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Comparative analysis of five methods of emergency zipper release by experienced versus novice clinicians

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The entrapment of penile tissue (foreskin, shaft, or glans) within the actuator or teeth of a zipper accounts for one of the most common genital injuries in young boys [1]. Literature suggests that zipper injuries are relatively uncommon, and that localized edema and pain are the most common outcomes, with significant injury such as skin loss and necrosis occurring rarely [1,2]. The purpose of our study was to compare five common techniques for releasing zipper-entrapped skin using an animal model.

This was a prospective, randomized trial using an animal model consisting of chicken skin firmly entrapped by a metal zipper on a pair of denim jeans. Volunteers consisted of 12 Emergency Medicine (EM) physician faculty and 18 medical students (novice clinicians). During the simulation lab, participants were taught the five common techniques for releasing zipper-entrapped skin: 1) cutting the median bar, 2) using a screwdriver to separate faceplates, 3) manipulation of the zipper using mineral oil lubricant, 4) lateral compression of the zip fastener using pliers, and 5) removal of teeth of the zip mechanism using trauma scissors [2–6]. The order in which the techniques were performed by each volunteer was chosen by a random number generator. Subjects were timed by evaluators using a digital stopwatch from the time they began until the successful release of the entrapped skin, or for five minutes, whichever came first. Success was defined as the release of the entrapped skin while minimizing trauma to the skin. Failure to successfully release the skin within five minutes, or causing full thickness laceration to the skin, were logged as failures.

Overall, procedure times were 16.2 s faster for EM faculty compared to students ($P < 0.05$), however success rates did not vary significantly (Table 1). Manipulation of the zipper using mineral oil lubricant was the most successful technique in novice (94%) and experienced (100%) clinicians. Because of the small number of successful procedures, the individual times in student and EM physician groups were pooled. Gentle manipulation of the zipper using mineral oil lubricant was the quickest technique among novice or experienced clinicians (53.9 ± 25.6 s), followed by cutting the median bar (126.0 ± 110 s) and use of a screwdriver to widen the faceplates (131.6 ± 90.5 s). The procedure that was least traumatic to skin involved cutting the closed teeth of the zipper using trauma scissors, permitting the unzipping the zipper from the distal end. Gentle manipulation was the preferred technique overall, followed by cutting the closed teeth of the zipper using trauma scissors (Table 2).

This is the first randomized trial to compare the five types of methods for releasing zipper-entrapped skin. Based on our animal model, the preferred technique is simply gentle manipulation of the zipper using mineral oil lubricant. If this is not immediately effective, clinicians may wish to try cutting the closed teeth of the zipper using trauma scissors, and unzipping the zipper from the distal end.

The removal of zipper-entrapped skin is a useful skill for emergency department physicians. The utilization of various techniques based on the location and type of the entrapment, will likely lead to successful release while minimizing trauma. Methods such as cutting the median bar, using a screwdriver to separate the faceplates, and lateral compression using pliers require substantial strength and may be more difficult for some physicians. The fact that trauma scissors and lubricants may be readily available in most emergency departments, and the fact that our study showed them as the favored

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Table 1
Success rates and procedure times for novice and experienced clinicians.

Technique	Success rate		Procedure times Sec ± SD (N = 30)
	Novice (N = 18)	Experienced (N = 12)	
Cutting median bar	53%	57%	126.0 ± 110.0
Rotating screwdriver	35%	29%	131.6 ± 90.5
Mineral oil	94%	100%	53.9 ± 25.6
Lateral compression	24%	14%	137.1 ± 96.9
Cutting zipper, pulling teeth apart	77%	86%	136.7 ± 71.2

Table 2
Skin damage and preferred techniques of novice and experienced clinicians.

Technique	Skin damage		Preferred technique	
	Novice (N = 18)	Experienced (N = 12)	Novice (N = 18)	Experienced (N = 12)
Cutting median bar	77%	43%	6%	14%
Rotating screwdriver	35%	71%	6%	0%
Mineral oil	24%	14%	41%	57%
Lateral compression	71%	71%	0%	0%
Cutting zipper, pulling teeth apart	18%	0%	47%	29%

methods for both experienced and novice clinicians makes these methods preferable.

Of course, the manner in which the skin is entrapped may aid in determining which method to use. If the skin is blocking the median bar, attempts at cutting the bar may prove more injurious to the patient. Because mineral oil and other lubricants will lead to making the zipper and area of the wound slippery, physicians may choose to try an alternate method first even though in our study this was the most preferred method. The ideal method for removal will be both fast and not result in any further injury to the affected area.

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