

[Orthopaedic Surgery]

Spondylolysis in Elite Junior-Level Ice Hockey Players

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Background: Spondylolysis is a common cause of low back pain and significant loss of play in the young athlete. Its incidence in hockey players has not been reported. This study reviewed the incidence and potential causative factors of low back pain and spondylolysis in an elite junior-level ice hockey program over a 15-year period.

Hypothesis: Because of the repetitive movements of the lower spine required by the sport, spondylolysis was expected to be a frequent cause of low back pain in hockey players.

Study Design: Retrospective case review.

Level of Evidence: Level 4.

Methods: The medical and athletic trainer records of male ice hockey players, ages 15 to 18 years, who presented with the complaint of low back pain were reviewed. This elite program consisted of 2 rosters. There were approximately 44 players total per year representing these 2 teams. For players diagnosed with spondylolysis, the following factors were reviewed: year in the program, age at presentation, symptoms and duration, studies performed, level of spondylolysis, presence of spondylolisthesis, affected side to shooting side, player position, treatment, and current level of play.

Results: Over 9 hockey seasons, 25 players presented to medical staff with low back pain. Of those, 44% were confirmed to have lumbar spondylolysis. The majority of these cases presented in the first year of the program without clear history of trauma but rather vague pain with weight lifting or hockey. Less than half of spondylolysis cases were diagnosed on plain films. There were no cases of spondylolisthesis. Spondylolysis occurred on the shooting side in 73% of players. Sixty-four percent of players with spondylolysis were forwards. The treatment for most included rest from lifting and hockey and physical therapy. Average return to play was 8 weeks. Ninety-six percent of players continued to play at an elite level.

Conclusion: Spondylolysis should be strongly considered in the differential of low back pain in ice hockey players with consideration for advanced imaging. Considerable loss of play occurs with spondylolysis, but with proper treatment, excellent outcomes occur.

Clinical Relevance: This study brings to light the prevalence of spondylolysis in ice hockey players. With an increased index of suspicion, the condition can be diagnosed and properly treated to allow full return to play.

Keywords: spondylolysis; low back pain; spine; pars interarticularis; hockey; adolescent athlete

Spondylolysis is a frequent cause of low back pain in the adolescent athlete. In the adult population, the incidence has been shown to be about 5%, whereas in young athletes who presented with low back pain, nearly half were diagnosed with spondylolysis.¹⁶ By definition, this injury is a fracture or defect in the pars interarticularis of the spine. It is most common at the level of L5, followed by L4.^{2,23}

The proposed mechanism of injury is a stress injury caused by repetitive flexion, extension, and truncal rotation of the spine.¹² For this reason, the injury is commonly seen in sports that require such motion of the spine, including gymnastics, dance, tennis, football (linemen), weightlifting, and rowing.¹⁸ It has also been reported in soccer, perhaps from the motion of the spine involved with kicking the ball.¹⁰

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The author reports no potential conflicts of interest in the development and publication of this manuscript.

DOI: 10.1177/1941738113519958

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Athletes with spondylolysis typically present with low back pain of acute or insidious onset and classically have pain with extension localizing to the area of the pars affected, either unilateral or bilateral. Rarely are neurologic symptoms present. The pain is relieved by rest.

Diagnosis may be made by plain radiographs, although these have poor sensitivity in detecting spondylolysis.²² Much controversy exists regarding the choice of additional imaging that is usually necessary for diagnosis or confirmation; current options include bone scan with SPECT (single-photon emission computed tomography), CT, or MRI.⁵

Treatment for this condition is rest from the offending sport as well as physical therapy addressing core weakness, hamstring flexibility, and back stabilization. Although controversial, rest from sport recommendations ranges from 6 to 12 weeks, with or without bracing in an antilordotic brace.^{4,7-9,11,15,19,21} Spondylolysis rarely goes on to surgery. Surgery is considered after failed conservative treatment of 6 to 9 months.⁶ Typically, athletes recover with minimal long-term disability and good to excellent outcome.¹⁷

METHODS

This study, which was approved by our Institutional Review Board (University of Michigan), was conducted by reviewing the medical records and athletic trainer records of elite junior-level ice hockey players in a single program over 15 years (1996-2011). All players were boys between the ages of 15 and 18 years. Those players who presented to either the trainer or team physician with the complaint of low back pain were identified. Year of diagnosis, age at presentation, year in program, symptoms at presentation, duration of symptoms at presentation, studies performed, and the diagnosis/cause of low back pain were identified. When spondylolysis was diagnosed, the following information was collected: level of spondylolysis, the affected side, presence of spondylolisthesis, shooting side, shooting to spondylolysis side, and player position. The treatment was reviewed with attention to time to return to play. Finally, the current level of play and years from diagnosis were reviewed.

RESULTS

Medical records from 9 hockey seasons were available for review over the years 1996 to 2011. During those seasons, there was documentation of 25 players presenting to the team physician for the complaint of low back pain. Of those 25 players, 11 (44%) went on to have a confirmed lumbar spondylolysis. The various causes of low back pain identified are listed in Table 1. Further data were reviewed for these cases of spondylolysis to better understand potential contributing factors.

The majority (73%) of those players diagnosed with spondylolysis presented in the first year of the program. Twenty-seven percent presented in the second year. Of the 11 spondylolysis cases, 6 were diagnosed at the age of 16 years

Table 1. Nonspondylotic causes of low back pain diagnosed

Lumbar strain
Interspinous ligament injury
Disc herniation
Lumbago
Mild degenerative disc disease
Bulging disc
Sacroiliac dysfunction
L3 transverse process fracture
Contusion

(55%), followed by 4 at the age of 17 years and 1 at the age of 15 years. Of those cases that presented in the first year of the program, 50% presented in the first half of the season.

All players with spondylolysis presented with low back pain. Most were of gradual onset without recall of injury. Two players noted back pain most predominant with weight lifting, and 1 player noted pain after dry land exercise of wrestling. Most, however, simply had vague low back pain that occurred with hockey. Reproducible pain on extension was documented for 9 of the 11 players (82%). Only 1 complained of numbness, tingling, and pain into the buttock. Otherwise, there were no neurologic symptoms encountered at the time of presentation or during the course of treatment. None of the players had any slippage or spondylolisthesis.

All players had plain films obtained at the time of presentation or soon after. Less than half (45%) of those spondylolysis diagnoses were based on evidence seen on the initial radiographs. Other studies that were utilized included triple-phase bone scan, bone scan with SPECT, CT, or MRI. In review, there was no evidence of a specific protocol followed for study selection. The variety of studies ordered was likely due to different provider preference and evolving recommendations over the 15-year period for the study of choice to evaluate spondylolysis.

The level of spondylolysis occurred at L5 the majority of the time (55%), followed by L4 (36%) and 1 L4-L5 involvement (9%). We reviewed the side of the spondylolysis in relation to shooting side. Spondylolysis occurred on the same side as the player's handedness or shooting side in 73% of the cases, in contrast to 27% with a spondylolysis contralateral to the shooting side. This suggests that repetitive twisting of the spine with shooting might predispose to the injury.

Most of those with spondylolysis (64%) were forwards. The remaining cases were defensemen, of whom 67% had contralateral spondylolysis. No goalies presented to a physician with the complaint of low back pain.

Two spondylolysis cases were recurrent. One presented at 6 months after the first diagnosis and the second at 8 months after diagnosis. Both patients had returned to play during the season pain-free during the interval. The second recovery was uneventful for both, and despite concern that the prognosis may be less optimal given the recurrence, both these players are currently playing high-level hockey.

The treatment for all injured included full rest from hockey and lifting and a course of physical therapy with continued rehabilitation exercises. The majority focused on core strength, flexibility, and antilordotic back stabilization. Custom bracing was utilized in 5 players (45%); the reasoning for bracing was not clearly evident on review of records. Bone stimulation was used in 2 players (18%). This modality was used in a player with recurrent injury as well as another player suffering with spondylolysis at the same point in the season. It did not affect return to play in either player. Surgery was not necessary in any player.

Return to play ranged from 6 to 12 weeks, with an average of 8 weeks. Bracing did not consistently correlate with earlier return to play.

Of the players with spondylolysis and other causes of low back pain, only 1 has retired from ice hockey. The remaining 24 (96%) continue to play at an elite level, ranging from juniors to Division I collegiate to professional.

DISCUSSION

While the numbers in the study are small, these results demonstrate a clear risk for spondylolysis in ice hockey players that poses considerable loss of play. Calculating the incidence of spondylolysis in this group is difficult because of fluctuations in players on the roster over any given season. With approximately 44 players each season over the 9 years for which data were available, the approximate incidence was 3%. However, we propose that this does not properly reflect the likely true incidence of this injury. In recent years, with an increased index of suspicion, there have been larger numbers diagnosed. In fact, there were seasons in which 2 players on the 22-player roster were out for 6 to 12 weeks because of spondylolysis. Unlike more frequent hockey injuries, such as lacerations and acromioclavicular separations,²⁰ spondylolysis is an injury that leads to significant loss of play. Even with common, more serious injuries—for example, concussions in ice hockey players—the majority of players typically are able to return to play within 10 days.^{1,3,13} Although nearly all players in our spondylolysis cases returned to high-level hockey, the loss of playing time and development due to the injury was considerable.

Difficulties in this review lie in the nature of reviewing team records. There were meticulous records kept by the athletic trainers and team physicians; however, it was still difficult to identify every case and cause of low back pain. In fact, in a season in which no player presented to the team physician for complaints of low back pain, there were 28 injuries treated by the training staff for low back issues. This suggests that

low back pain is even more common in ice hockey than what this study demonstrated, but causes are difficult to identify in review of these types of records.

Our results suggest that shooting the puck may be a contributing factor for this injury, as the majority of cases involved spondylolysis on the shooting (ipsilateral) side. Olympic-style weight lifting utilized by this group is also thought to be a contributing factor to low back pain.¹⁴ None of the cases of spondylolysis involved acute trauma, which suggests that these cases were a result of accumulative stress at the pars interarticularis, rather than an acute contact event.

CONCLUSION

Lumbar spondylolysis is a common source of low back pain in adolescent athletes. Advanced imaging should be pursued for persistent low back pain in a hockey player, especially those with pain in extension. The injury comes with considerable loss of play and time for full recovery with extensive rehabilitation. Fortunately, with a high index of suspicion and early detection, these injuries can fully recover with excellent outcomes, as shown by the continued elite level of play by these ice hockey players.

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