

Marathon runners			
Exercise associated hyponatremia	Exercise associated collapse	Heat stroke and Hyperthermia	Cardiac origin

- Exercise associated collapse is defined as an athlete unable to stand or walk secondary to light headedness, faintness, dizziness or syncope. There are many causes for an athlete to collapse but the most common cause at the end of a race is **postural hypotension**.
- This results from venous pooling of blood in the lower extremities due to abrupt cessation of lower extremity muscle pumping action combined with cutaneous vasodilation. Postural hypotension affects nearly two thirds of participants in endurance events. 85% of runners admitted to a medical tent after finishing a marathon were reported to have postural hypotension.

A 38-year-old female runner crosses the finish line of a 26.2-mile marathon with a finishing time of 3 hours and 40 minutes and then collapses. The most likely cause of the collapse is:

- Postural hypotension
- A cardiac origin
- Hyponatremia
- Hypoglycemia

- A **cardiac origin** for collapse should be suspected anytime a runner has a syncopal episode during the race but is more common in elderly runners and those with previous cardiac history.
- Hyponatremia** should also be considered but is more likely diagnosed in runners with race finish times greater than 4 hours and is also not the MOST likely cause of a runner's collapse at the finish line.
- Hypoglycemia** as a cause of collapse is more likely to be seen in a Diabetic who might have taken his usual dose of Insulin instead of a modified dose prior to the race.

You are a physician volunteering at a marathon medical tent and a 30-year-old female presents at the finish line with confusion and dizziness wearing a shirt that feels very damp. She says that she has been drinking water at regular intervals and has been urinating frequently. Which of the following is the most likely cause of her symptoms?

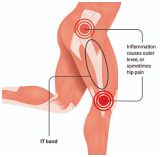

- Postural hypotension
- Hyponatremia
- Frostbite
- Dehydration

- Exercise associated hyponatremia is defined by a serum or plasma sodium concentration less than 135 mmol/L but one usually will get symptoms when sodium levels drop below 130.
- Early signs and symptoms include nausea, vomiting and headaches. As the severity of exercise associated hyponatremia develops, a patient may experience symptoms of altered mental status, seizures, respiratory distress, coma and death as a development of worsening cerebral edema.
- Risk factors for exercise associated hyponatremia are low body weight, female sex, four hours exercise duration, slow running or performance pace, race inexperience, excessive drinking behavior, high availability of drinking fluids, and extreme hot or cold environmental conditions. In this case the patient is most likely suffering from hyponatremia due to excessive drinking.

A 43-year-old male runner seeks medical help at 20 miles mark in a marathon race. He is manifesting a headache, dizziness, confusion, and lack of sweating. His rectal temperature is above 40°C (104°F) more than 10 minutes after stop running. What is proper management?

- Needle UB40, DU26, DU20, PC3, Shixuan
- Give "Bai Hu Tang (White Tiger Decoction)"
- IV hypertonic saline
- Cooling and fanning; sponging the axillae, neck, and groin with towels immersed in ice water; take the rectal temperature every 15 minutes until below 38°C (100.4°F); If treatment as listed does not produce a rapid fall in temperature, or the mental state does not improve, send the patient to ER.

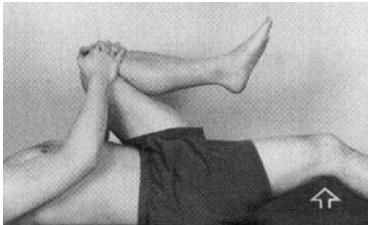
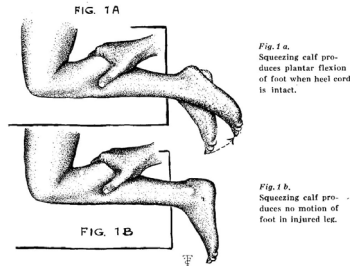
- Marathon runners can have a high core temperature while running. This usually settles rapidly but if it persists may indicate early heat stroke. Exercise induced hyperthermia may be due to ambient temperature, an increase in relative humidity, inadequate acclimatisation and training or hydration status.
- Persisting exertional hyperthermia is defined in runners as a rectal temperature above 40°C more than 10 minutes after running. If neurological symptoms develop the diagnosis is heatstroke, a potentially lethal condition with progressive end organ damage and high mortality if not recognised and treated promptly. Heatstroke affects 1 in 10,000 marathon runners.

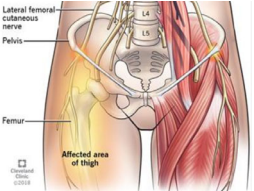
Iliotibial band syndrome		Ober test	
	<ul style="list-style-type: none"> <li>The iliotibial band runs along the lateral or outside aspect of the thigh, from the pelvis to the tibia, crossing both the hip and knee joints.</li> <li>Iliotibial band syndrome is an overuse injury of the connective tissues that are located on the outer thigh and knee.</li> </ul>		<ul style="list-style-type: none"> <li>With the patient lying in the lateral position, support the knee and flex it to 90 degrees. Then abduct and extend the hip.</li> <li>Then release the knee support. Failure of the knee to adduct is a positive test.</li> </ul>

What test is used to assess for iliotibial band syndrome?

- A. McMurray's test
- B. Thomas test
- C. Ober test
- D. Anterior drawer test

<b>Ober test</b>	<ul style="list-style-type: none"> <li>used to test for contraction of the iliotibial band. If a contracture of the tensor fascia lata or iliotibial band exists, then the leg remains abducted during the test.</li> <li>The leg may also remain abducted in polio or meningomyelocele.</li> </ul>
<b>Thomas test</b>	<ul style="list-style-type: none"> <li>used to detect a hip flexion contracture.</li> </ul>
<b>McMurray's test</b>	<ul style="list-style-type: none"> <li>used to assess for a meniscal tear.</li> </ul>
<b>Anterior drawer test</b>	<ul style="list-style-type: none"> <li>used to evaluate disruption of the anterior cruciate ligament.</li> </ul>

Thomas test	Thompson test
<ul style="list-style-type: none"> <li>The Thomas Test is used to measure the flexibility of the hip flexors, which includes the iliopsoas muscle group, the rectus femoris, pectineus, gracilis as well as the tensor fascia latae and the sartorius.</li> </ul>	<ul style="list-style-type: none"> <li>The Thompson test examines the integrity of the Achilles tendon by squeezing the calf. It is performed as a clinical test to identify the presence of a complete Achilles rupture.</li> </ul>
	 <p>FIG. 1A Squeezing calf produces plantar flexion of foot when heel cord is intact.</p> <p>FIG. 1B Squeezing calf produces no motion of foot in injured leg.</p>

	<ul style="list-style-type: none"> <li>Meralgia paresthetica is a condition characterized by tingling, numbness and burning pain in your outer thigh. The cause of meralgia paresthetica is compression of the lateral femoral cutaneous nerve that supplies sensation to the skin surface of the thigh.</li> <li>Risk factors: diabetes, hypothyroidism, alcoholism, injured by the seatbelt during a car accident, overweight or obese, pregnant, wearing tight clothing, girdles, or tight stockings or wear a heavy utility belt (like a tool belt or police gun belt)</li> </ul>
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A 40-year-old diabetic woman who is 7 months pregnant presents with dysesthesia over her right lateral thigh. Lower extremity active range of motion, strength, and reflexes are normal. Straight leg raise test is negative. What is her diagnosis?

- A. Lumbar radiculopathy
- B. Lateral femoral cutaneous nerve syndrome
- C. Sacroiliitis
- D. Right hip osteoarthritis

- Lateral femoral cutaneous nerve syndrome** or **meralgia paresthetica** is due to compression or entrapment of the lateral femoral cutaneous nerve and is characterized by pain, dysesthesias, or hypoesthesias over the anterolateral thigh that sometimes extends to the knee. The deficit is purely sensory.



- Metatarsal stress fractures are commonly found in distance runners and ballet dancers.
- Stress fractures occur most often in the second and third metatarsals in the foot, which are thinner (and often longer) than the adjacent first metatarsal.
- This is the area of greatest impact on your foot as you push off when you walk or run.

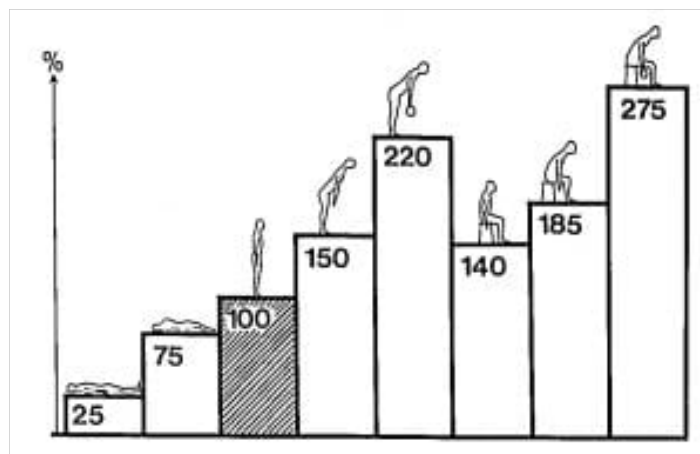
Noncritical metatarsal stress fractures	Critical metatarsal stress fractures
<ul style="list-style-type: none"> <li>• Noncritical stress fractures can usually heal by themselves with immobilization or relative rest.</li> <li>• The second metatarsal is the most common, and this is followed by the third, the first, and the fourth metatarsals.</li> </ul>	<ul style="list-style-type: none"> <li>• It is important to remember that stress fractures of the fifth metatarsal shaft are classified as critical fractures and should be promptly referred to orthopedics for consideration of surgical management because they are prone to nonunion.</li> </ul>

A 28-year-old female distance runner presents to you with a right second metatarsal stress fracture. The patient states that she has undergone an abrupt change in her training including barefoot running. She reports no pain with rest and moderate pain during running.

For your initial management, you decide to:

- Place her in a walking boot and follow up with her in 3 weeks
- Obtain radiographs of the right foot
- Instruct her to return to running as tolerated
- Make her none-weight bearing in a short leg cast for 6 weeks

- Her history indicates that she has undergone an abrupt change in her training (barefoot running) that would cause a significant change in the types of forces experienced by her skeletal system, and has an accompanying point of focal bony tenderness. Given this history and exam, the patient likely has a 3rd metatarsal stress fracture. This is not considered a "critical" stress fracture site and can be treated initially with a walking boot. If she is able to walk without limping in 3 weeks, she can be progressed out of the boot and to physical therapy.
- Non-weight bearing in a cast for 6 weeks is generally not needed with "non-critical" stress fractures and would be overly restrictive. Radiographs are relatively insensitive for stress fractures, and would not likely change management in this case as there is little concern for a "critical" stress fracture. Given her likely injury, pain, and functional limitations, returning her to activities at this time would be inappropriate.

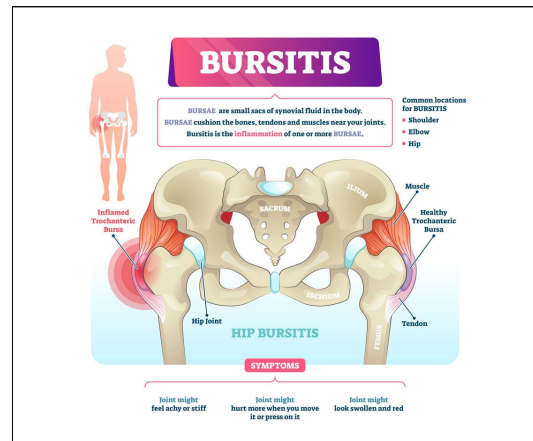


Which position exerts the most pressure on the lumbar discs?

- Standing erect
- Standing erect and flexed forward
- Seated in a chair
- Seated in a chair and flexed forward

- Nachemson measured the relative pressure changes within the third lumbar disc with changes of position. Standing erect was the reference position and pressures decreased with lying supine and increased in the seated position.
- Seated and flexed forward further increased disc pressures. Several other positions were evaluated.

- Tendons, ligaments, muscles, and skin must glide over bones during joint movement. Tiny, slippery sacs of fluid called bursae facilitate this gliding motion by providing a thin cushion and reducing friction between the surfaces.
- A bursal sac is made up of an outer membrane and inner fluid.
- When the synovial membrane of a bursa becomes inflamed, it is called bursitis. The inflamed membrane will thicken. In addition, the membrane will produce excess synovial fluid, causing the bursa to swell.
- Inflammation can be caused by an injury, repetitive irritating friction, or an underlying condition such as rheumatoid arthritis.



Bursa	Bursitis
<ul style="list-style-type: none"> <li>• Fluid-filled sacs that cushion the bones, tendons and muscles near your joints.</li> <li>• A body has more than 140 bursae.</li> </ul>	<ul style="list-style-type: none"> <li>• Occurs when bursae become inflamed.</li> <li>• The most common locations for bursitis are in the shoulder, elbow and hip</li> </ul>

A 60-year-old patient complains of pain and tenderness over the lateral right hip. She is unable to sleep on that side. Physical examination notes tenderness over the lateral greater trochanter. What is the most likely diagnosis?

- Osteoarthritis of the hip
- Septic arthritis
- Trochanteric bursitis
- Trochanteric tendonitis

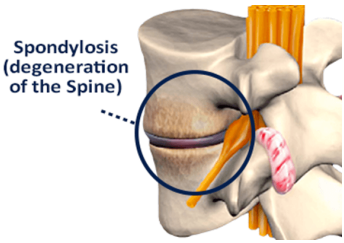
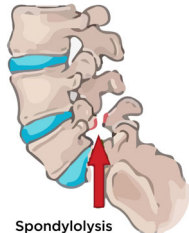
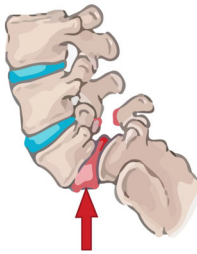
- **Trochanteric bursitis** is inflammation (swelling) of the bursa (fluid-filled sac near a joint) at the outside (lateral) point of the hip known as the greater trochanter. When this bursa becomes irritated or inflamed, it causes pain in the hip. This is a common cause of hip pain.
- **Osteoarthritis of the hip** would be painful with internal rotation and there would be evidence on radiographic imaging.
- **Septic arthritis** would be associated with fever and severe pain with motion.
- **Trochanteric tendonitis** would have tenderness proximal to the trochanter suggesting tendinitis of the gluteus medius tendon.

	<b>Sinding-Larson-Johansson disease</b>	Pain at the inferior pole of the patella	<ul style="list-style-type: none"> <li>• Caused by swelling and irritation of the growth plate there.</li> </ul>
	<b>Patellar tendonitis</b>	pain at the patellar tendon	<ul style="list-style-type: none"> <li>• An injury to the tissue connecting the kneecap to the shin bone (patellar tendon).</li> </ul>
	<b>Osgood-Schlatters disease</b>	pain at the tibial tuberosity	<ul style="list-style-type: none"> <li>• A childhood repetitive use injury that causes a painful lump below the kneecap.</li> </ul>

10-year-old track and field athlete presents with tenderness at the inferior pole of the patella. What is the diagnosis?

- Sinding-Larsen-Johansson disease
- Patellar tendinopathy
- Osgood-Schlatter disease
- Pes anserine bursitis

- **Sinding-Larsen-Johansson disease** will show tenderness at the inferior pole of the patella.
- **Patellar tendinopathy** will show pain at the patellar tendon.
- **Osgood-Schlatter disease** will show pain at the tibial tuberosity.
- **Pes anserine** will show pain at the proximal antero-medial tibia, and quadriceps tendinopathy will show pain at the quadriceps tendon usually at the insertion of the superior pole of the patella.

Spondylosis	Spondylolysis	spondylolisthesis
degenerative osteoarthritis of the spine	defect of a vertebra in the pars interarticularis	slipped vertebra
 <p>Spondylosis (degeneration of the spine)</p>	 <p>Spondylolysis (Stress fracture in the Pars Interarticularis)</p>	 <p>Spondylolisthesis (Stress fracture and sliding of vertebra)</p>


What is the most common etiology of low back pain in a 13-year-old female athlete?

- A. Disc abnormalities
- B. Spondylolysis
- C. Muscle-tendon strain
- D. Osteoarthritis

- 100 adolescents with low back pain were evaluated. Spondylolysis stress fracture of the pars interarticularis were present in 47% of adolescents, 1% of the adolescent group had back pain attributable to disc abnormalities, while only 6% of adolescents were diagnosed as having muscle-tendon strain.
- Spinal stenosis and osteoarthritis were not encountered in the children.

Match the terminology to the correct definition.

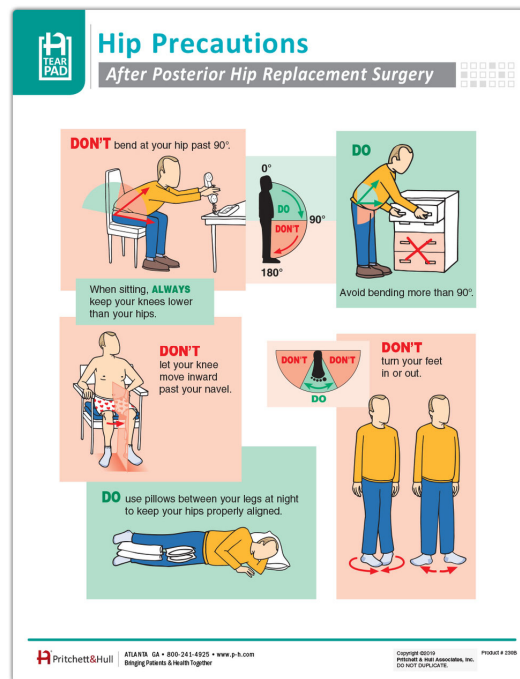
Spondylosis	■	<input type="checkbox"/> the displacement of a vertebra, most commonly occurring after a break or fracture. There are 2 common forms: Isthmic, degenerative
Spondylolysis	■	<input type="checkbox"/> refers to degenerative osteoarthritis of the spine – essentially the space between adjacent spinal vertebrae narrows. Because this condition commonly occurs in the zygapophysial (facet) joints or the intervertebral discs, it is often referred to as facet syndrome or degenerative disc disease.
Spondylolisthesis	■	<input type="checkbox"/> a defect of a vertebra in the pars interarticularis – most typically a stress fracture that is caused by repetitive trauma done to the lumbar spine from strenuous sports such as football, weightlifting, cheerleading, or gymnastics.

	<ul style="list-style-type: none"> <li>Often associated with <b>patellar tracking disorder</b> is a condition called <b>patellofemoral pain syndrome</b>. Patellofemoral pain syndrome is pain that exists at the front of the knee, also referred to as runner's knee. This injury is most common in people who play sports as it is most often an overuse injury.</li> </ul>
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A patient presents with bilateral knee pain. Her training had just begun for a half marathon but has been limited by knee pain. She reports anterior knee pain and describes it as "beneath the knee cap." The pain is worse when arising after prolonged sitting position. Which physical examination finding might be expected?

- A. Pes cavus
- B. Strong hip abductors
- C. Flexible iliotibial band
- D. Tight quadriceps muscle

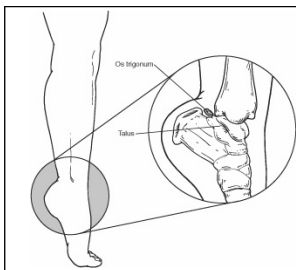
- Patellofemoral arthralgia is thought to result from tracking problems of the patella within the trochlear groove.
- Several biomechanical issues, such as tight and inflexible quadriceps, pes planus, tight iliotibial band, weak and ineffective vastalis medialis, and weak hip abductors may contribute to incorrect tracking of the patella.



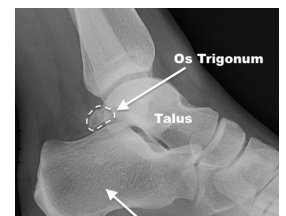
How long are hip precautions routinely continued after a posterior approach total hip arthroplasty?

- A. 4 weeks
- B. 8 weeks
- C. 12 weeks
- D. 6 months

- Total hip precautions include avoiding flexion of more than 90 degrees, adduction past midline, and internal rotation past neutral.
- Total hip precautions for a posterior approach total hip arthroplasty should be continued for 12 weeks.



- The os trigonum is an extra (accessory) bone that sometimes develops behind the ankle bone (talus). It is connected to the talus by a fibrous band. The presence of an os trigonum in one or both feet is congenital (present at birth).
- When an os trigonum is present, this accessory ossicle together with surrounding soft tissues can become wedged between the tibia, talus and calcaneus. This can lead to inflammation of the involved structures.
- The os trigonum syndrome can also be named the symptomatic os trigonum, the talar compression syndrome or posterior tibial talar impingement syndrome.



A 12-year-old ballerina presents to your clinic with right ankle pain. She was dancing pain-free until this year when she began to dance on pointe. On examination, you note tenderness to palpation at the posterior talocrural joint, pain with end passive ankle plantarflexion range of motion, and no pain with resisted active ankle dorsiflexion or plantarflexion. Which of the following would you anticipate with imaging?

- A. Tendinosis of the Achilles tendon on ultrasound
- B. An os trigonum on ankle radiographs
- C. A Haglund's deformity on ankle radiographs
- D. A split peroneus longus tendon on MRI

- Dancers who go on pointe are risk for posterior ankle impingement syndrome, which results from impingement of posterior aspect of talus between tibia & calcaneus with repetitive ankle plantarflexion.
- One predisposing factor for this condition is the presence of an **os trigonum**, which results from an accessory ossification center of the posterior talus.
- While **Achilles tendinopathy** and peroneal tendon injuries are not uncommon in ballet dancers, the patient's location of pain and physical examination are not indicative of either of these as the diagnosis.
- Similarly, her exam is not suggestive of **Haglund's deformity**; furthermore, this patient would be relatively young for this condition.