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# In Motion

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THE SPORTS MEDICINE CENTER AT
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## Collarbones: More Important Than You Think

By Madison Argo, and Michael Khazzam, MD

The clavicle, also commonly known as the "collarbone," is one of the most frequently fractured bones in the human body. This "S" shaped bone lies horizontally and extends from the midline of the neck to the top of the shoulder. One can easily feel their own clavicle bone, evidence that it is fairly exposed to the environment and thus susceptible to injury. Most fractures typically occur from direct trauma such as recreational activities, motor vehicle collisions, falls onto an outstretched hand, or even during childbirth. The majority of these fractures occur at the middle of the bone, the weakest region, and are easily seen or felt. In addition, there may be tenderness at the site accompanied with difficulty moving or raising the arm.

The clavicle serves multiple purposes, including maintaining the position of the arm at the side of the chest and allowing for one to fully raise the arm above the head and create a complete circular motion. There are six muscles in the chest, neck, shoulder, and upper back that attach to this bone's flat surface and rely on this anchor for stability. The collarbone also overlies and protects important blood vessels and nerves, which can be at risk during injury.

### Treatment

Treatment for a simple, minimally displaced collarbone fracture, includes a sling to support the arm's weight which provides pain relief and comfort during the healing process. This is followed by 6–12 weeks of restricted weight bearing (3–6 weeks in children) and a follow-up exam with the physician to ensure proper healing. During this period, physicians generally prescribed daily elbow range of motion to prevent stiffness. Surgery may be necessary when the ends of the fracture are not aligned, the fracture involves several fragments, or the bone has punctured the skin. Surgical repair involves placing a plate secured with screws along the fracture site. With any period of prolonged immobility, muscles begin to weaken. Physical therapy and gradual strengthening exercises are encouraged to restore full function. For non-operative clavicle fractures, the healing process requires time to heal before strenuous exercises are pursued. This differs in surgically repaired fractures that rely on hardware for support, allowing earlier initiation of shoulder range of motion.

### Return to Play

Fortunately, the prognosis for collarbone fractures is very good. Following healing, approximately 2–3 months later, the majority of patients return to full mobility whether this is the vigorous activity of a professional athlete or a child simply riding their bike. Complications may arise for particular fracture patterns and it's important to follow your physician's recommendations for treatment and healing.

# The Artist as an Athlete—Injuries in Dancers

By Christopher J. Tucker, MD

Professional dancers are both artists and athletes—not only performing incredible feats of athletic prowess, muscular strength, and flexibility—but doing so in an aesthetically pleasing and seemingly effortless way. The thousands of hours which are devoted to perfecting each individual component of a routine require dedication and commitment akin to any other professional sport—and similarly place these artistic athletes at risk for certain injuries.

The rising incidence of dance-related injuries may be a product of the physical demands of newer dance moves, combined with the earlier starting age of aspiring dancers and higher cumulative number of hours of practice and performance.

Multiple studies have documented the rates of injury in dancers, which are overwhelmingly related to overuse and the repetitive actions associated with frequent jumping and landing maneuvers. Most injuries occur in the lower extremity and can lead to significant absences from both rehearsals and performances. The most frequently injured body parts are the foot (24%), lumbar spine (23%), and ankle (13%). This experience is comparable to that of a collegiate athletic department or professional sports team.[1]

Interestingly, when evaluating risk factors for injury, age, years in training, body mass index (BMI), gender, and ankle range of motion, all showed no predictive value for identifying those at risk for injury. A history of previous injury and dance discipline (ballet) both correlated with risk of injury.[2]

The "dancer's fracture," is a common injury among ballet dancers and usually occurs when the dancer rolls over the outer border of the foot while in the demipointe position on the ball of the foot with the ankle flexed. Non-operative management has been shown to be incredibly successful for these injuries, even in the face of displacement, and almost universally results in return to pre-injury level of dance performance. Dancers, on average, return to barre exercise around 11 weeks and performance by 19 weeks.[3]

Stress fractures are also a concern for many female athletes, including dancers. Data suggest that prolonged periods of amenorrhea and heavy training schedules (more than 5 hours per day) are risk factors for developing stress fractures. Thirty-one percent of dancers in professional ballet companies have sustained stress fractures, most commonly of the metatarsal (63%), tibia (22%), and spine (7%).[4]

Somewhat surprisingly, despite the high volume of jumping and landing performed during dance routines, dancers have been shown to have a much lower incidence of ACL injuries (0.009 ACL injuries per 1000 exposures) than athletes competing in team sports (0.07 to 0.31 ACL injuries per 1000 exposures).[5] Also interesting to note is that there is no clear gender difference in the incidence of ACL injuries in dancers. Investigation into the jump landing biomechanics of dancers has revealed that both male and female dancers, who universally have received jump- and balance-specific training since an early age, avoid landing patterns that have been associated with increased ACL injury rates.[6]

In summary, dancers are similar to other elite athletes in the ways they approach training, and in many ways, surpass many team sport athletes in the volume of training that they perform. This can put dancers at risk for a variety of unique acute and chronic overuse injuries. Vigilant attention to modifiable risk factors and early education can potentially help minimize these injuries and keep these artistic athletes at peak performance levels.


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# Potential Consequence of Repeat Concussions

By Justin Classie, MD, and Alexander Golant, MD

With the growing attention on sports-related concussions, greater light has been shed on the condition known as chronic traumatic encephalopathy (CTE). There is now evidence that multiple or repeat concussions may lead to progressive neurological issues. There is even concern that sub-concussive injuries (i.e., those where minimal or no symptoms occur) may add up over time to contribute to the development of CTE in the future.

While only recently making major headlines, CTE is not a new entity, having been known to affect boxers as early as the 1920s. At that time it was referred to as "dementia pugilistica."[1] Over the past few years, CTE has been publicized most prominently with regard to professional American football players; however, the NFL is far from the only sports organization dealing with this issue. There is growing concern that CTE may affect football players relatively early in their careers—as early as during collegiate participation. Others sports where greater attention has been directed to this problem include hockey and soccer.[2,3]

While the exact mechanism of the development of CTE is not fully understood, it is thought that repeated head trauma may lead to chronic damage to some of the vital proteins that aid in brain function. Abnormalities in the shape and function of these proteins, especially the protein called tau, may lead to overall dysfunction and potentially even brain cell death. Diagnosis is currently possible only after death, with an autopsy. There is much work being done to learn how to diagnose CTE in the living. This would aid tremendously in awareness, treatment, and prevention.

Symptoms of CTE can appear during, relatively soon, or long after the individual stops playing competitive sports and can include cognitive (thinking), physical, and emotional issues and vary widely in their severity and impact on the individual. Perhaps the most stark example of the potential severity of issues that arise from CTE is shown in the autopsies of athletes who have committed suicide, highlighting the need for greater understanding, prevention, and treatment of the problem.

While repeat head injury, leading to concussive or even sub-concussive episodes, is thought to be the main culprit of CTE, we currently do not know which athletes are most

at risk. There are ongoing research studies which are aiming to define categories of athletes who may be at a higher than average risk for developing CTE, such as those with pre-existing learning disabilities, and those who have persistent lingering symptoms after a concussion.[4]

With the recent increase in our understanding of sports-related traumatic brain injury and CTE, there's been increased attention to diagnosis and management of concussion, including implementation of concussion protocols in many sports. Hopefully, these strategies, along with improved education of athletes, trainers, coaches, parents, and medical providers, will result in better outcomes after sports-related head injuries and safer return to play.

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# The Dangers of Hoverboards: More Than Just a Hot Topic

By Lance LeClere, MD, and Brian Gerstenlager, BS

One of the most popular gifts this past year was a "self-balancing scooter," more commonly known as a hoverboard. Just like any vehicle or toy, hoverboards can be fun and entertaining, but some safety concerns have arisen, including the toy catching fire and injuries such as concussions, fractures, cuts, bruises, and internal organ damage.

The American Association of Pediatrics (AAP) recently issued a statement on the use of safety equipment while hoverboarding, and advises against allowing children under the age of 16 to ride. The AAP article also cites a survey that highlights the concern for serious fractures from hoverboard falls. Of 10 health care facilities surveyed in the two weeks between Christmas and New Year's Day 2016, 100 children sought care for broken bones after hoverboard falls, and about 20 of them required surgery. The AAP advises consumers to look for a national testing laboratory mark as a means to ensure its safety. However, it should be noted that a national laboratory mark cannot guarantee safety.

The source of the fall risk from hoverboards may not as obvious as it seems. The mechanics of the self-balancing scooters themselves, and not necessarily rider error, may be a major contributing cause of the high rate of falls. Specifically, the devices may not accurately account for the weights of different riders, and therefore, the hoverboard can lurch forward or backward unexpectedly. This may not come as a surprise when considering that self-balancing scooters support weight ranges from 45 pounds to up to 300 pounds.

In addition, many hoverboards are capable of tackling steep inclines. Most of the two-wheeled transportation devices claim to climb an incline of around 30°. For reference, a parking garage ramp is normally about 4°, and the typical max incline for pedestrians is about 7°. So riders can easily climb any ramp in an urban area. But this ability may also increase the risk of falling because as the degree of incline or decline becomes larger, so too can the tilt.

Hoverboard top speeds are variable between different brands, ranging from about 6 mph up to 12 mph. Faster devices can lead to falls with more serious injuries, especially if the falls are from unexpected, sudden movements of the hoverboard coupled with a high degree of tilting.

With the potential hazards of hoverboarding, many experts recommend wearing a helmet, elbow and knee pads, and wrist guards, and avoid riding on excessive inclines and near roads.

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