Monkeybar Injuries: Complications of Play

Mark L. Waltzman, MD; Michael Shannon, MD, MPH; Anne P. Bowen, MS, RN; and Mary Christine Bailey, MD

ABSTRACT. Background. Playground equipment resulted in >200,000 injuries from 1990 to 1994, according to the Consumer Product Safety Commission; 88% were attributable to climbers (monkeybars/jungle gyms [MB/JGs]), swings, and slides. Equipment-specific injury requiring emergency department (ED) evaluation has not been reported previously.

Objective. To describe the spectrum of significant MB/JG-related injuries.

Methods. A 2-year retrospective chart review was performed using the computerized charting system at a large urban Children's Hospital/Regional Pediatric Trauma Center with 50,000 ED visits per year. A telephone survey also was conducted after the chart review to obtain additional information concerning the injury location, the surface type below the equipment, and the presence of adult supervision.

Results. A total of 204 patients were identified. Mean age was 6.2 years (range, 20 months to 12 years); 114 (56%) were male. A seasonal variation was noted with June to August accounting for 43% of visits. Injuries included fractures in 124 (61%), contusions in 20 (10%), neck and back strains in 17 (8%), lacerations in 16 (8%), closed head injuries in 10 (5%), abdominal trauma in 5 (3%), genitourinary injuries in 5 (3%), and miscellaneous injuries in the remainder. Among fractures, 90% were fractures of the upper extremity; 48 (40%) were supracondylar fractures. One child sustained a C7 compression fracture. Abdominal injuries included 1 child who sustained a splenic laceration. All genitourinary injuries (2 vaginal hematomas, 1 vaginal contusion, 1 penile laceration, and 1 urethral injury) were from straddle-type injuries. Fifty-one (25%) patients were admitted to the hospital. Of these, 47 (92%) required an operative procedure (orthopedic reduction or vaginal examination under anesthesia).

Analysis of the telephone data revealed that the surface did not influence the injury type. Of the 79 fractures, 30 occurred on “soft surfaces.” Injury type was associated significantly with chronologic age. Younger children (1 to 4 years of age) sustained more long-bone fractures than did older children. The presence of adult (at least 18 years of age) supervision, did not influence the occurrence of fractures.

Conclusions. These data suggest that 1) a significant proportion (25%) of MB/JG-related injuries that are evaluated in the ED require hospitalization; 2) most of the injuries resulting in admission will require operative intervention (92%); 3) the surface below the equipment has no influence on the type or severity of the injury; 4) younger children are more likely to sustain long-bone fractures than are older children; and 5) adult supervision does not influence the injury pattern. These data identify the need for additional investigation of means of making MB/JGs safer for child use.

C hildhood play takes on many forms, from organized interactions to independent activities. Unfortunately all types of play can place children at risk for injury. In the United States, >15 million children are seen in emergency departments (EDs), and ~600,000 children are hospitalized each year as a result of injuries.1 Many of these injuries are equipment-related; the Consumer Product Safety Commission estimates that 200,000 injuries occurred from playground equipment. Among these injuries 88% involved the use of climbers (monkeybars/jungle gyms [MB/JGs]), swings, and slides.

Several studies have reported the spectrum of injuries sustained during activities on playgrounds. These studies have focused on general playground equipment, the types of surfaces below the equipment, and the injuries sustained.2-4 To date, however, there have been no systematic studies examining the specific injury patterns associated with individual pieces of equipment. The goal of this study was to gain an understanding of the specific injuries that occur as a result of play on MB/JGs.

METHODS

The computerized database of a large urban children’s hospital ED/pediatric trauma center was searched using the text words “monkeybar” and “jungle gym.” The ED has ~50,000 visits annually and 12,000 injury visits per year. The ED database was searched for the 2-year period ending October 31, 1997. Demographic, epidemiologic, and injury data were abstracted from each visit meeting the inclusion criteria.

A telephone survey was conducted after the chart review to obtain additional information about the injury. An attempt to contact all parents/guardians was made. The interval for telephone contact ranged from 1 week to 2 years after the initial injury. Parents or guardians were asked to recall three details: 1) the injury location (eg, school playground, public playground, day care, or home), 2) the type of surface below the equipment (eg, sand, wood chips, grass, or concrete), and 3) the presence of adult supervision. Data analysis consisted of simple descriptives and measures of central tendency. Intergroup analyses were performed using the x² statistic and logistic regression. P ≤ .05 was
considered significant. The study was approved by the Institutional Review Board.

RESULTS

There were 204 patients identified during the study period. Median age was 6 years, with an age range of 20 months to 12 years (Fig 1). There was a bimodal age distribution, with peaks at 4 and 6 years. Males accounted for 56%. Seasonal variability was noted, with the majority of injuries occurring between June and August.

Table 1 summarizes the injury pattern observed. The most common injuries sustained were long-bone fractures that occurred in 59% of children (Fig 2). These fractures were supracondylar in 48 (40%), radius/ulnar in 40 (33%), isolated radius in 17 (14%), humerus in 7 (6%), tibia in 4 (3.5%), fibular in 3 (2.5%), and femur in 2 (1%). Nonlong-bone fractures included 1 metatarsal, 1 clavicular, and 1 C7 compression fracture.

There were 10 (5%) closed head injuries; of these, 6 were complicated by the appearance of neurologic disturbances (n = 5), and the occurrence in 1 child with a preexisting clotting factor deficiency. Head computed tomography evaluation was performed on these 6 patients; all were negative for fracture or intracranial injury.

Blunt abdominal trauma resulted in one renal contusion and one splenic laceration. Genitourinary trauma resulting from straddle injury occurred in 5 children. These injuries included three vaginal contusions (1 requiring an examination under general anesthesia), 1 penile laceration, and 1 urethral injury.

Fifty-three injuries (26%) were classified as minor, consisting of lacerations, sprains, and contusions. Other miscellaneous injuries included 1 dental fracture, 1 ocular foreign body, 1 digital foreign body, 1 corneal abrasion, 1 case of toxic synovitis, and 2 radial head subluxations.

Fifty-two patients (25%) were admitted to the hospital. Fifty-three injuries (26%) were classified as minor, consisting of lacerations, sprains, and contusions. Other miscellaneous injuries included 1 dental fracture, 1 ocular foreign body, 1 digital foreign body, 1 corneal abrasion, 1 case of toxic synovitis, and 2 radial head subluxations.

Fifty-two patients (25%) were admitted to the hospital as a result of their injuries (Fig 3). Of these, 47 (90%) were taken to the operating room. Of the operative procedures, 98% were orthopedic interventions. These included open reduction and internal fixation in 5/46 (11%), closed reduction and percutaneous pinning in 38 (83%), and closed reduction in 3 (6%). Twenty-seven children (57%) were taken directly to the operating room from the ED; the remain-

ing 26 patients underwent surgery the next day. One child was discharged from the ED, returning the next day for orthopedic intervention.

Five patients were admitted to the hospital but did not require operative intervention; 1 patient was admitted to the intensive care unit (ICU) for management of a splenic laceration; the remaining 4 were admitted for non-ICU observation (1 C7 compression, 1 closed head injury, 1 renal contusion, and 1 straddle injury).

Parents/guardians of 132/204 patients (65%) were reached and completed the telephone questionnaire. In an analysis of the telephone data, there was no significant association between the surface below the equipment and the type of injury. Of the 79 fractures, 30 occurred on soft surfaces (woodchips or mats) (P = .12). Using logistic regression for analysis between the individual surfaces (sand, dirt, woodchips, and grass) and the occurrence of fractures, there was no statistical difference noted in either the occurrence of fractures or the protective benefit of individual surfaces. In specifically examining the association between supracondylar fracture, having a soft surface did not result in a significantly lower rate (P = .26). However, in comparing the age of the child and the type of injury, children 1 to 4 years of age sustained more long-bone fractures than did older children (P < .05). The presence of an adult supervisor also was not significantly associated with a lower rate of fracture (P = .87).

DISCUSSION

Injuries sustained during play are common and variable. Epidemiologic data indicate that playground-related injuries most often are equipment-related. Bond and Peck reported in 1993 that 34% of playground injuries were related to climbers, 30% from slides, and 22% from swings.2 Mott and associates found that among 178 children, 125 sustained injuries related to the surface beneath the equipment.3 These authors, however, did not delineate the specific injury patterns seen with equipment type. In 1997, Lillis and Jaffe reported their observations of the general injuries sustained by children from climbing apparatus. They found that climbing apparatus accounted for 29% of playground-related injuries in children younger than 5 years and 47% of those older than 5 years; the most common injuries found in this series were fractures (28%), lacerations (24%), and hematomas (14%).4

This study describes the specific injuries associated with MB/JGs. The most common type of injury iden-
tified was fracture, primarily of the long bones. Fractures of the distal humerus were the most common of these, accounting for 40% of long-bone fractures. Farnsworth and colleagues described the etiology of supracondylar fractures over an 8-year period, noting that 29% of these fractures occurred on playgrounds with 61% of all playground supracondylar fractures as a result of MBs. However, they observed that the incidence of supracondylar fractures increased with age ≥4 years. The high incidence of long-bone fractures, specifically supracondylar fractures found in this study, most likely is related to the design and height of the MB/JGs. This equipment is designed to permit children to climb on top or hang from crossbars. Consequently, injuries occur most commonly as a result of falls and direct injury to the extremity. Younger children may be at higher risk for long-bone fractures because their balance has not developed fully. Also, because the center of gravity of children is centered more cephalad, they tend to land more on the upper portion of their body, sustaining injuries to the upper extremities, torso, and head. Chalmers and Langley found in 1990 that the incidence of fractures increased with falls from equipment >1.5 meters.

Our data indicate that the injuries from this equipment often are serious; 36 (75%) of the supracondylar fractures required admission to the hospital and operative intervention. Isolated radius, radius/ulnar, and nonsupracondylar humerus fractures also were common, requiring surgery in many cases.

There are several laboratory studies that have resulted in the recommendation for use of impact-absorbing surfaces below climbing equipment to minimize fall-associated injuries. These recommendation come from such public health agencies as the Centers for Disease Control and the United States Consumer Product Safety Commission. Mott and associates found that certain materials provide protective surfaces for playgrounds. However, they also stressed that impact-absorbing surfaces alone are insufficient to prevent all injuries. Sosin and co-workers could not identify any impact-absorbing surface as clearly superior in regards to the incidence of equipment-related fall injuries. Our study indicates that injury pattern is independent of the surface below the equipment.

There are several limitations to this study that deserve mention. The data are almost certainly skewed toward more serious injuries, because minor trauma (contusions, abrasions, etc) often are likely to be treated at home without medical intervention. In
addition, because these are data from a single hospital, the overall frequency of these injuries on a population basis is likely to be underestimated. Selection bias is likely to be present in the study population because our ED is a level 1 trauma center that receives referrals from surrounding hospitals. However, although influencing frequency, we would not expect this factor to alter significantly the distribution of the fracture types or the pattern of other injuries identified. Finally, this study is retrospective and therefore has the inherent limitations in data collection. Medical record data were supplemented by the telephone survey in an attempt to circumvent this shortcoming. However, there may have been recall bias on the part of the parent, given the time span between the initial injury and the telephone survey. We feel that recall bias in minimal in that the equipment is located in areas that are frequented by the families and they were able to answer questions easily about the surfaces below the equipment. Despite these limitations, this study offers the first glimpse of the injuries associated with a particular type of equipment, finding an alarming incidence of serious upper extremity injury as well as significant injuries to the head, abdominal organs, and genitalia.

In summary, these data indicate that play on MB/JGs is responsible for a large number of serious childhood injuries. Most common among these are long-bone fractures, particularly supracondylar fractures.

Despite current recommendation that soft surfaces be placed below playground equipment, this study did not find any difference in frequency of supracondylar fractures associated with the surface type. Adult supervision, although always recommended, also did not seem to influence the occurrence of the most common injury, long-bone fractures.

We also found that a significant proportion of children who are injured while playing on MB/JGs require hospitalization, with the majority of these children requiring orthopedic surgical interventions.

Should MB/JGs be banned from playgrounds and backyards? Although our study indicates that there are a significant number of potential serious injuries as a result of this type of equipment, we do not feel these preliminary data warrant an end to the use of this type of recreation. Rather, additional study of the efficacy of soft surfaces placed below the equipment is needed. Increasingly, communities are making significant financial expenditures to place soft surfaces below playground equipment; our data suggest that this investment does not significantly alter the injury pattern.

REFERENCES

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