

# Causes and prevention of low back pain in young athletes

Laura Purcell; Canadian Paediatric Society, Paediatric Sports and Exercise Medicine Section



Low back pain in young athletes must be taken seriously to avoid delays in diagnosis and treatment (1,2). The etiology of low back pain in youths is usually significantly different from that in adults (1-4). Low back pain in youths tend to result from structural injuries, such as spondylolysis, whereas disc pathology and muscular strain are uncommon (3).

Low back pain is a common complaint in paediatric athletes, occurring in 10% to 15% of participants (5). This incidence is higher in sports such as football, figure skating, gymnastics and soccer (1,2,4-7).

The present article reviews some of the causes and management of low back pain in young athletes (Table 1).

## RISK FACTORS

Adolescents may be predisposed to back injuries because of muscle imbalances, inflexibility, structural differences of the spine and improper training. During growth spurts, muscles and ligaments cannot keep pace with bone growth, causing decreased flexibility and muscle imbalances (5,6).

Structural differences in the paediatric spine include growth cartilage and secondary ossification centres, which are susceptible to compression, distraction and torsion injury (5,7). Cartilaginous end plates and ring apophyses overlying the epiphyseal growth plates at either end of the vertebral bodies may be damaged by repeated flexion of the spine. In addition, with repetitive spinal flexion, intervertebral discs may herniate through the ring apophysis, which is a secondary ossification centre. Furthermore, ossification of the pars interarticularis may be incomplete, predisposing to spondylolysis (2,5).

Back injuries can result from poor technique and excessive training, particularly during periods of rapid growth (5). The appropriate amount and intensity of training for young

athletes varies from person to person because each athlete tolerates training differently, which may change as the person grows and matures (2).

## SPECIFIC INJURIES (TABLE 1)

### Spondylolysis

Spondylolysis is a stress fracture of the pars interarticularis caused by repetitive spinal extension and rotation. Sports requiring these movements, such as dance, figure skating and gymnastics, increase the risk of spondylolysis (2,5,7).

Athletes present with insidious onset of extension-related back pain (1,2,5,8). Hamstring flexibility is reduced and there may be pain with impact activities (running, jumping). A physical examination shows hyperlordosis, paraspinal muscle spasm and hamstring tightness.

Investigations include x-rays, bone scan and possibly computed tomography (CT) (Figure 1). Anteroposterior and lateral x-rays may identify anatomical variants and developmental defects, such as spina bifida occulta. Oblique views may demonstrate stress reaction of the pars interarticularis in up to one-third of cases, although routine use of oblique views is discouraged because of the increased radiation exposure (5,8).

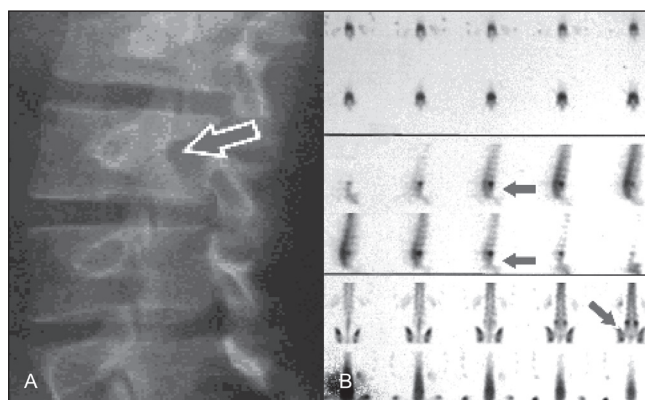
A single photon emission CT bone scan shows increased uptake if there is a bony lesion with active turnover. CT can confirm spondylolysis and monitor healing, but this will require increased radiation exposure (1,5).

Management should focus on avoidance of painful activities (extension movements). Abdominal strengthening, hip flexor and hamstring stretches, and antilordotic exercises should be initiated, preferably by a physiotherapist (2,6,9). Some practitioners recommend custom thoracolumbar orthoses or lumbar braces to limit spinal extension (1,5,8-10). Others advise restriction of activities without bracing (1).

**TABLE 1**  
Causes and treatment of low back pain in young athletes

Condition	Type of pain	Onset	Treatment	Return to play
Spondylolysis	Extension	Insidious	Physiotherapy, rest, with or without brace	4-8 weeks with a brace; 3-6 months without a brace
Posterior element overuse	Extension	Insidious	Physiotherapy, rest, with or without brace	4-8 weeks
Vertebral avulsion fracture	Flexion	Acute	Rest, heat; possibly surgery	3-6 months
Disc herniation	Flexion	Acute; sometimes chronic	Physiotherapy, rest	3-6 months

Correspondence: Canadian Paediatric Society, 2305 St Laurent Boulevard, Ottawa, Ontario K1G 4J8. Telephone 613-526-9397, fax 613-526-3332, Web sites [www.cps.ca](http://www.cps.ca), [www.caringforkids.cps.ca](http://www.caringforkids.cps.ca)



**Figure 1** **A** Oblique x-ray of the lumbar spine. The arrow indicates sclerosis of the pars interarticularis (neck of the 'Scottie dog'), consistent with spondylolysis. **B** Single photon emission computed tomography bone scan indicating increased uptake (arrows) in the pars interarticularis consistent with spondylolysis

If bracing is used, the athlete wears the brace for four to eight weeks until he or she is pain-free. Activity is gradually increased until the athlete is participating fully in activities in the brace with no pain. Then the brace is weaned over the next couple of months (5,8-10). If bracing is not used, the athlete is usually restricted from activity for three to six months or until he or she is pain-free, and then activity is gradually increased until full activity is restored (1). An athlete who has resumed full pain-free activities without a brace is considered to be clinically healed. Most athletes with spondylolysis return to full activities without a brace and without pain within six months.

#### Posterior element overuse syndrome

Posterior element overuse syndrome, also known as 'hyperlordotic back pain' or 'mechanical/muscular back pain', is a constellation of conditions involving the posterior spine, including muscle-tendon units, ligaments and facet joints (3).

Athletes present with an insidious onset of extension-related back pain, similar to spondylolysis. There is focal tenderness of the lumbar spine and the paraspinal muscles may be tender. Investigations in this setting are typically negative.

Ice and nonsteroidal anti-inflammatory drugs (NSAIDs) relieve pain and inflammation. Pain-free activity is allowed (avoidance of extension movements). A program of antilordotic exercises, abdominal strengthening, and hamstring and thoracolumbar stretches should be initiated by a physiotherapist (1,2,5). Antilordotic bracing may be helpful until pain resolves. Athletes are usually able to resume full activity without pain within four to eight weeks.

#### Vertebral body apophyseal avulsion fracture

Repetitive spinal flexion and extension can injure the ring apophysis, resulting in fractures that may posteriorly displace into the spinal canal, along with the intervertebral disc (2,6). Avulsion fractures occur in sports such as volleyball, gymnastics and weightlifting (2,6). Athletes present with acute-onset flexion-related lumbar pain, similar to disc herniation, although with no associated neurological

symptoms. On examination, there may be spinal flexion and extension limitation, and paraspinal muscle spasm.

Lateral lumbar spine x-rays may show an ossified fragment in the canal. CT is the preferred imaging procedure to identify the displaced apophyseal fracture, which may be missed with magnetic resonance imaging (MRI).

Management includes rest, heat and NSAIDs. Athletes may need to rest for three to six months to allow for resolution of their symptoms. Significant neurological findings, such as significant leg weakness or loss of bladder/bowel control, necessitates surgical excision of the fragment (2,6,9).

#### Disc herniation

Only 11% of young athletes with low back pain have acute disc herniation of the lumbar spine (3). Pain is usually acute in onset, flexion-related and associated with back muscle spasm, hamstring tightness and, sometimes, buttock pain (2,4,5,7). Radicular symptoms (muscle weakness, paresthesias) are uncommon (1,6). Examination demonstrates decreased flexion, positive straight leg raise and occasionally decreased reflexes/strength of the lower extremities.

Lumbar x-rays can rule out associated pathological conditions, such as fractures or tumours. MRI can demonstrate the extent of herniation, including nerve root impingement, but is reserved for progressive or refractory symptoms. Because MRI can be overly sensitive for disc herniation, clinical correlation is important.

Most patients improve with conservative management, including NSAIDs and physical therapy, within three to six months. Surgical indications include cauda equina syndrome (loss of bowel/bladder function and leg paralysis resulting from nerve compression), progressive neurological deficit or refractory pain (2,5,7,9).

#### Other causes of low back pain

Inflammation, infection, tumours and visceral pathology can present as back pain. 'Red flag' symptoms such as fever, night pain, neurological abnormalities, weight loss and malaise should prompt further investigation (1,2,5,6,9).

#### PREVENTION

Recognition of risk factors, such as excessive training, improper technique and muscle imbalances/inflexibilities, is key to preventing injury (2). Training should be reduced during rapid growth. An emphasis should be placed on proper techniques. Injury risk can be reduced by core-strengthening exercises, and hamstring and hip flexor stretches (2,6).

#### RETURN TO PLAY GUIDELINES

Return to sport recommendations must be specific to the diagnosis, sport/activity, age and maturity of the child, and cooperation of the athlete, parents and coaches (2,6). Generally, relative rest allows healing; painful activities should be avoided. Young athletes may require a note to be excused from physical education classes and from participation in their sport until symptoms resolve. Once pain-free range of motion and normal strength has been obtained, athletes can return to full sport participation.

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**Principal author:** *Dr Laura Purcell, London Health Sciences Centre, London, Ontario*

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The recommendations in this statement do not indicate an exclusive course of treatment or procedure to be followed.

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