to the penis in children^{2,3}. Hence, several techniques have been reported which could release the tissue trapped within the zip teeth and slider³⁻¹¹. Most reports of zip injuries focus on children^{2,3,12}. A study by Bagga HS et al, which included both adults and children, showed that 21.6% of all penile injuries were related to zip injuries¹³. In this study two thirds of all cases attending the emergency department (ED) with penile injuries were children 0-18 years of age. In these children 16.6% penile injuries occurred while fastening the zip. Zip injuries in females were exceedingly rare¹³.

Management of zipper injuries is a challenging task in the ED or in the outpatient department (OPD). There are several case reports and management techniques reported in the literature³⁻¹¹. These include ingenious solutions and radical suggestions including routine circumcision. However, to the best of our knowledge, none of these articles have suggested the exact principle which can be generalized to the management of prepuce entrapment in the zip. Some studies showed the use of bone cutters, pliers, screw drivers, wire cutters, needle holder etc. to release the entrapped skin and mentioned simple manipulation of the zip without explaining the exact principle³⁻¹¹.

Objectives

- To categorise the zip injuries to genital skin based on the mechanism of injuries.
- To elucidate the principle technique (Rolling back technique) of release of such injuries.

- To educate clinicians to assess the mechanism of entrapment and how to extricate such zip related injuries either in office practice or in emergency department.
- To influence the prevention of such injuries in children, by educating parents.

Method

All children in the age group 1 to 18 years, both boys and girls, who presented to OPD/ED with genital skin (penile/scrotal skin or labial skin) entrapment into the zip were analysed and the “Rolling back” technique was practised to release the entrapped skin.

First, the principle of management of genital skin entrapment in the zip was designed. A series of experiments were conducted to apply this principle (vide infra) and technique on cloth, being entrapped in the zip at various positions simulating different mechanisms of injuries. After achieving the success in these simulative experiments 2 of our consultant colleagues (Authors) were taught this technique and asked to practise and validate this technique in their office/emergency practice. The data of such case series was collected over a period of 3 years. The technique was named as the “Rolling back” technique. Figure 1 shows the anatomy of a zipper.

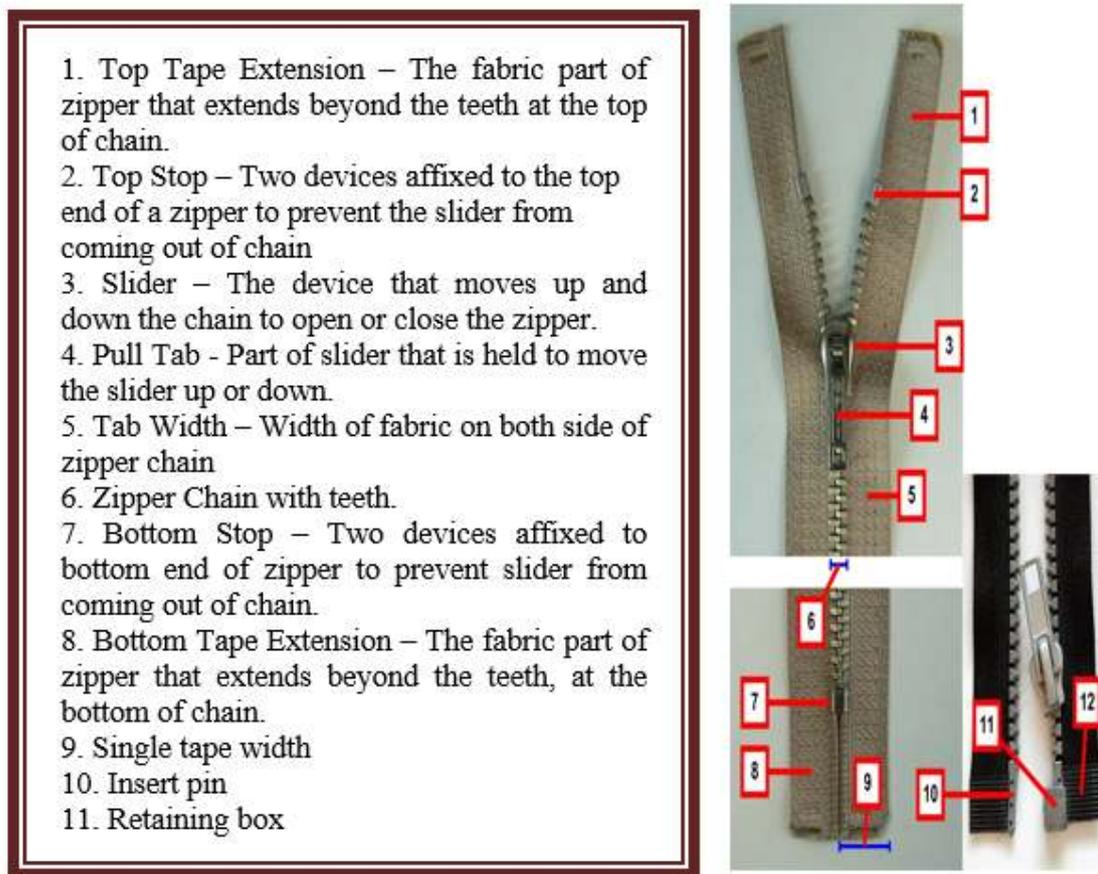


Figure 1: Anatomy of a zipper

Mechanisms of injury

- A. The most common type of injury is the entrapment of genital skin while closing the zip. In this type the entrapped skin is between the slider of the zip and teeth (Anterior entrapment injury). This is shown in Figure 2.

Extrication Technique 1: Roll back the sliding part of the zip to the original position i.e. to the bottom stop (*downward pull*), which can be achieved either by pulling the “pull tab” towards bottom stop or by pulling apart the two tab width so that the sliding part moves down and trapped skin slides off the zip.



Figure 2: Anterior entrapment injury

B. The less common type is the entrapment of genital skin while opening the zip. In this type the entrapped skin is between the posterior faceplate of slider of the zip and teeth. (Posterior entrapment injury). This is shown in Figure 3. The trapped skin

may be either prepuce or skin on dorsal part of the penis or labial skin in girls.

Extrication Technique 2: Entrapped skin can be slid off by closing the zip (*upward pull*) i.e. Roll back the sliding part of the zip to the original position by pulling the “pull tab” up towards the top stop.

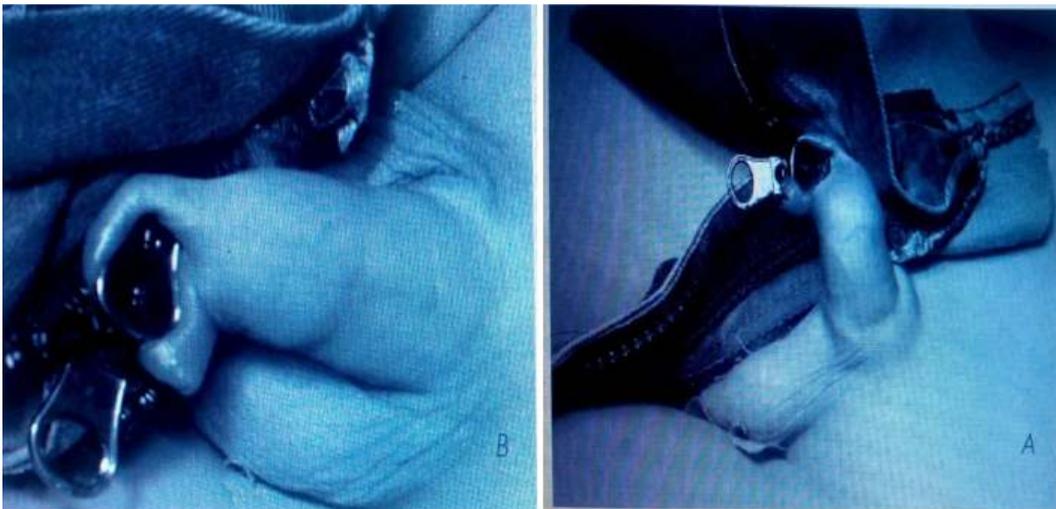


Figure 3: Posterior entrapment injury

This principle technique of management of genital skin entrapment in zip was discussed in hospital ethical committee and got approval to be practised in office or emergency department.

Results

Out of 35 cases with zip injuries to genital skin 34 (97%) were boys and 01 (2.8%) was a girl with labial skin entrapment. Most common age of presentation was 4 to 9 years as shown in Figure 4.

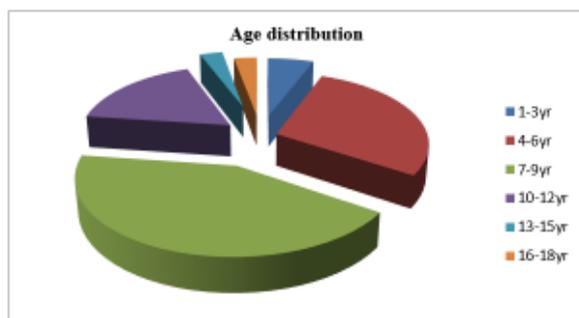


Figure 4: Age of presentation

Youngest age of presentation was 3 years. Out of 34 boys, 28 (82.4%) were uncircumcised and 06 (17.6%) were circumcised. Of 35 cases 25 (71.4%) children had anterior entrapment injuries (prepuce caught between lateral side of sliding part and zip teeth as shown in Figure 2) whilst 10 (28.6%), comprising 9 boys and one girl had posterior entrapment injuries (prepuce or dorsal penile or labial skin caught between posterior faceplate and closed teeth of zip as shown in Figure 3). None had scrotal skin entrapment. None were wearing inner garments at the time of injury (Table 1).

Table 1: Type of zipper injuries

Gender No. (%)	Anterior entrapment injuries (Group-A)			Posterior entrapment injuries (Group-B)		
	Circumcised No. (%)	Uncircumcised No. (%)	Total No. (%)	Circumcised No. (%)	Uncircumcised No. (%)	Total No. (%)
Boys 34 (97.2)	02 (5.9)	23 (67.6)	25 (71.4)	04 (11.8)	05 (14.7)	10 (28.5)
Girls 01 (02.8)	Nil			01 (2.8)		

All of them presented as outpatients during working hours, within 1hr of sustaining entrapment injury. All children were extremely apprehensive, anxious and agitated at the time of presentation.

All children in Group A were managed by “Rolling back” technique 1 and all children in Group-B were managed by “Rolling back” technique 2 after taking child and parents into confidence and getting their consent. Local anaesthetic gel or mineral oil was used as a lubricant. The success rate was 100% in both types of injuries. None of them required any mechanical devices like bone cutter, wire cutter,

pliers, screw driver, needle holder etc. In only one case the pants was cut surrounding the zip to locate the entrapment of skin. None required general or regional anaesthesia. Procedure was completed within 3 minutes in all cases and none sustained any major injuries like tears or hematoma to the genital skin. Minor injuries like bruises and crush injury points were treated with local antibiotic gels. Figure 5 is an algorithm for the management of genital skin entrapment.

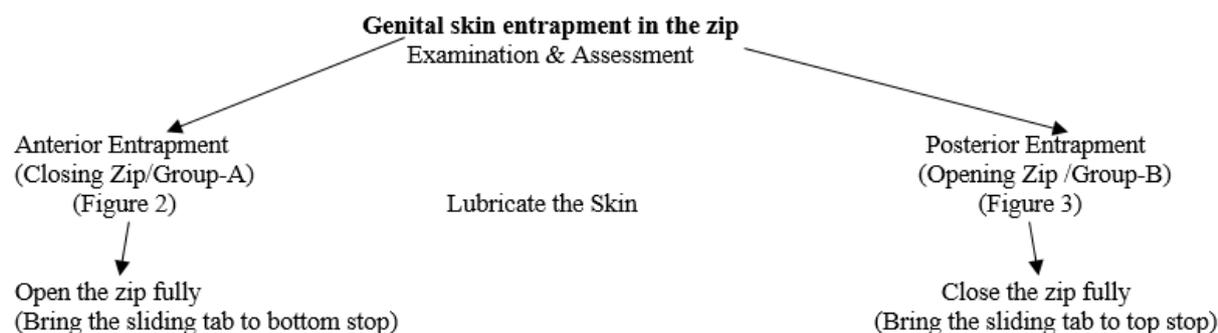


Figure 5: Algorithm for the management of genital skin entrapment

Discussion

Boys, particularly if uncircumcised, are at risk of genital skin entrapment into the zip, when they are unprotected by inner wear^{2,3}. Labial skin entrapment in girls, though rare, can still be a possibility. In our study children in the age group of 4-9 years were at highest risk of zip related injuries. These children are often distressed, frightened, agitated and

apprehensive. Any unwarranted, futile manipulations without background information about the type of entrapment will add to their anxiety and agitation. In fact such manipulation can be potentially dangerous⁸, as they may cause tear or haematoma.

Various management strategies are reported including simple manipulative technique, usage of

instruments like bone cutters, pliers, needle holders, screw drivers and sometimes more radical procedures like circumcision or partial excision of entrapped skin under general anaesthesia. The method mentioned in one article⁷ (to push zip fastener in opposite direction from which it had originally trapped) is similar to the “rolling back” technique practised in this study. However, the commonest method described in the literature is the division of the median bar connecting anterior and posterior faceplates of a zip fastener, using bone cutter or mini hacksaw^{5,9,14,15}. Though zip entrapment can be successfully released using various mechanical instruments, such procedures are potentially dangerous in the agitated child and may require general anaesthesia.

This principle of the “Rolling back” technique is simple, based on the underlying mechanism of injury, safe, quick, without need of any mechanical devices or general anaesthesia. The success rate is as high as 100%, especially if the injury is less than one hour duration where there is no oedema of the skin. Infiltration of xylocaine may worsen the condition by increasing the oedema. “Rolling back” technique is used to release the entrapped skin, whether it is anterior entrapment while closing the zip or posterior entrapment while opening the zip which are released by opening the zip and closing the zip respectively.

This study will help to educate clinicians about the zip entrapment injuries and also help them to assess the mechanisms of entrapment and how to extricate zip related injuries quickly and easily in their office practice or emergency department using the “Rolling back” technique. This study will also influence the prevention of such injuries in children by educating parents to encourage their children to use inner wear to keep the phallus away from the zip.

Despite the high success rate to the extent of 100%, there were some limitations of the study:

- All of them presented within 1 hour of injury.
- There was no oedema of either entrapped or surrounding genital skin.
- No comparative studies were done to assess the efficacy of different techniques as data is unclear and all other techniques are effective in release of entrapped skin though difficult and time consuming.
- Incidence rate of zip related injuries could not be estimated as the study involves case series by three different clinicians in their office practices and emergency departments.

Conclusions

Of 35 zip injuries seen in this study 71% had anterior entrapment and 29% had posterior entrapment. All zip injuries were successfully managed by the “Rolling back” technique.

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