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Row, Row, Row Your Boat
A Look at Common Rowing Injuries

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Background
Rowing became an Olympic sport in 1896, originally as a male-only sport and gained popularity among female athletes after the passage of Title IX in 1972. Women's rowing became an NCAA sport in 1997, and the number of women competing in Division I rowing has increased by 86 percent, offering more scholarships per school than any other sport except football.
To understand rowing injuries, we must first understand the sport:

- Sweep: Rowers pull one oar with two hands. Sweep boats involve up to eight rowers, plus the coxswain (pronounced 'kaks(ə)n/), who steers the boat and coordinates rowing.
- Sculling: Rowers use two oars (one in each hand) and compete in single, double or quadruple sculling boats.

The rowing stroke is composed of two basic phases:

- Drive: With the oar in the water, the legs and back extend, pushing back explosively. Then the arms pull into the chest.
- Recovery: With the oar out of the water, the hands extend forward and the athlete crouches into a flexed position, until reaching the "catch," just before the explosive drive phase.

Injury Treatment and Prevention: In general, rowing injury treatment and prevention can be approached based on three principles:

1. **Pain Limited Activity:** Acute pain is a gift that tells the brain when the tissue may be at risk for injury. As much as possible, try to learn the difference between the normal pain of exercise, and the pain that indicates potential bodily harm.
2. **Next Day Rule:** If it hurts more the next day, then that was too much. Keep a training journal.
3. **The 10% Rule:** No more than 10 percent increase in exercise per week. This can be challenging in a boat, as the whole crew does effectively the same workout. The rowing machine or single scull allows rowers to gradually increase the load after injury.

Injuries: The repetitive motions involved in rowing can lead to overuse injuries that mainly affect the knees and lower back but also the upper extremities, foot/ankle and ribs. We will address six of these injuries.
Low Back Injuries: The lower back makes up 22 percent of all rowing injuries, most often caused by improper rowing technique and/or overexertion. Most back pain is self-limited and improves within 6 weeks, but disk herniation and spondylolysis can sometimes require more attention.

- **Disk Herniation**
  In between the spinal bones the intervertebral disks absorb compressive forces. During rowing these disks are placed under repetitive sheer, compression, side-bending and rotational forces. These forces may cause the disk to "herniate," or slip out. While not all disk herniations found on imaging cause pain they can become symptomatic if compressing the nerves within or exiting the spine. This typically causes characteristic nerve pain that is shooting in nature and follows the route of sensation supplied by the nerve that is pinched. Symptoms are typically worse with increased sitting and bending forward.

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Fortunately, most injuries can be managed non-operatively by a sports medicine physician with anti-inflammatory medications, anti-spasm medications and a dedicated physical therapy regimen.

- **Spondylolysis/Spondylolisthesis**
  Spondylolysis is a stress fracture of the bone between the two connecting portions of adjacent vertebrae. This can occur in sports involving repetitive back extension, in the context of poor core strength and overtraining. Spondylolisthesis is the slipping of one vertebrae over another, and can occur if the stress fracture is not healed. Athletes present with low back pain that worsens with leaning back and experience point tenderness in the same area. Treatment typically requires relative rest from activities that cause pain, until pain free. This should be followed by 8-12 weeks of rehabilitation exercises. Bracing may be helpful in some athletes. Treatment should be individualized and guided by a sports medicine physician.

The best way to prevent spondylolysis is maintaining good core stability through hip and buttock strengthening, to support the lower back. Training schedules should be monitored and sufficient recovery time allowed.

Rib Cage Injuries: The rib cage constitutes 9-10 percent of total rowing injuries.

Rib Stress Fracture:

Rib stress fractures most commonly occur in ribs 5 through 9, where two muscles, pulling in opposite directions, insert. Symptoms include vague, slow onset of chest wall pain, that worsen with deep breath, cough, rowing or reaching. Like other bone stress injuries or stress fractures, these injuries are due to a mismatch of bone breakdown and repair. Repair is compromised when recovery time and nutrition are inadequate. High-level rowers need approximately 150 percent of the daily calories required of sedentary individuals. For any rib complaints, rowers, coaches and medical staff should have a high index of suspicion for this injury.

Initial treatment commonly requires relative rest from rowing until asymptomatic, which may take for 3-6 weeks. The load must be gradually re-introduced to avoid reoccurrence. Any nutritional deficiencies, underlying injuries and technique errors should be addressed. If the injury does not heal in the expected time frame, then imaging can be considered to rule out other causes.

Upper extremities: The upper extremities constitute 14 percent of total injuries in rowing.

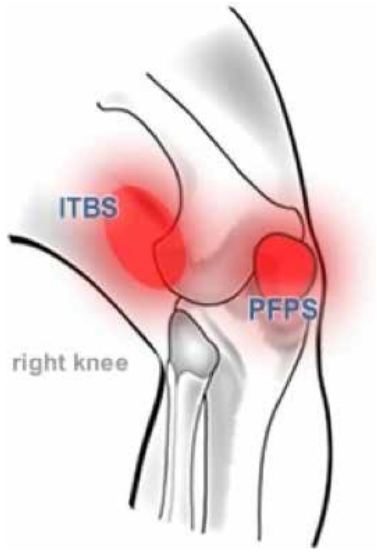
- **Wrist Tenosynovitis**
  Tenosynovitis is characterized by inflammation of the sheath surrounding the wrist tendons and is caused by overuse and technique errors. This injury typically arises in early spring, when there is high intensity training in cold weather, especially with newer rowers with poor form and lower fitness.

  Treatment involves 2 to 3 weeks of relative rest and return to rowing as tolerated. Wrist splints, bracing, and taping can be helpful. Modifications such as keeping the oar square throughout the stroke, changing the size of the oar, or handle grip, can also prevent this wrist injury. Prevention also includes keeping the hands warm by wearing long sleeves, fleece gloves, or “pogies” (mittens that fit over the oar).

- **Intersection Syndrome**
  Intersection syndrome is an overuse injury caused by friction between the tendons that control the thumb and wrist and leads to pain just above the wrist and may include a “creaking” noise (known as crepitus) with moving the wrist up and down

  Initial management is relative rest, followed by consideration of non-steroidal anti-inflammatory medications, or cortisone injection at the site of friction. The rowing athlete can prevent intersection syndrome by relaxing their grip and should consider changing the oar or handle size.

Knee injuries: Knee injuries constitute 29 percent of total injuries in rowing.



- **Iliotibial Band Syndrome**
  Distal Iliotibial (IT) Band Syndrome is caused by friction under the IT band as it courses across the widening of the femur (thigh bone), approaching the knee joint. Pain is localized to the outside of the knee. Risk factors include a bowlegged knee position and weakness in the hip and core stabilizing muscles. This can also occur when rowers use the outside of the knee to balance the boat. Instead, rowers should adjust the oar handle height to improve balance.

  In addition to stretching, core strengthening and anti-inflammatory treatments, modifying the shoe stretcher position can improve the lower extremity mechanics with the goal of reaching full knee compression at the catch position without changing the side-to-side angle of the knee, which places more stress on the knee joint.

Conclusions:

The most common rowing injuries can be treated and minimized through using good rowing technique and following the three guidelines for systematic activity progression. A basic appreciation of rowing terminology, equipment, physiology and biomechanical demands can help us understand common injury patterns and activity adaptations in order to help keep rowers healthy and use rowing to promote community health & wellness in this growing sport.

References

Core Exercises for Overhead Athletes

By Shane Larson, MD FAAFP and Jason Butler, DO

Core exercises and specific training for overhead and throwing athletes is important to both injury prevention and rehabilitation. Baseball accounts for a large number of injuries each year, and there are many other types of overhead athletes, like volleyball, swimming, football, softball and javelin. This article will explore the role of core strengthening exercises in overhead athletes.

Throwing a baseball requires the use of not only the shoulder but also the lower back, core, leg, and hip muscles to generate power and torque that is transferred through the body and into the throw. Similar muscle use happen in a volleyball spike or a javelin throw.

What kind of injuries do overhead athletes get?

Due to the dynamic and repetitive nature of movements required by overhead athletes, they are at increased risk of overuse injuries to the tendons, muscles and cartilage in the shoulder. These injuries typically have a gradual onset of pain and often need longer recovery periods between games and practices.

Acute traumatic injuries include broken bones, dislocations and ligaments tears. These injuries vary widely based on the sport, which positions are played and the motions required of the affected body part.

Shoulder rehabilitation basics

"PRICE therapy" is often used (Protecting the injury, Relative rest, Ice, Compression and Elevation) until pain has subsided. Pain that continues beyond these initial treatments should be further evaluated by a physician to rule out severe injuries and ensure the athlete can safety start rehabilitation and eventually return to play.

After pain decreases, the athlete should be assessed for imbalances in strength and return of movement that may have led to an injury. Overhead athletes generally require strength, endurance and control exercises for the rotator cuff muscles and supporting muscles of the shoulder blade, known as the "scapula stabilizers." These muscle groups are the "core of the shoulder" and require ongoing maintenance.

Once the basic exercises are mastered, sport-specific exercises should be added to include the larger, force producing muscle groups of shoulder, forearm and wrist.

One example of a home exercise program is the "thrower's ten." However, this article is not meant to endorse a single program, and tailored rehabilitation guided by a physical therapist or athletic trainer may be required.

It is helpful to assess core and lower limb control deficits prior to starting a core strengthening program. These screening tests do not require fancy equipment and include functional tests such as a box jump, single leg squat or air. Any deficits should be addressed and incorporated into the rehabilitation.

Core strengthening in overhead athletes

1. **Proprioception:** Proprioception is the sense our body uses to determine where it is in space and is important in achieving the power and control involved in most overhead sports. Typical proprioception exercises include working on balance with or without the eyes closed to engage supporting and stabilizing muscles of the core and lower limbs. With prompting, athletes can learn to engage these muscles while performing shoulder exercises.
2. **Combination Exercises:** Combine core and shoulder exercises are added last and are the most difficult to perform. These exercises involve challenging the core to stabilize the body while moving the limb. Examples include:

- Side plank maneuver performed while doing rotator cuff band exercises.
- Three-point plank (pushup position with one upper extremity free to perform shoulder exercises, such as arm raises, extensions, rows and abduction exercises).
- Overhead weighted ball tosses with squats or kettlebell swings.

Due to the difficulty and dynamic nature of these exercises, proper technique and supervision is crucial to prevent injury. These types of exercises involve more complex movements to mimic what the athlete will need to return to play.

Summary

Core strengthening in the overhead athlete plays a pivotal role recovery from injury. By focusing on dynamic movements that engage the back, trunk and lower extremities, athletes are better prepared to return to overhead activities in a safe and deliberate manner. Like any exercise or rehabilitation program, appropriate technique and form is important to prevent further injury.

Choosing Wisely®: Plantar Fasciitis

By Leonardo Oliveira, MD, CAQSM, FACP

Definition

The plantar fascia starts at the heel of the foot (calcaneus) and extends forward to the toes. It plays an important role in foot control and in supporting the arch of the foot. Studies have shown that this condition is secondary to degeneration of the plantar fascia rather than inflammation, as was previously thought. As the fascia loses its normal architecture, typically from overuse, it becomes painful and then is referred to as plantar fasciitis (PF).

Symptoms and Risk Factors

Typically, the first step out of bed is very painful and symptoms worsen with increased activity or prolonged standing. It is the third most common injury in runners, affecting 5-10 percent at some point.

- Common risk factors include:
- Flat foot or high arches
- Calf muscle tightness
- Excessive pronation (rolling in of the foot)
- Having one leg longer than other
- Improper footwear
- Excessive weight
- Jobs involving prolonged standing or walking,
- Errors in training (i.e. quick increases in duration, intensity or distance of running)

Treatment

Plantar fasciitis (PF) can take up to two years to resolve, if not addressed properly. Starting treatment earlier in the course of PF, can usually avoid chronic pain and more complex and invasive treatments. Any modifiable risk factors listed above should be addressed.

An effective initial approach is to start with relative rest, reduction of exercise volume, stretching the calf muscles and plantar fascia, and most importantly, strengthening the muscles of the calf and foot. Shoes should be changed at 350 to 500 miles, depending on the durability of the shoe. Custom orthotics can improve the mechanics and address anatomical factors, such as excessive pronation and low or high arches, though this can be expensive. Night splints can help passively stretch the calf and plantar fascia and can improve foot mechanics, though compliance is important to be an effective treatment. Anti-inflammatory medications can decrease pain but do not change the course of the PF.

When symptoms have become chronic (or lasting more than three months), more advanced diagnostic and treatment strategies should be considered. X-rays are commonly performed to rule out other potential foot injuries. Heel spurs are frequently seen, but they have no role in the pain or diagnosis of PF. Ultrasound confirms the diagnosis with good accuracy. In addition, MRI can be utilized when the diagnosis is unclear or when other conditions need to be ruled out, such as a calcaneal stress fracture.

Shockwave therapy (ESWT) is a non-invasive treatment which emits a series of shocks to the tissue. This is thought to release growth factors leading to tissue healing. It has been shown to be an effective option when PF symptoms have lasted for more than six weeks. Cortisone injections decrease pain in the short-term though they may weaken the plantar fascia and can cause atrophy of the soft tissues protecting of the heel. Platelet rich plasma injections have been shown to be equally effective as cortisone for up to six months in some studies.

Surgery is effective in 90 percent of patients, but the recovery time is substantially longer than non-invasive options. Newer minimally invasive interventions such as percutaneous ultrasound guided fasciotomy has also been shown to be effective, but the studies are small and more research is needed.

In summary, starting treatment early after the onset of symptoms to address mechanical risk factors and training errors is fundamental to achieve a fast recovery from PF. When symptoms have become chronic, ESWT and corticosteroid injections are frequently used in season, requiring a short time off. Other minimally invasive interventions, such as PRP and fasciotomy appear to be effective but will require more time for recovery.

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Carpal Tunnel Syndrome

By Rathna Nuti, MD

Carpal tunnel syndrome is the most common nerve injury of the upper extremity. It is caused by compression of the median nerve within the carpel tunnel, which is located between the transverse carpal ligament and the bones of the wrist. Damage to the nerve occurs when pressure is increased secondary to inflammation, overuse or other systemic factors. It is common among jobs requiring a high degree of repetitive wrist and hand movements or use of vibratory tools.

Individuals with certain medical conditions — like diabetes mellitus, hypothyroidism, rheumatoid arthritis, acromegaly, obesity, flexor tenosynovitis, ganglion cysts, and pregnancy — are at high risk for developing this disease. Women are three times more likely than men to have this disorder and the prevalence and severity increases with age. Unfortunately, this disease can be debilitating enough to interfere with daily activities and cause people to seek treatment options from their medical providers.

What are the symptoms?

The hallmark symptoms are pain and paresthesias, or nerve symptoms in the distribution of the median nerve. This includes the palmer side of the thumb, index, middle and half of the ring finger. Symptoms can vary and occasionally localize to the wrist or the entire hand, but can also extend to the forearm. Patients are often woken-up with symptoms and shake out their hand to provide relief (Flick sign). In severe cases, the thumb becomes weak, which can lead to difficulty holding objects, opening jars or buttoning a shirt.

Do I need imaging?

Diagnosis of carpal tunnel syndrome is usually clinical and typically does not need further testing. However, if structural abnormalities are suspected, plain radiography may be a useful tool. Ultrasound imaging is also helpful in measuring the nerve as enlargement of the nerve is a sign of damage and can aid in confirming diagnosis. Generally, magnetic resonance imaging (MRI) is not indicated. In unique cases, nerve conduction studies and electromyography can aid in the diagnosis, determining severity, and planning for surgery. Laboratory testing for diseases such as diabetes, hypothyroidism or rheumatoid arthritis should be assessed if these are suspected.

How is it treated?

Conservative treatment such as night splints, physical therapy, and/or corticosteroid injections are first line treatments and suggested for mild to moderate cases. Usually, symptoms improve in two to six weeks and reach maximal benefit at three months. However, in severe cases or nerve damage, surgery should be considered.

Do I need surgery?

Surgery is the treatment of choice for patients with severe median nerve damage. Patients return to work on average eight days earlier with endoscopic repair than with open repair. The most common complications are a painful scar and/or pain in the thicker parts of the palm (Pillar pain). Most patients note significant improvement in one week and are able to return to normal activities in two weeks. However, it is possible for full recovery to happen in a course of one year in very severe cases.

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