

Washing Machine Injuries of the Upper Extremity

Case reports with a review of the literature

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اصابات الطرف العلوي الناجمة عن مكائن الغسيل - تقرير حالات مع مراجعة أدبيات

اس اس سوريث

الملخص: تعتبر مكائن الغسيل جزءا مهما من اثاث البيت . وهناك تقارير عديدة لأصابات الطرف العلوي نظرا لعدم أخذ احتياطات السلامة اللازمة أثناء تشغيلها. معظم الاصابات تحصل عند محاولة رفع الملابس منها والتي تتسبب في حصر اليد في الماكنة . يمكن أن تكون الاصابة خفيفة وتشمل الانسجة الرخوة فقط . بينما تكون في حالات أخرى شديدة . هناك احتمال كبير لاصابة الأعصاب والأوعية الدموية والتي ينتج عنها متلازمة الحيز . نقدم هنا وصفا لثلاث حالات لاصابات ماكنات الغسيل من أجل التوعية لتفادي هذه الاصابات غير النادرة . تم التطرق أيضا الى الأدبيات ذات العلاقة .

مفتاح الكلمات: اصابة، ذراع، كسر، اصابات اليد، مكائن الغسيل، تقرير حالة، عمان.

ABSTRACT Washing machines are part of every household and there are various reports of upper extremity injuries due to inadequate safety precautions while operating the machine. Most of the injuries occur when an attempt is made to remove the clothes from the machine and the hand gets caught in the spinning machine. The presentation can vary from minor soft tissue injuries to a mangled upper extremity. The chance of neurovascular damage resulting in compartment syndrome is very high. The author reports three cases of washing machine injuries to draw attention to this not so uncommon injury. The relevant literature is also considered.

Keywords: Injury, arm; Fracture; Child injuries; Washing machines; Case Report; Oman.

THERE HAVE BEEN VARIOUS REPORTS OF washing machine related injuries ever since MacCollum first published on 'wringer arm' injuries in 1938.^{1,2} He described the 'wringer arm' as an avulsion injury to the arm caused by the wringer washing machines that were popular at that time.^{1,2} Most of the washing machine related injuries were not clinically significant as most of the sufferers required only out-patient management, but a few were serious requiring inpatient management for many days. As the design of washing machine has changed in the recent times, most of the reports are of injuries caused by wringer washing machines. In support of this view, according to the United States Consumer Product Safety Commission,³

there were 19,109 injuries from 1993 till year 2000 due to washing machines. Most of the reported cases of washing machine injuries come from North America and were often due to a design that is now defunct. The present study documents three cases of injuries to the upper extremities caused by washing machines of more modern design. These were caused when the children were trying to unload the contents while the machine was still spinning, with or without their parents' permission.

CASE 1

A 10 year old girl was admitted to Ibri Hospital, Oman, in September 2004 following injury to her right fore-



Figure 1: (Case 1) Fracture of the humerus

arm when she attempted to remove the clothes from a washing machine while the machine was spinning. She sustained a closed fracture of the radial and ulnar bones of the forearm. There was gross oedema of the forearm and she was hospitalized for observation. The position was not acceptable after closed manipulation and hence she was taken for closed intramedullary fixation.

The fracture united in six weeks time and she regained full range of movements and full recovery of function [Figs. 1 & 2].

CASE 2

A five year old boy presented to the Orthopaedic Department of Ibri Hospital in March 2007 with swelling of the right arm after it had been trapped in a spinning washing machine. He was diagnosed to have a closed comminuted fracture of the shaft of the right humerus which was treated conservatively. There was no neurovascular compromise in the extremity. The arm was immobilized in a back slab. The boy was admitted for three days to observe for compartment syndrome. There was uneventful healing of the fracture with normal elbow and hand function [Figs. 3 & 4].

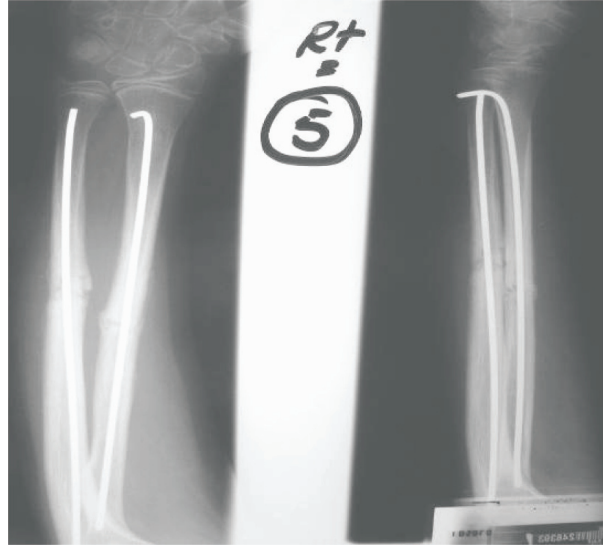


Figure 2: (Case 1) Post operative X-ray showing intramedullary K wires in situ

CASE 3

A 14 year old boy presented in the Accident and Emergency Department of Ibri Hospital in May 2007 with pain of his right middle finger. The injury was sustained while attempting to remove the clothes from the washing machine while the machine was still spinning. He had sustained a closed undisplaced fracture of the proximal phalanx of his middle finger, which was managed conservatively by strapping it to the neighbouring finger. At follow up he had full range of movements without residual deformity [Fig. 5].

DISCUSSION

Washing machines have been part of the household ever since the earliest washing machine, 'the scrub board', was invented in 1797. Injuries occur when attempts are made to remove clothes from the machine and the hand gets entangled in the spinning laundry, leading to soft tissue injuries and fractures. In the previously reported studies, this occurs most in children. This present study is consonant with this view. It has been speculated that such vulnerability is probably due to parental negligence.



Figure 3: (Case 2) Post operative X-ray showing fractured humerus

In most machines there is a safety mechanism to stop the drum from spinning once the loading door is opened. There should be two safety features in the machine: one to keep the door shut and locked during the operation and the other to stop the machine from spinning when the door is opened. But usually there is a time delay and the machine continues to spin even when the door is open. To prevent injury, the washing machine lid, which blocks access to the spinning drum, should be locked in the closed position during the wash and spin cycles; however, most machines continue to spin even when the lid is open causing injury to people trying to remove clothes. A time-delay feature in the lid lock using a thermal element⁴ is a recently patented improved safety feature. Previous wringer machines had 'instinctive' release mechanisms which stopped the machine to prevent hand injuries. Usually, when the arm is trapped, an attempt is made to pull out the arm instead of activating the safety release.

The severity of the injury, which occurs due to mechanical and thermal damage, is not obvious initially, but only a few hours later. These children need to be hospitalised and observed for soft tissue injuries and compartment syndromes.^{1,5} The vascular status of the

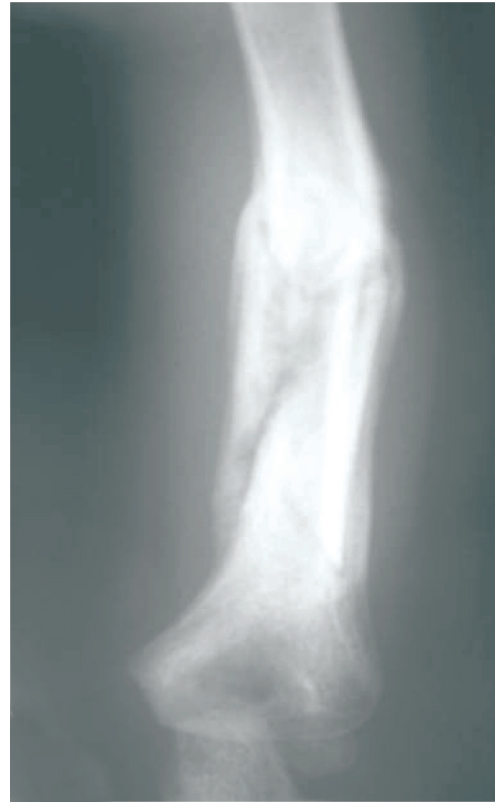


Figure 4: (Case 2) X-ray showing united fracture

extremity has to be periodically assessed and fasciotomy done if required. In rare cases, a child can present with degloving or mangled extremity. Many authors recommend hospitalization for 48 hours since the magnitude of the soft tissue injury is not obvious at presentation, with initial assessment of neurovascular integrity and radiological survey to rule out skeletal injuries.^{1,5} Simple elevation compared to compression dressings is found to be effective in preventing vascular compromise. In an animal study by Adams and Fowler,⁶ they found maximum damage to tissues at 24 hours, although it began at three to five hours. In their study, striated muscle was found to have the maximum injury. Injuries that can occur include: friction injuries; compression causing contusion of skin and muscles; fractures and haematomas, and degloving injuries.⁵ Deshmukh in 2005,⁷ reported a case of irreducible volar subluxation of the proximal interphalangeal joint of the index finger in a woman, sustained when she attempted removal of clothes while the washing machine was slowing down.

Most of the injuries caused now are due to automatic machines as the United States stopped production of wringer machines in 1983.³ The injuries in the present series were due to top loaded machines which

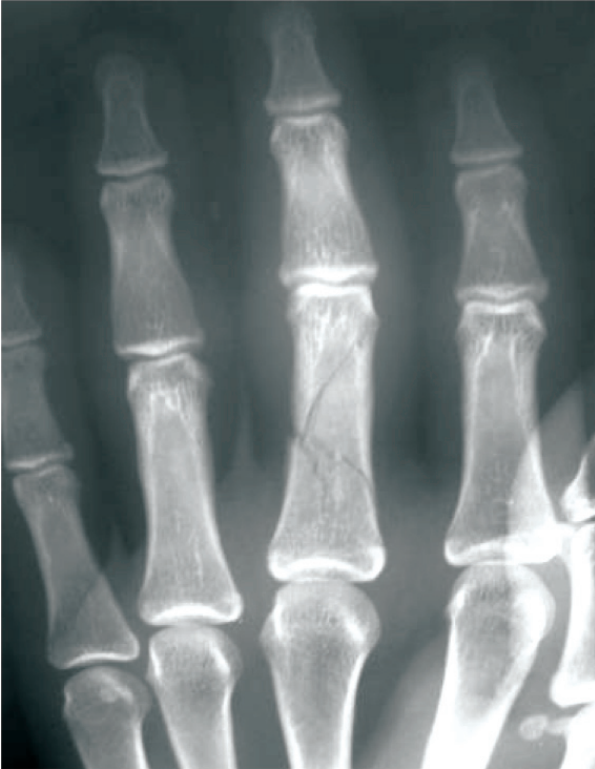


Figure 5: (Case 3) Fracture of proximal phalanx

are popular in Oman. The injuries occurred during the spin cycle when patients tried to remove clothes while the machine was still running. Front loading machines use 40-60% less water and 30-50 % less energy than top-loaders, but are expensive. Child injury could be due to specific preventable factors and inadequate child supervision. There should be attentive supervision around known hazards that are frequent sites of injury.^{5, 8-10}

CONCLUSION

Given the risk, there are various measures that would prevent washing machine injuries to children. Parents should be counselled regarding the proper location of the machine; the need to keep it unplugged to prevent injury and better child supervision. Injuries

could also be prevented by improved safety features such as a triggering system, sensitive enough to detect even a small opening of the lid. A further improvement would be a list of safety features and measures clearly displayed in Arabic on a visible area of the machine.

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Prenatal MRI Image of a Fetus with Semilobar Holoprosencephaly

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صور الرنين المغناطيسي لاندماج مُقَدَّم الدماغ نصف الفصي عند جنين
أثناء الحمل

سكخال سوهني، لوفينا ماجادو، راجيف جين

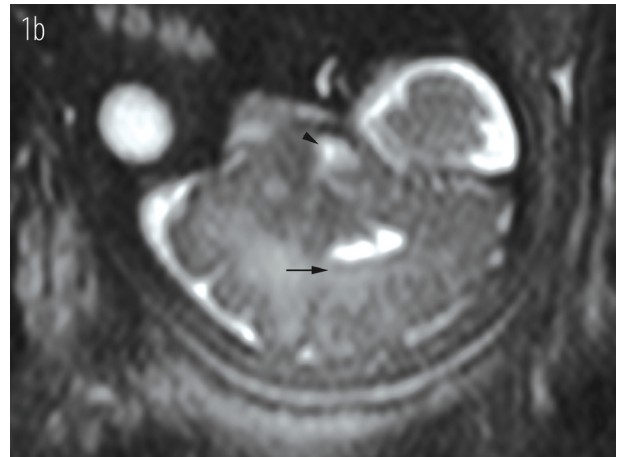
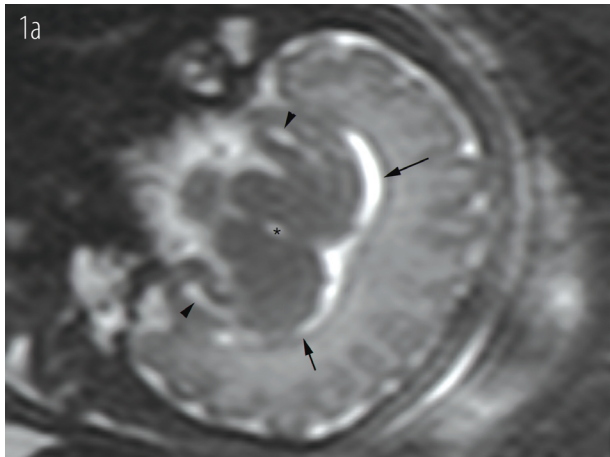


Figure 1a: Heavily T2W (HASTE) images in the fetal cranial coronal and sagittal planes.

1a. Coronal plane at the level of the thalami: Central horseshoe-shaped single monoventricle (arrows) with absent frontal horns, absent anterior midline falx and inter-hemispheric fissure, absent septum pellucidum with failure of cleavage of frontal and parietal lobes anteriorly; rudimentary temporal horns (arrowheads); thalami are partially separated with rudimentary third ventricle (marked *)

1b. Sagittal plane: Corpus callosum (arrow) is absent in the uncleaved frontal region. Temporal horn (arrowhead) is identified. Note the proptosis.

A 30 YEAR OLD MULTIGRAVIDA PRESENTED TO the Gynecology Department of Sultan Qaboos University Hospital, Oman, at 32

weeks pregnancy. Both parents were healthy and the marriage was nonconsanguineous. There was no family history of birth defects. An antenatal ultrasound study,

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at 32 weeks pregnancy, raised the suspicion of a brain malformation, but it was suboptimal due to maternal habitus. An MRI of the fetus, at 34 weeks pregnancy, demonstrated semilobar holoprosencephaly. The baby was born at term with microcephaly, proptosis, and dysmorphic features. The diagnosis was confirmed by a postnatal computed tomography (CT) scan.

COMMENT

Holoprosencephaly (HP) is a congenital anomaly characterized by lack of cleavage of the prosencephalon. Although relatively rare, it is the most common anomaly that involves both the brain and the face. Prenatal diagnosis of this anomaly using ultrasonography, particularly of the less severe forms, is difficult. Magnetic resonance imaging (MRI) has recently become an important complement to ultrasound in prenatal diagnosis of central nervous system anomalies.¹

HP is the most common anomaly affecting the ventral forebrain, occurring in 1/250 embryos and 1/8300-16,000 live births.^{2,3}

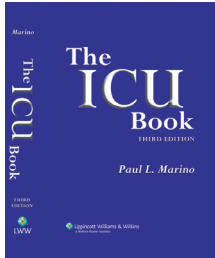
HP refers to a spectrum of disorders resulting from absent or incomplete cleavage of the forebrain (prosencephalon) during early embryologic development (days). HP is usually categorized as alobar, semilobar or lobar depending on the degree of forebrain cleavage.⁴ Alobar is the most severe form with complete failure of cleavage of the two cerebral hemispheres. It results in a monoventricular cavity; fusion of the thalami; absence of the corpus callosum; falx cerebri; optic tracts and olfactory bulbs. Semilobar HP shares many of these same features, but demonstrates partial segmentation of the ventricles and incomplete fusion of thalami. Septo-optic dysplasia, the least severe type of HP, results in separation of the ventricles and thalami and absence of the septum pellucidum.⁵ The advent of high-resolution

real-time ultrasound imaging equipment has allowed detection of the group of holoprosencephalies, but lack of familiarity with uncommon forms may lead to diagnostic confusion. Coronal sonograms of the fetal head, in addition to standard axial projections, should be performed whenever an intracranial cystic abnormality is identified.⁶ Several characteristic midline facial malformations are associated with holoprosencephaly, including hypotelorism. The degree of facial dysmorphism tends to parallel the severity of holoprosencephaly and, therefore, sonographic evaluation of facial morphology may aid in prenatal diagnosis.⁷ Recently, diffusion tensor imaging and fiber tracking have revealed white matter structures not apparent on routine MRI imaging sequences, which are in agreement with pathologic descriptions of the holoprosencephalic brain.⁸

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كتاب وحدة العناية المركزة

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AUTHOR INFORMATION

Dr. Marino is Chairman of the Department of Medicine and Critical Care Director of Saint Vincent's Midtown Hospital in New York City. He is also clinical Associate Professor of New York Medical College in Valhalla. The third edition of the ICU Book welcomes Dr. Kenneth Sutin, Department of Anaesthesiology and Surgery at Bellevue Hospital Centre and Associate Professor of Anaesthesiology and Surgery at University School of Medicine in New York City, who adds his expertise to the final 13 chapters of the book.

The book, running to more than 1000 pages, has 53 chapters in 16 sections covering: Basic Science Review; Preventive Practices in the Critically ill; Vascular Access; Haemodynamic Monitoring; Disorders of Circulatory flow; Critical Care Cardiology; Acute Respiratory Failure; Mechanical Ventilation; Acid Base Disorders; Renal and Electrolyte Disorders; Transfusion Practices in Critical Care; Disorders of Body Temperature; Inflammation and Infection in the ICU; Nutrition and Metabolism; Critical Care Neurology; Toxic Ingestions. The appendices include Units and Conversions, Selected Reference Ranges and Clinical Scoring Systems.

The ICU book is excellent reference material for all physicians, not just intensivists. It is a valuable resource for any health professional, from medical student to experienced physicians and a must for anyone entering critical care medicine, anaesthesia, accident and emer-

gency, medicine or surgery and even for critical care nurses as well. It provides a superior review for residents preparing for board examinations and the essential background for ICU rotations.

The ICU Book is a very complete overview of fundamentals and the physiology behind patient care presented in a succinct manner. The latest complex physiological findings are broken down into simple concepts, accompanied by important straight to the point facts and easy to understand illustrations. The short paragraphs prevent you from getting lost in the subject. The text is brilliantly written and easy to read and learn from, with simple English for those who speak English as a foreign language; every nurse can follow it as well. The emphasis on managing critically ill patients in a simple manner with the support of evidence-based medical literature is also useful for patient care outside the ICU.

The ICU book covers a broad spectrum of critical care topics. The third edition has undergone extensive revision in content and most of the chapters have been rewritten. Newly renamed and refocused chapters on hot topics are: acute coronary syndromes, severe airflow obstruction and anaemia and red blood cell transfusion in the ICU. Additional new chapters include hyperthermia and hypothermia syndromes and infection control in the ICU. Close to 400 new tables and figures including radiographs, CT scans, electrocardiograms and microscopic images have been added to provide visual references, which aid in comprehension of the text.

The editor is to be congratulated on enforcing the original aim to produce a book that is well organised, with topics that are easy to find for quick reference and exam review. The majority of chapters make good use of tables and figures. Critical points and controversies are bold faced throughout the text. Most chapters include a so-called Final Word with an important take-home message. Each chapter has an extensive and generally up-to-date reference list, subdivided into specific topics as an easy link to further readings, and with emphasis on evidence-based clinical practice guidelines.

In general, the ICU book has good quality paper and binding. The large print and solid text unbroken by illustrations and brilliant simple figures with great message make the book pleasant to read. A future edition should not be any larger so that the book retains its handy portability. However, I found there were too few details about Non-Invasive-Ventilation. Also the Ramsay Score, which assesses the level of ICU sedation, although described in the text, should be included in the appendix of clinical scoring systems.

As an owner of the previous edition and the German translation, I am even more impressed with this third edition. The ICU Book has been always a great guide for my everyday practice as anaesthetist and I highly recommend this excellent reference book, available at a reasonable price that will disappoint nobody.

REVIEWER

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