

Spin Safe: Investigations and Management of Hand Injuries due to Washing Machine

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Abstract: *The aim is to analyze injuries sustained to the hand when using the washing machine. The mechanism and pattern of injuries were analyzed retrospectively. Fifty patients who presented with washing machine injuries between April 2022 and April 2023 were included in this study. Injuries occurred to the index finger in most of the cases and occurred while using the semi - automatic machine. All injuries occurred in a domestic setting. Crush injury with skin loss associated with proximal phalanx fracture and extensor tendon injury were seen. Management included fracture fixation and tendon repair. Primary suturing, flap coverage, or shortening and closure were performed as needed. Flexor tendon injury was observed in 4 cases for which primary repair was done. Four patients sustained blunt injuries with dislocation, which were managed with closed reduction. Complete amputation of the proximal phalanx occurred in one case, where replantation was attempted and successful. Washing machine injuries are rare but devastating injuries. Modern - day use of gadgets has seen an increase in such injuries. Due to the nature of the injury, it is difficult to give optimal results in most of the cases. Prevention of such injuries can be done by altering the make of the machine and educating the public to prevent such injuries.*

Keywords: Washing machine injury, hand injuries

1. Introduction

Washing machine injuries are becoming common in recent times among individuals when using the semi - automatic machine while using the dryer, and inserting the hand into the machine before the spin completely stops. Injuries more commonly occurred to the index finger and among young and inexperienced. Many studies in the literature have reported injuries to the upper limb while using the wringer washing machine, the design which is now no longer used.^{1, 2} The modern machines usually have rotations per minute between 1000 – 1600 rpm, making the injuries quite devastating.

This study focuses on injuries due to the modern design of washing machines

Aims and Objectives:

To Analyze the pattern of injuries to the hand sustained due to washing machine - related injuries.

2. Review of Literature

Very few studies exist related to washing machine injuries.

MacCollum published the first study of injuries due to washing machines in 1938 where he described avulsion machines to the wringer arm caused by wringer washing machines available at that time.^{4, 5}

A Study was done in 1964 by Edward Press et al. which studied injuries caused due to wringer machine injuries that were used before automatic and semi - automatic machines became popular. In this study, the make of the machine, and injuries were reviewed in a retrospective study. This machine is no longer manufactured now. There were several studies done during the same period related to wringer machines with

smaller sample sizes but wringer machines have a different make than washing machines.¹

Another study done by BL Warner et al. in 2005 studied injuries occurring in children retrospectively where he reviewed 492 cases. In this study, he studied the patterns of the injuries occurring and body parts injured among children. He concluded that despite safety features incorporated in automatic washing machines injuries are common and that parental supervision of children is very important. However, only pediatric injuries were reviewed in this study.²

A study done in Malaysia reported four cases of injuries in the pediatric age group, involving top loader washing machines and injuries all occurred during the spinning phase. Injuries all occurred to the upper limb.³

Another study was published in Oman which also reported cases with injury to the hand due to washing machines.⁶

3. Materials and Methods

A retrospective study was conducted to analyze patient records of individuals who presented to our hospital with washing machine - related hand injuries between April 2022 and April 2023. Data collected included patient demographics (age, sex, occupation), injury mechanism, and treatment outcomes.

4. Results

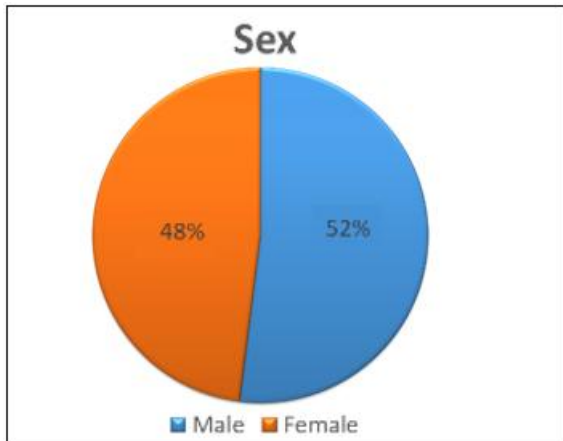
During the study period about 50 patients presented to the emergency department with injuries to the hand due to the washing machine.

Out of the 50 cases, 26 were male and 24 were female.

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The injury occurred while using a semi - automatic machine in all the patients.

The injury occurred when prematurely opening the machine before the spin stopped, and trying to adjust the clothes using a single finger. Because of the quick withdrawal of the hand in all the cases, only a single finger was injured in most cases.

36 patients had injury to their right hand and 14 to their left.40 patients in all had injuries in their dominant hand.

30 of the patients had fracture dislocations at the level of proximal interphalangeal joints, with near circumferential laceration, and injury to one or both neurovascular pedicle. It was associated with injury to flexor tendons in 10 cases.

10 patients had fracture dislocations at the level of the metacarpophalangeal joint with injury to one or more neurovascular pedicles associated with injury to the extensor and flexor tendons.

4 patients had fracture dislocation at the level of distal interphalangeal joint and 6 patients had simple lacerations.

Management

24 patients underwent shortening and closure.

14 patients underwent primary skin suturing.

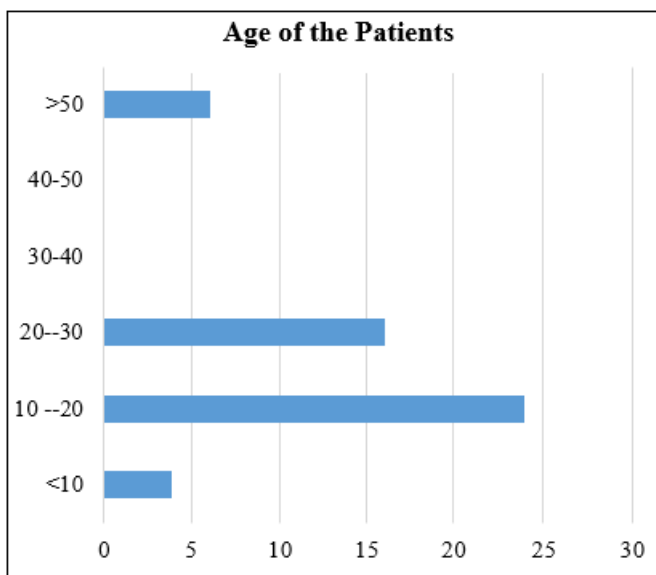
2 patients underwent cross - finger flap

4 patients underwent primary repair of the flexor tendons with k - wire fixation.

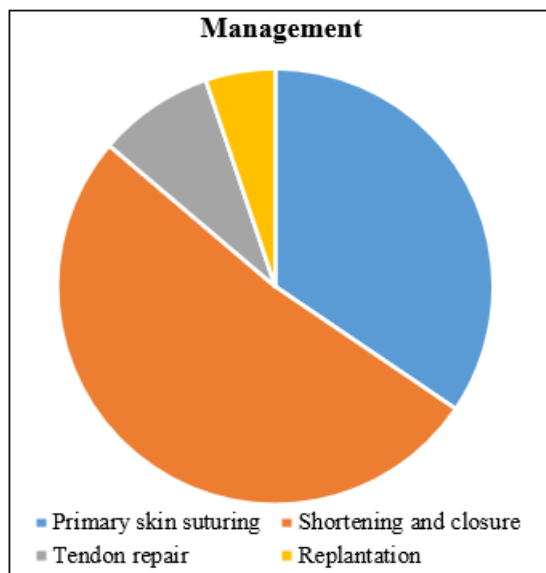
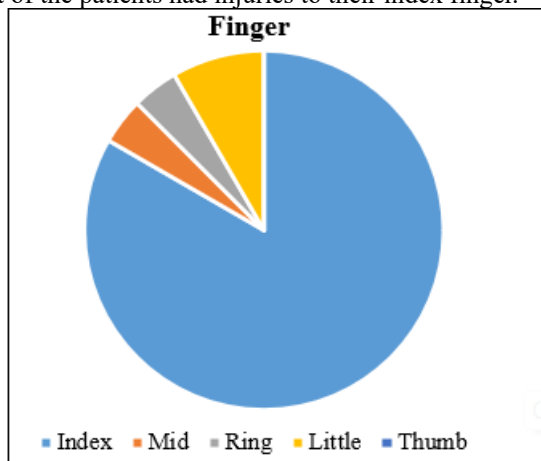
6 patients underwent revascularisation/ replantation out of which was successful in one patient.

Patients in whom the finger survived, many present with the stiffness of the joints and require secondary procedures for the same

Most of the patients were between the age group of 10 - 20.



Most of the patients had injuries to their index finger.





Shortening and closure are done at the level of the proximal phalanx shaft



Cross - finger flap done



K wire fixation, tendon repair, digital nerve repair, and revascularisation were done.



Post - operative proximal interphalangeal stiffness present

5. Discussion

Washing machine injuries have been reported in the literature since the time the earliest washing machine was invented. Several papers have reported injuries due to wringer washing machine injuries whose production has stopped in the United States since 1983⁷. However, injuries are now being reported due to the automatic washing machines which have now largely replaced the earlier models. While safety features have been added to the automatic washing machines in several of the newer models machines fill with water while the lid is open and spinning and agitation continues for a few seconds after the lid is opened. Most of the injuries occur when the patient attempts to remove clothes from the machine and the hand or finger gets entangled in the clothes. This occurred as

the machine continued to spin even when the door was opened as there was a time delay.⁶ While the injury usually occurred in children it was also seen among adults who are inexperienced in handling such machines in our study. It usually leads to severe injuries as the modern automatic machine has a high rpm of 1000 - 1600.

In our study, we found that injuries mostly occurred to the fingers as avulsion injuries, with proximal interphalangeal joint dislocation or fracture to the proximal phalanx. The injury also occurred to the neurovascular pedicles, flexor, and extensor tendons. Skin injuries ranged from simple bruises to complete degloving of the skin requiring flap cover. In most of the cases with non - viable distal part, the injury to the neurovascular pedicle was severe and showed features of long segment intimal injury or thrombosis and avulsed up to the terminal phalanx making replantation/ revascularization difficult. It was successful only in one case in our study. In some cases, the injury was severe enough to proceed for shortening and closure. Long - term follow - up of the cases showed stiffness of the proximal interphalangeal joint as the main complication and patient hand to under arthrolysis in 2 cases for the same.

Most of the injuries that occurred in this study could have been prevented with safety features such as keeping the door of the machine shut and locked during the operation of the machine and stopping the machine from spinning when the door is opened. The door must remain shut till the machine stops spinning.

6. Conclusion

Washing Machine injuries are rare and devastating injuries. Modern use of gadgets has seen an increase in such injuries. Due to the nature of the injuries, it is difficult to give optimal results. Prevention of such injuries can be done by altering the make of the machine and educating the public.

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