Paediatric injuries due to home treadmill use: an emerging problem

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ABSTRACT

INTRODUCTION The use of home exercise equipment is increasing and treadmills are becoming more popular. This has brought with it an emerging but preventable problem. We present our experience, highlight the importance and promote public awareness of this type of injury. To our knowledge this has not been reported previously in the UK.

METHODS A retrospective review was conducted of the medical records at two regional burn units of children who sustained treadmill-related injuries between July 2003 and July 2009. Data on patient demographics, mechanism of injury, management, surgical intervention and outcome were recorded.

RESULTS Twenty-nine children (15 boys, 14 girls) sustained treadmill-related injuries. The mean age was 3.8 years (range: 1–13 years). All injuries occurred at home and the majority of children trapped their hand under the running belt when an adult was using the machine. Most of the injuries were to the upper limb (97%) with less than 1% of the total body surface area burnt. More than two-thirds of patients had deep burns and 17 (58%) required surgical intervention. Five patients developed hypertrophic scars. All patients achieved a good functional outcome.

CONCLUSIONS Treadmills can pose a significant danger to children. These injuries are preventable. Regulatory authorities, manufacturers and parents should take steps to prevent this emerging health problem.

KEYWORDS

Treadmill-related injuries – Burns – Paediatric – Prevention

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Advances in medical knowledge and awareness of the benefits of exercise have changed our behaviour in the last few decades. In an era of busy modern lifestyles and expensive gym membership, home exercise equipment, especially the treadmill, has become increasingly popular. This has brought with it an increasing number of injuries. Children are the most vulnerable group suffering from treadmill-related injuries.

Treadmills can cause friction burns, abrasions, blunt trauma and even amputations. These injuries are potentially serious and often require surgical intervention.¹ The aim of this study was to report our experience, highlight the importance of this emerging problem (not documented previously in the UK), and promote public awareness and prevention.

Methods

The medical records of children who were managed for treadmill-related injuries at two regional burn units during

a six-year period (July 2003 to July 2009) were reviewed. Data on patient demographics, date and mechanism of injury, assessment and management, surgical intervention and outcome were recorded.

Results

Twenty-nine children sustaining treadmill-related injuries were managed during the six-year period. There were 15 boys and 14 girls between 1 and 13 years of age, with a mean age of 3.8 years.

Fourteen children were referred from local accident and emergency (A&E) departments, eight were referred from other burns units for further care and seven were referred from peripheral hospitals 2–5 days after the injury. Children who were referred from the local A&E department were seen on the same day.

All injuries occurred at home. Sixteen children (55%) trapped their hands or forearm under the conveyer belt when an adult was using the machine. Seven children (24%)

touched the recently used machine while playing under the supervision of an adult caretaker; two patients (7%) sustained injury while playing unsupervised, one child touched the recently used machine when an adult left the child alone in the room and in another case, a 13 year-old tried to use the machine. In four cases (14%) the mechanism of injury was not documented (Fig 1). The vast majority of injuries affected the upper limb (n=28, 97%) (Fig 2), while one toddler (3%) sustained a burn to the nape of the neck.

The total body surface area burnt varied from ½% to 1%. Fourteen patients (48%) sustained full thickness, 6 (21%) deep dermal, 5 (17%) superficial partial-thickness and 4 (14%) mixed depth burns (Figs 3 and 4). Seventeen patients (58%) required burn excision. Ten of these had split-thickness and seven full-thickness skin grafts. The remainder were managed conservatively. All patients required wound care and occupational therapy. Five patients developed hypertrophic scars. To date no patients have required secondary surgery for scar contracture release. The incidence of treadmill-related injuries increased each year (Fig 5).

Discussion

All models of treadmills have a rotating conveyor belt. The motorised treadmill can move at a speed of greater than 8 feet per second. This can generate a significant amount of friction if skin comes in contact with the belt.² Most children sustain injury after trapping their hand in the treadmill. Injuries vary from superficial burns to complete loss of

Figure 3 Six-year-old child with friction burn to right thumb and wrist (volar surface)

Figure 4 Three-year-old child with friction burn to volar surface of right index, middle and ring fingers

full-thickness skin and even injury to deeper structures depending on the amount of friction sustained by the trapped hand.⁵ The sequelae can range from pain to scar contracture and loss of range of motion, with subsequent limitation of normal hand function.³⁻⁵ Early referral to a specialist centre and close follow-up including wound management, occupational therapy, splinting and use of pressure garments can prevent long-term functional deficits.⁵⁻⁵

The true incidence and trend of treadmill-related injuries is difficult to determine.⁶ Abbas *et al* reviewed data from the US Consumer Product Safety Commission (CPSC) on exercise equipment accidents in the home.⁷ There were 1,009 injuries in children aged 5 years or under from 1996 to 2000. More than half of these (56%) were on the upper extremities and 90% of those were on the hands and fingers.⁷ In our study, 97% of children sustained injury to the upper extremity and 90% were on the hand and wrist.

Hypertrophic scarring and contractures are usually evident within a relatively short time period after injury and early intervention by hand therapists can ameliorate these potential consequences.⁶ Previous studies have raised the issue of delayed referral and initiation of wound care.^{2,3,6}

Friedrich *et al* noted 4 of 13 patients were referred months or years after the initial injury and three of those required surgery for release of flexion contractures.⁶ Marshall and Lourie noted 8 of 14 patients and Maguiña *et al* found 4 of 10 patients were referred quite late after the initial injury and all delayed referrals developed contractures. However, they did not mention that earlier referral and aggressive hand therapy would have prevented the scar contractures.^{2,5,6}

All our patients received occupational therapy early in their management. Five developed hypertrophic scarring but none required surgery for secondary contracture release. Therefore, one can possibly conclude that earlier referral to a specialist centre for wound management, splinting and aggressive hand therapy may prevent the sequelae.

The CPSC has issued a warning to 'keep children away from exercise equipment'.⁸ The majority of children in our study sustained injuries when a toddler caught his or her hand or forearm while an adult was using the machine. This scenario is common with other reported treadmill-related injuries.^{1-5,5,7} We also managed a 13-year-old child who sustained injury when trying to use the machine unsupervised. A treadmill is not a toy for children and they should not be left alone and allowed to use or even touch the machine.⁵ It is the parents' responsibility to supervise and prevent children from accessing a treadmill.

Several studies have recommended design modifications and warnings for the public to reduce this preventable injury.^{1,5,9} The design modifications include childproof switches or lockout codes, warning labels on the console of the machine, installing guards to shield the belt and sensor-activated mechanisms to stop the belt on soft tissue contact. Wong *et al* listed public recommendations such as locking the room during treadmill use, positioning the treadmill to face the open door, using of a back wall mirror, avoiding the use of headsets while on the treadmill and avoiding treadmill use in the presence of children.¹ Despite these recommendations, children are still sustaining injuries as detailed above.

Conclusions

Home treadmill use is on the rise and more children are at risk of injury. Previous studies have highlighted this and recommended additional safety features but it is still a significant problem. Accidents will continue to happen as long as children have access to the equipment. We believe parents, manufacturers and regulatory authorities must take important steps to prevent this emerging health problem. We also believe that early referral to a specialist burns centre results in a better outcome and prevents devastating complications such as hypertrophic scarring and contracture.

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