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Brief Reports

Softball Sliding Injuries

A Prospective Study Comparing Standard and Modified Bases

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In a previous retrospective study, base sliding was found to be responsible for 71% of recreational softball injuries. As most injuries occurred following rapid deceleration impact against stationary bases, quick-release (breakaway) bases were evaluated as a means to modify this mechanism of injury. Six hundred thirty-three softball games were played on breakaway-base fields and 627 games were played on stationary-base fields. Forty-five sliding injuries (7%) occurred on the stationary-base diamonds and only two sliding injuries (<1%) occurred on the breakaway-base fields. Implementing the use of breakaway bases in recreational softball leagues could potentially achieve a significant, cost-effective reduction of injuries.

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The American Softball Association estimates that 40 million individuals nationally, 250 000 players in Michigan, and over 8500 athletes in our city participate in organized softball leagues.[1] These athletes range in age from teenagers to seniors, with a wide variation also present in their athletic ability and physical conditioning. Between 1983 and 1987, over 4000 game-related injury claims were made to the insurance carrier of the American Softball Association. This figure represents only the cases reported to this secondary insurance coverage agency and is undoubtedly an underestimate of the actual number of injuries. These game-related claims totaled $894 597 and represent payments over and above those provided by the players' primary insurance carriers. These figures illustrate the magnitude of the problem.

The consequences of a sports-related injury include lost wages, restriction of future athletic activities, and long-term functional impairment. In a previous retrospective study,[1] base sliding was found to be responsible for 71% of recreational softball injuries. This review indicated that a variety of injuries resulted from base sliding, including abrasions, sprains, ligament strains, and fractures. The mechanisms of these sliding injuries included shearing, impact, and torque forces to the involved extremity.

The potential costs of these traumatic events were investigated to facilitate and emphasize the discussion of their prevention.[1] The injury-related costs to the player, the player's employer, and the sponsoring softball organization can be significant. Athletic knee injuries are common and receive much attention in the lay press. The mean charge for a knee sprain treated in a hospital can easily reach $200 to $400 (Table 1). If operative intervention is required for a base-sliding–related injury to the knee ligament, this figure can rapidly escalate to between $6000 and $10 000 (Table 2). These figures do not include time lost from work and future functional impairment. Therefore, when health insurance carrier costs and company-paid health insurance premiums are included, the cost to the employer and the injured employee can be staggering.

As many softball injuries are related to base sliding, efforts should be directed at altering this mechanism of injury. The methods suggested to reduce base-sliding injuries and their related medical expenses include the abolition of sliding, better instruction of sliding techniques, the use of recessed bases, and the use of quick-release bases.[1,2] Outlawing base sliding would be effective but not practical in controlling the frequency of sliding injuries. This would also offend the purists among the sport's fans and participants. Holding instructional clinics on proper sliding techniques is a possibility for school-related organizations (Fig 1). For community-based teams, however, the vast number of recreational players makes these teaching sessions impractical. In addition, the physical condition of the part-

Table 1.—Mean Charge for Knee Sprain Treated in Hospital

Potential Expenses	Charge, $*
Emergency department visit	60-150
Roentgenograms	65
Orthopedic consult	40-60
Splint	36
Crutches	30
Follow-up visit	20-50/visit
Total	200-400

*Figures based on average fees charged by a large midwestern public hospital.

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ble 2.—Mean Charge for Knee Ligament Injury quiring Operative Intervention

Potential Expenses	Charge, $*
spital	
Emergency department	80-150
Admission	100
Daily rate	515/d
Roentgenograms	65
rgery	
Operating room	1600
Surgeon	1500-5000
Anesthesia	800-900
Supplies	100-300
tsoperative	
Therapy	50/30 min
Clinic	20-50/visit
Immobilizers	35
Braces	35
Roentgenograms	65
Total	6000-16 000

*Figures based on average fees charged by a large midwestern public hospital.

time athlete cannot be effectively regulated. Late decision making by the runner on the base path, poor musculoskeletal conditioning of the player, and alcohol consumption by the slider remain factors in the etiology of poor judgments leading to base-sliding injuries (Fig 2).

Preventive medicine efforts directed at altering base design may provide a practical, reliable, and cost-effective means to reduce sliding-related injuries. As most injuries occur following rapid deceleration impact against stationary bases, quick-release bases might be an effective means to modify this implicated mechanism of injury.

METHODS

The breakaway base (Fig 3) is anchored by receiving holes fitting into grommets on a rubber mat that is flush with the infield surface. The rubber mat is anchored to the ground by means of a metal post similar to that used with standard stationary bases. Nine hundred fifty joules (700 ft-lb) of force, or one fifth of the force needed to dislodge a stationary base from its mooring, is required for the breakaway portion of the base to release (Fig 4). Breakaway bases were obtained for use on recreational softball fields. The breakaway bases cost $295 per set of three, compared with approximately $150 for a set of three stationary bases.

Six hundred thirty-three games were played on breakaway-base fields and 627 games were played on stationary-base diamonds. The players ranged in age from 18 to 55 years and included college students, laborers, executives, physicians, and other recreational players. Teams were assigned to one of four leagues on the basis of skill level and previous playing experience. A coed league was also included in this study.

Fig 1.—Proper sliding techniques can be demonstrated and taught by qualified instructors.

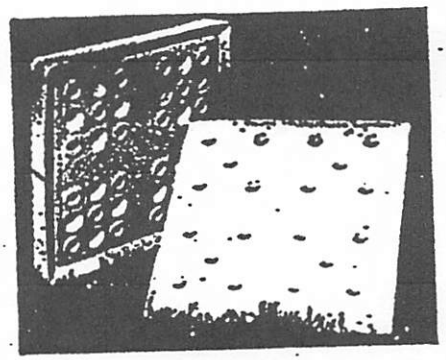

Fig 3.—Breakaway base is displayed. Two components fit together by small rubber grommets.

Table 3.—Sliding-Related Injuries, 1986-1987

Type of Injury	No. of Injuries Involving Stationary Bases	No. of Injuries Involving Breakaway Bases
Ankle sprain	18	1
Ankle fracture	6	1
Skin abrasion	5	
Knee contusion/sprain	3	
Finger fracture	3	
Knee ligament injury	2	
Tibia/fibula fracture	1	
Shoulder subluxation	1	
Acromioclavicular joint disruption	1	
Wrist fracture	1	
Wrist sprain	1	
Foot contusion/sprain	1	
Finger ligament disruption	1	
Finger dislocation	1	
Total	45	2

The elite Class A players did not use these diamonds. Teams were assigned to playing fields on a random and rotating basis. All fields were maintained in the same manner and all experienced the same weather conditions.

Base-sliding injuries that occurred on these recreational softball fields were

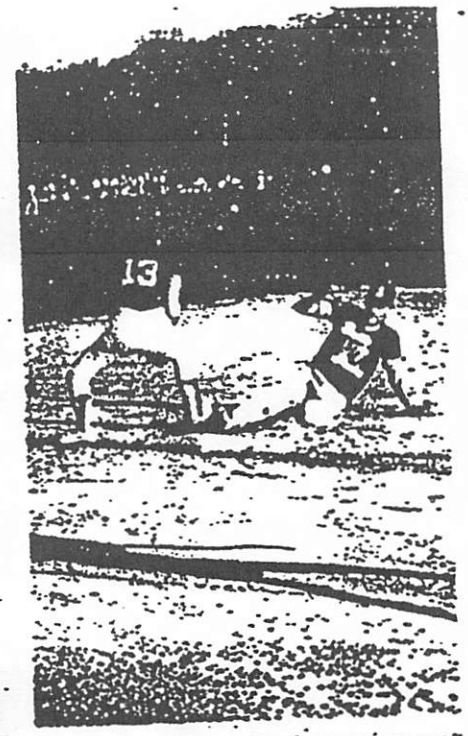

Fig 2.—Late decision making by runner can result in base-sliding injury.

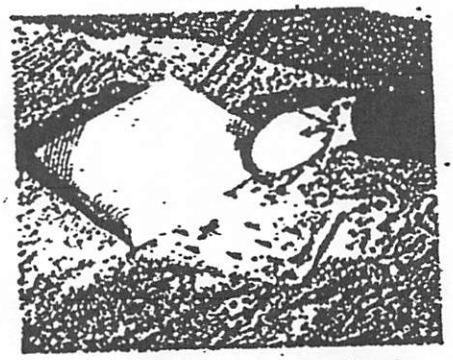

Fig 4.—Exposed aboveground part of breakaway base is dislodged when impacted by sliding athlete.

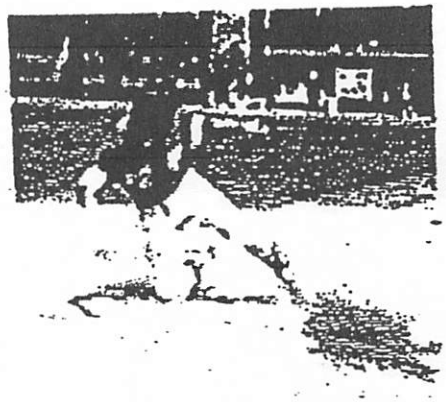

Fig 5.—One fifth of impact force is needed to disarticulate breakaway portion of base away from its mooring, as compared with stationary base. Breakaway bases did not detract from excitement of games.

recorded and subsequently analyzed. All injuries requiring first aid were documented by field supervisors. These field umpires were not aware of the ongoing study. Each injured player was evaluated by a physician at the student health service or local hospitals and was also contacted by at least one of the authors. Local hospital emergency departments, the student health service, and orthopedic surgeons in private practice were also requested to keep logs of patients seen with softball-related injuries. These players were also contacted by the authors and included in the analysis if their team played in our recreational league on our study fields.

RESULTS

During the two seasons studied, a total of 45 sliding injuries occurred on the stationary-base fields, while only two sliding injuries occurred on the breakaway-base fields. This difference was statistically significant (comparison of Poisson means, $P<.001$). Of the 45 injuries sustained by athletes sliding into stationary bases, the lead foot or hand was involved in 43. The distribution of injuries sustained on the stationary-base fields is illustrated in Table 3. Ankle injuries preponderated, with 24 (53%) of the 45 injuries involving this region. The total medical charges to these 45 players were approximately $55 050 ($1223 per injury). Two other players were hurt when they tripped over stationary bases as they ran around the diamond. These injuries, an ankle fracture and a scaphoid fracture, were not included in our stationary-base series total.

The two isolated injuries that occurred on the breakaway bases were a nondisplaced medial malleolar fracture of the ankle and an ankle sprain. The total medical charges to these two players were approximately $700 ($350 per injury). In these two sliding injuries on the breakaway-base diamonds, the bases did not break away. Opposing players were not standing on the bases during these times.

The director of the field supervisors was interviewed two to three times each month during the study concerning experiences with the breakaway bases. It was the feeling of the field supervisors that softball play was not significantly delayed with the use of breakaway bases, even though sliding players broke away the bases up to six times each game (Fig 5). Properly seated bases did not detach during routine running around the bases by the athletes. The umpires did not have difficulty with judgment calls (safe vs out) when the bases released. In addition, replacing the base onto its rubber mat was easy and rapid. The bases were durable and did not need to be replaced during the two seasons studied.

COMMENT

This prospective study supports the concept that modifying the bases can alter the pattern and frequency of sliding injuries. An analysis of our injury rates reveals that one injury occurred every 12.9 games (in 7.2% of games played) on the stationary-base fields, while one injury occurred every 316.5 games (in 0.3% of games played) on the breakaway-base fields. The rate ratio was 22.8 injuries on the stationary bases for every sliding-related injury on the breakaway-base fields. Injuries will still occur and most will result from judgment errors by the runner. Improper sliding technique, poor timing, inadequate physical conditioning, and alcohol consumption may always contribute to sliding injuries. Breakaway bases, however, may modify the outcome of these poor judgments.

The quick-release feature of the breakaway bases decreases the impact load generated against and subsequent trauma inflicted on the athlete's limb. Sliding players come in all sizes and approach the bases from all angles, so no one preventive system can be completely foolproof.[2] The forces generated by the trajectory athlete against the ground or other players are still more than sufficient to result in severe injuries to the musculoskeletal system.

Prevention of sliding injuries would benefit the health of the athletes and would reduce the costs to the player, the player's employer, and the involved insurance carriers. The extra cost for a set of breakaway bases ($295 compared with $150 a set for standard bases) is outweighed by the potential savings in health care costs if a sliding injury can be prevented. The use of breakaway bases in recreational softball leagues could produce a significant, cost-effective reduction in softball injuries. We believe that by changing the bases from stationary to breakaway, a significant reduction in the quantity and the resultant morbidity of softball injuries could be achieved.

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