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A posterior ring apophyseal fracture and disc herniation in a 21-year-old competitive basketball player: a case report

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Objective: *To describe the diagnosis and management of a competitive male basketball player with discogenic low back pain and presence of an old posterior ring apophyseal fracture (PRAF). This case will highlight the importance of early recognition and considerations regarding patient management for this differential of radiating low back pain.*

Clinical Features: *A 21-year-old provincial basketball player presented with recurrent radiating low back pain into the left groin and lower limb. After several weeks of persistent symptoms including pain, muscle weakness, and changes in the Achilles deep tendon reflex, imaging was obtained that revealed a large disc extrusion with an old posterior ring apophyseal fracture. In collaboration*

Objectif : *D*écrire le diagnostic et la prise en charge d'un joueur de basketball de compétition atteint de lombalgie d'origine discale et présentant une ancienne fracture des apophyses postérieures. Ce cas mettra en évidence l'importance d'un dépistage précoce ainsi que des considérations relatives à la prise en charge du patient pour ce différentiel de lombalgie irradiée.

Caractéristiques cliniques : *Un joueur de basketball provincial de 21 ans présentait une lombalgie irradiée récurrente au niveau de la partie gauche de l'aine et du membre inférieur. Après plusieurs semaines de symptômes persistants parmi lesquels la douleur, une faiblesse musculaire et des modifications du réflexe achilléen, l'imagerie médicale a été obtenue. Cette dernière a révélé une importante extrusion discale ainsi qu'une ancienne fracture des apophyses postérieures. En collaboration avec un chirurgien spécialiste de la colonne vertébrale et un médecin de famille, le patient a été soigné à l'aide d'une approche multimodale conventionnelle. Le traitement consistait en des mobilisations graduelles, en*

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with a spine surgeon and family physician, the patient was treated using a conservative, multimodal approach. Treatment consisted of graded mobilizations, spinal manipulative therapy, interferential current, and soft tissue therapy to the lumbar spine. Rehabilitation exercises focused on centralizing symptoms and improving strength, proprioception and function of the lower limb. After a period of 8 weeks, the patient was able to complete all activities of daily living without pain in addition to returning to basketball practice.

Summary: *PRAF is a unique condition in the immature spine and recent evidence suggests that those involved in sports requiring repetitive motion of the lumbar spine may be at increased risk. The astute clinician must consider this differential in young populations presenting with discogenic low back pain, as a timely diagnosis and necessary referral may allow for effective conservative management to reduce symptoms. Equally as important, one must be aware of the complications from PRAF as a contributing source of low back pain and dysfunction into adulthood. Knowing when to refer for advanced imaging and/or a surgical consult given the variable clinical presentation and prognosis is an essential component to care.*

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KEY WORDS: chiropractic, case report, posterior ring apophyseal fracture, PRAF, posterior limbus bone

des manipulations vertébrales, en une électrothérapie à courants interférentiels, et en un traitement des tissus mous au niveau du rachis lombaire. Les exercices de rééducation étaient axés sur la centralisation des symptômes et l'accroissement de la puissance, de la proprioception et du fonctionnement du membre inférieur. Après huit semaines, le patient était en mesure de réaliser l'ensemble des activités de la vie quotidienne sans ressentir de douleur et de reprendre les entraînements de basketball.

Résumé : *Les fractures des apophyses postérieures sont un état unique de la colonne vertébrale immature. Des données probantes récentes suggèrent que les sujets pratiquant une activité sportive requérant un mouvement répétitif du rachis lombaire peuvent présenter un risque plus élevé. Les cliniciens avisés doivent tenir compte du différentiel chez les populations de jeunes personnes souffrant d'une lombalgie d'origine discale dans la mesure où un diagnostic en temps opportun et un aiguillage nécessaire peuvent permettre une prise en charge conventionnelle efficace pour réduire les symptômes. Il est tout aussi important et nécessaire d'avoir connaissance des complications associées aux fractures des apophyses postérieures, qui peuvent entraîner une lombalgie et un dysfonctionnement du rachis lombaire à l'âge adulte. Savoir quand se référer à des technologies d'imagerie de pointe ou à l'avis d'un chirurgien au vu de la présentation clinique et du pronostic variables est une composante essentielle du traitement.*

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MOTS-CLÉS : chiropratique, étude de cas, fracture des apophyses postérieures, os limbique postérieur

Introduction

Lumbar disc herniation is a common condition which has been reported to affect as many as 40% of adults in their lifetime.[1] Rarely in adults, lumbar disc herniations are associated with posterior ring apophyseal fractures (PRAF).[1] Also known as posterior limbus bones or fractures, these injuries are unique to the immature spine and are characterized by separation of an osseous fragment at the superior or inferior edge of the posterior vertebral body.[1,2] In pediatric patients (those <18 years of age), the incidence of reported lumbar disc herniation is substantially lower than adults, with ranges in the literature falling between 0.5-5%.[2,3] Despite these findings, the occurrence of PRAF is a far more common entity present in pediatric patients with associated lumbar disc herniation. Recent literature reporting the incidence of PRAF occurring in conjunction with pediatric disc herniation ranges from 19-42%.[4-6]

Managing disc-related injuries in the pediatric and

adolescent populations pose difficulty to the clinician as the history, clinical presentation, and response to care can be highly variable and atypical when compared to adults. Injuries such as PRAF and pars interarticularis fractures are unique to the immature spine and can mimic disc-like symptoms.[6] Unlike adult lumbar disc herniation, it has been reported that approximately 30-45% of pediatric patients suffer from a history of trauma, such as heavy lifting or athletic activity, prior to developing discogenic symptoms.[3,7-10] Furthermore, it has been theorized that PRAF can occur in adolescent athletes as a result of cumulative or repetitive stress from sport-dependent movements.[9] With these issues taken into consideration, it is imperative to understand the clinical presentation in young active populations and to be aware of unique structures that are vulnerable in the skeletally immature spine. Since skeletal maturity may not be reached until the ages of 18-25 years, formulating a differential diagnosis that includes PRAF in children, adolescents, or young adults presenting with discogenic symptoms, is essential for patient management.

The purpose of this paper is to discuss the clinical presentation and management of a case involving a posterior ring apophyseal fracture in a 21-year-old male provincial basketball player with a subsequent lumbar disc extrusion. An update on the literature regarding this pathology will highlight relevant features of the clinical presentation, diagnosis, and patient management.

Case Presentation

A 21-year-old male provincial basketball player sought chiropractic care for an episode of insidious left-sided radicular low back pain that travelled into the posterior thigh, lateral leg and ankle that persisted for eight days. He could not recall a specific mechanism of injury, but stated that pain began after participation in a recent weekend tournament with approximately 5 games in three days. In addition to the leg pain, the patient described a sharp, spasm-like pain in the left groin. The intensity of the pain was rated 8/10 on a visual analogue scale (VAS) and was most aggravated by prolonged sitting (greater than 1 hour), flexed postures, putting on socks and shoes, and participation in basketball and off-court resistance training. Activities most provoking during sport were repetitive sprints, intervals of dribbling, and running. Both coughing and straining during resistance exercise aggravated his groin symptoms. Short-term relieving factors included relative rest while lying on his back with a pillow underneath his legs.

Past medical history revealed a severe episode of acute low back pain that occurred two years prior when he was 19 years old. At the time, the pain was significant and sidelined him from off-season training and basketball for several weeks. Although he could not recall a specific onset or mechanism of injury, he stated that the acute low back pain began one evening after taking part in a lower body conditioning session that included squats, deadlifts, and interval training. He did not seek any medical attention during the episode of acute low back pain and reported that his symptoms subsided with relative rest over several weeks. Since that incident, the patient reported a two-year history of recurrent local, non-radiating low back pain that would present intermittently after rigorous activity. The patient reported no previous imaging, medical management, or health concerns other than his recurrent low back pain.

Physical examination revealed an alordotic posture, while gait analysis demonstrated fatigability in left toe and heel walking. Both active and passive lumbar flexion were reduced to 20° due to recreation of groin pain and tension in the posterior left limb. All other active, passive and resisted ranges of motion in the lumbar spine and hips were unremarkable. Palpation and resisted muscle testing for the hip musculature on the left was unremarkable and unable to reproduce the chief complaints. Provocative orthopaedic testing for the sacroiliac joint, including the thigh thrust, sacral thrust, and both sacroiliac joint compression and distraction tests, were also negative bilaterally. Active and passive straight leg raise (SLR) were positive at 35° on the left with recreation of groin and leg symptoms. Crossed SLR recreated groin and low back pain at 80°. Palpation revealed hypertonicity in the lumbar paraspinal musculature and tenderness with spinous challenge at L3-S1. Motion palpation revealed local painful restriction with rotation and posterior-anterior joint challenge at L2-S1, while Kemp's test caused local pain bilaterally at L3-5. Neurological evaluation for the lower limb revealed weakness in left ankle range of motion, as dorsiflexion, plantar flexion and great toe extension were rated 4/5. The left S1 (Achilles) deep tendon reflex was rated 1+ and deemed asymmetric in comparison to the right. Sensory findings were intact and symmetrical for the lower limb.

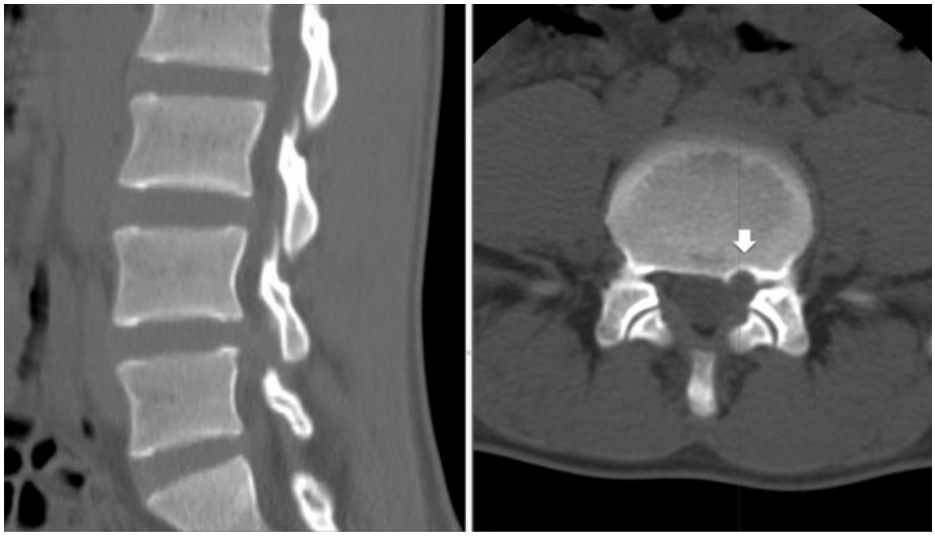

Figure 1.
Sagittal CT bone window lumbar spine (left) and axial CT bone window of the superior endplate of L5 (right). There is a semi-oval bony erosion at the left posterolateral corner of L5 vertebral body with suggestion of a defect at the adjacent endplate rim (white arrow).

A working diagnosis of a left posterolateral L4-5 disc herniation was made and the patient was referred to his family physician for radiographs given his previous history and current neurological findings. Within two days of the initial examination, results from plain radiographs were taken and read negative for lumbar spine pathology. As such, a conservative plan of management was initiated and included a multimodal approach over a 4-week period, 2 times per week. The first two weeks of treatment consisted of interferential current (IFC), soft tissue therapy, spinal mobilizations, spinal manipulative therapy (SMT), and rehabilitation exercises. As the patient was most comfortable side-lying (left side facing up), IFC was applied to the lumbar spine in this position for 15 minutes at a frequency of 80-150 Hz (continuous) at an amplitude providing a gentle paraspinal muscle contraction. Following the IFC application, soft-tissue techniques were used that involved stretching and mobilizing the paraspinal muscles while the patient remained in the side-lying position. In the first week of treatment, grade II and III segmental lumbar spine mobilizations achieving flexion and rotation were implemented. As treatment sessions progressed, side-lying spinal manipulative therapy was applied to the affected segments in the lumbosacral spine. The initial goals of rehabilitation exercises were to centralize the radiating low back pain and facilitate core stability and endurance. Initial rehabilitation exercises included the McKenzie protocol[11,12] to centralize radicular symptoms. This was utilized in the first two weeks as the patient laid prone and created lumbar extension by lifting their chest off the ground with elbows contacting the floor (push up position). Since pain was centralized to the low back with this procedure, the patient was instructed to perform this hourly for 10-15 minutes as tolerated. The patient was also taught abdominal hollowing and core bracing with use of the modified curl-up exercise in the first weeks of treatment.[13] This was performed as the patient was supine with one leg extended (parallel to the floor) while the other was positioned in 45° knee flexion and 90° hip flexion.[13] The patient was asked to co-contract core musculature in this position via active feedback from the practitioner palpating the abdomen and low back. Education was provided in which the patient was made aware of provocative postures and taught to bend at the hips to avoid flexion of the lumbar spine (hip-hinge).[13] Additionally, he was instructed to modify daily activities, which included avoiding sport until signs and symptoms had resolved.

After two weeks the patient only found relief of radicular pain during the McKenzie exercises. As such, the family physician ordered computed tomography (CT) images at the end of the second week. CT images demonstrated an intraspinal and extradural mass at the entrance of the left L5-S1 lateral recess with a focal defect in the vertebral body of L5 (Figure 1). Since the CT images could not differentiate the mass, magnetic resonance

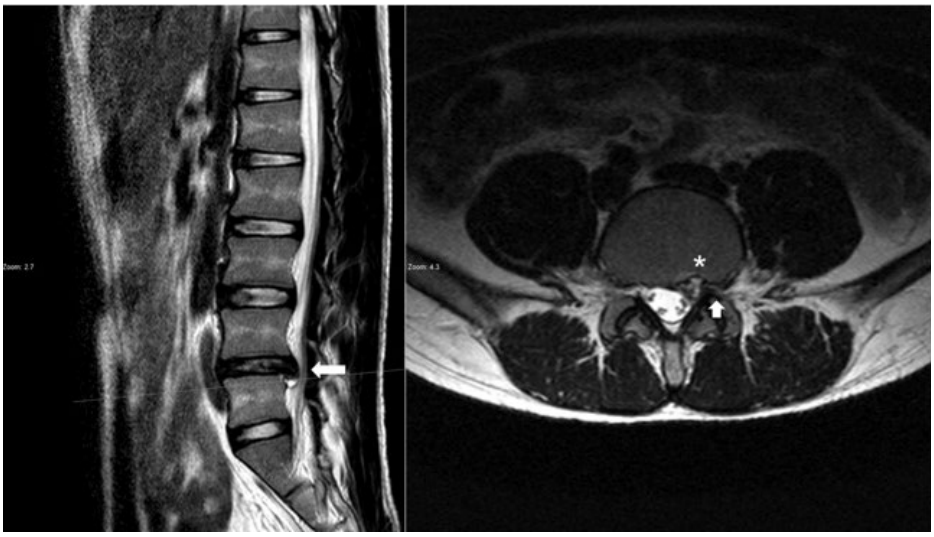

Figure 2.
Sagittal T2 weighted MRI lumbar spine (left) and axial T2 weighted MRI at the level of the L5 superior vertebral endplate (right). There is a large left paramedian and intraforaminal disc extrusion occluding the entrance of the left L5-S1 lateral recess (white arrows). There is a semi-circular rim defect is seen at the left posterolateral corner of the L5 superior endplate consistent with an old type III PRAF (white asterisk).

(MR) imaging and a consult with a spine surgeon was initiated. MR imaging was obtained during the 5th week of treatment and confirmed a large paramedian disc extrusion at L4-5 with compression of the left L5 nerve root and posterior displacement of the left S1 nerve root. It also identified an old type III posterior ring apophysis fracture at the superior endplate of L5 (Figure 2). The spine surgeon had suggested continuing with a conservative plan of management and would monitor his symptoms over the next 8-12 weeks.

At 6 weeks, the patient's symptoms began to subside significantly (3/10 on VAS) and he had attributed this to an increased focus on core strengthening and bracing with activity. While soft tissue therapy and SMT continued to be the predominant form of passive therapy, rehabilitation exercises had progressed to place more emphasis on maintenance of a neutral spine during dynamic activities, especially those requiring flexion-extension. Exercises included the modified curl-up, front plank, side-bridge, supine gluteal bridge, and bird-dog.[13,14] These exercises were preformed daily at a volume of 2-3 sets with 12-15 repetitions. The front planks and side bridges were performed with three repetitions utilizing 45-second holds. Wall squats with an exercise ball placed behind the torso was used to teach the patient active core bracing and maintenance of a neutral spine in a dynamic upright posture. Progressions from this exercise included static single leg variations to enhance proprioception and balance.

At 8 weeks, the patient was able to return to basketball practice as he had no further provocative pain or functional issues. Progressive rehabilitation exercises focused on dynamic core stability, endurance, and whole-body strength which included goblet squats, farmer-carries, multi-angle lunges, and standing Pallof presses. Following 2 weeks of basketball practice and rehabilitation exercises with no exacerbation of previous symptoms, he was able to return to game play at 10 weeks.

Discussion

This case highlights several important issues that can complicate clinical decision making when young adults or adolescents present with discogenic low back pain. Although there is no objective way to measure the contribution in which the disc extrusion or existence of an old PRAF had on pain or dysfunction, early detection is essential for optimizing patient management. Therefore, it is necessary for clinicians to recognize the clinical presentation and implement best-practices regarding this pathology for a timely diagnosis and prompt orthopaedic referral.

Posterior ring apophyseal fractures most commonly present in children and adolescents.[11] These types of fractures occur almost exclusively with the presence of a single level lumbar disc herniation and are more prevalent in those who are overweight or obese.[6] True incidence is difficult to estimate as these types of fractures are fre-

quently undetected when they occur in combination with lumbar disc herniations.[5] Further complicating the incidence of PRAF, lumbar disc herniations are themselves rare in children and adolescents, occurring in as little as 3% of those who presented with low back pain below the age of 20 who needed surgery.[16] To date, PRAF have been estimated to occur in 0.5-6.8% of those adolescents who present with lumbar disc herniation.[12] PRAF presents most frequently at the levels of L4, L5, and S1, but can occur anywhere from the 12th thoracic vertebra to the second sacral vertebra.[17] The L5 and S1 superior vertebral body endplates have been shown to be the most common area for these lesions.[9] Among acute trauma, participation in sports such as weight lifting or gymnastics are the most cited risk factors for this type of injury.[16,17,19] Males are almost three times more likely to suffer a PRAF since the ring apophysis fuses later in age than females.[19] The ring apophysis appears around the age of 5 in children and begins to ossify between the ages of 6 and 9 years.[4] Fusion typically occurs between the ages of 11 and 15 years in females and between 14 and 17 years in males. Complete fusion does not often occur until the ages of 18-25 and can leave the annulus fibrosis of the vertebral body vulnerable to insult.[7] The mean age for those found to have PRAF is 14 years, but the reported range in age is variable from 8 to 69 years.[16] Genetics have also been shown to predispose an individual to this type of injury, as gymnasts with a TT genotype of COL1181 were found to have a higher incidence of PRAF due to the decreased tensile strength of their collagen.[20]

Several theories exist regarding the etiology of PRAF, though it is widely thought that age, activity level, and trauma are the main factors that can lead to this injury.[21] Acute macrotrauma has been associated with 30-60% of patients presenting with a PRAF.[22] A fatigue phenomenon (microtrauma) has also been proposed from repetitive compression and shear stress on the annulus fibrosis.[19,21,22] Some authors have postulated that injuries such as PRAF and pars stress reactions may be due to early sport specialization, as children expose themselves to similar repetitive motions that chronically load the non-fused structures in the spine.[23] Recent finite element model studies have provided evidence that repetitive stress to the posterior ring in extension ultimately weakens the structure, making it more prone to avulsion with tensile loads in flexion.[24,25] Additionally, the material properties of the ossified apophyseal ring is subject to significantly higher stresses than both the adult (fused) and earlier cartilagenous models.[24,25] This may explain the higher prevalence of PRAF between the ages of 11-17 years.[25]

Table 1.
Differential diagnoses for PRAF

Macro & Microtrauma	Pars Stress Continuum Disc herniation SCIWORA
Space Occupying Lesion	Disc herniation Tumours Cysts
Infection	Discitis
Mechanical Low Back Pain	Facet irritation/syndrome Sacroiliac joint syndrome Paraspinal strain Dynamic muscular instability

SCIWORA: spinal cord injury without radiographic abnormality

Clinical presentation of PRAF is difficult to differentiate from other forms of discogenic low back pain in children, adolescents and young adults. Several competing differential diagnoses are essential to rule out, such as infection in young populations (Table 1). Since PRAF in the lumbar spine most often occurs with a subsequent disc herniation, one must recognize signs and symptoms of pediatric disc herniation.[5,7,9,26] Unlike adults, pediatric disc herniations typically have a prior history of trauma, usually from athletic activity resulting in falls or trauma sustained from heavy lifting.[7,26] Probing the patient for a family history regarding disc herniation has also been suggested due to familial-linked issues in connective tissues formation.[7,27] Singhal et al.[1] found that 13-57% of pediatric patients with disc herniation have a first degree relative whom also suffers from disc herniation, further suggesting familial predisposition to the condition.

A recent review by Wu et al.[18] found that the most common signs and symptoms of those suffering from PRAF include paravertebral muscle spasm and tenderness, diminished deep tendon reflexes, sensory loss and motor loss.[18] It has been suggested by some authors that radiculopathy without back pain is the most common symptom.[7] However, Ozgen et al.[28] reported that 88% of their adolescent

disc herniation patients presented with a chief complaint of low back pain, and just 35% had pain along the L4-S1 dermatomes. Valsalva manoeuvres, forward lumbar flexion, and assessment of bowel and bladder dysfunction for potential complication of Cauda Equina Syndrome (CES) have been indicated as important parts of routine screening for detection of pediatric disc herniation.[7] The literature suggests evaluating for sensory deficit, manual motor testing, deep tendon reflexes, and using the straight leg raise test for detection of a pediatric disc herniation.[7,26] Several authors have presented cases of adolescent PRAF in which patients demonstrated a marked reduction in straight leg raise testing (as minimal as 30°) with minimal pain accompanying the finding.[16,21,30,31]

When PRAF presents in adulthood, physical signs and symptoms are similar to lumbar disc herniation.[2,5,17,18,32,33] A recent study found that in adult patients who underwent surgery for lumbar disc herniation and PRAF, 99.1% suffered from low back pain and leg pain, 9.8% had bilateral leg pain, and 13.8% of patients demonstrated unilateral leg weakness.[6] In adults, the most common symptoms of lumbar PRAF included low back pain with or without a history of trauma along with radicular pain in one or both legs.[9] It was also suggested that those who suffer from PRAF have greater severity of symptoms than those who suffer from lumbar disc herniation alone.[5,18]

Since PRAF is an imaging-dependent diagnosis and that it often presents similar to lumbar disc herniation alone, this injury is easily missed when initial conservative management is effective. When there is concern in the clinical history to warrant imaging, techniques such as radiographs, MRI and CT can all be used to diagnose PRAF. Lateral lumbar radiographs have been shown to detect PRAF at a rate of 79.3%, with a visible wedge-shaped osseous fragment along the posterior corner of the vertebral body.[22] The difficulty with diagnosing PRAF at L5-S1 on plain radiographs occurs from the osseous overlap of the iliac crest as witnessed in the case presented.[17] MRI does not use ionizing radiation and provides a better evaluation of soft tissue lesions and degree of spinal stenosis. However, small PRAF are often missed on MRI due to low signal intensity.[23] As such, CT is the diagnostic study of choice as it has a sensitivity and specificity reaching 100% and is also able to detect PRAF previously missed in plain radiographic and MR studies.[1,6,22,23]

Takata et al.[34] proposed a classification that is subdivided into three categories based on CT findings. Type I corresponds to a simple separation of the posterior vertebral margin without bony defect; type II represents a fracture on the posterior margin with avulsion from the vertebral body; and type III consists of a small posterior fracture due to a cartilaginous irregularity of motor plate.[34] An additional class of type IV lesions was developed to describe a complete dislocation of the vertebral body posterior wall.[32] Types I, II, and IV lesions are more clinically significant, occur in younger patients, cause more bilateral symptoms, and are more likely to be surgical candidates.[18,22] Type III lesions occur in older adolescents or young adults as most of the ring is fused. These have been shown to be less clinically significant, present unilaterally, and both conservative and microsurgical approaches are favoured.[18,22] The patient in our case presented with a type III lesion, suggesting an onset later in adolescence which may have been a factor contributing to success with conservative interventions (Figures 1 and 2). Most often, CT classifications systems categorize lesions based on the size and location of the lesion. Lesions that are large (greater than 50% of the width of the posterior vertebral body wall) are more likely to be clinically significant and surgical candidates.[14] Chang et al.[5] reported patients with small central or lateral fragments had excellent results with conservative treatment, while patients with large fragments had poor results.[5,18] Therefore, imaging findings may help the clinician provide more insight to the relative prognosis of the patient or aid in directing appropriate conservative management strategies.

Currently, there are controversial and contradicting theories to determine whether a patient should receive conservative or operative treatment for PRAF. Wu et al.[18] concluded that indications for surgery include: failed trial of conservative care (6-12 weeks), declines in neurological status, intolerable low back and/or leg pain, severely affected function (ADLs), and any signs of CES. The principles of conservative treatment for PRAF are similar to those for a herniated nucleus pulposus.[23] This includes bed rest, analgesic and non-steroidal anti-inflammatory drugs, physical therapy and activity modification with or without lumbar braces.[18,23] However, the duration for attempting conservative treatment has not been consistently reported with some trials lasting 6-12 weeks, and there is considerable heterogeneity in baseline patient characteristics.[18] Another important consideration in response to

conservative care is age. Children and adolescents have been reported to have less favourable response to conservative care when they have both PRAF and lumbar disc herniation present. Damage to the annulus fibrosis from trauma, state of the nucleus pulposus, presence of larger osseous fragments, and issues with treatment compliance have all been cited.[18] When conservative therapy is ineffective or the patient maintains persistent back pain that adversely compromises daily activities, regardless of neurological deficits, the need for operative treatment has been emphasized.[18,23] The debate whether or not the bony fragment should be removed during surgery has been contentious. One must consider if the existence of the osseous or disc material alone is responsible for symptom severity. If the fragment is untreated or unrecognized, the fracture could heal with residual bony spinal stenosis.[18] Currently, posterior discectomy with excision of a mobile osseous fragment without fusion is the preferred approach.[18] It is important for both the patient and surgeon to consider the associated risks of such procedures which can include dural damage, painful paresthesia, infection, and recurrence of disc herniation.[18]

Several case reports involving the chiropractic management of pediatic and/or adolescent lumbar disc herniation with and without PRAF have been published.[16,21,30,35] Despite being retrospective case studies, they provide clinical insight on how a rare condition can be managed in a chiropractic setting where the literature is scarce. Upon analysis of these reports, many patients presented in the expected mean age of 14 years and all implemented a multimodal approach including spinal manipulation, soft tissue techniques, therapeutic modalities, and rehabilitation exercises. Of important note, those patients initially presenting with hard neurological findings (motor weakness, atrophy, and loss of deep tendon reflexes) and functional limitations were more likely to have failed conservative care and undergo surgery. Those with minimal or no neurological compromise and functional limitations upon initial evaluation responded favourably to conservative care, with complete resolution of symptoms within 2-4 months.

On revisiting the case, several key aspects of the patient presentation should have raised concerns and played a role dictating appropriate management. The patient history was critical in this case as it described an inciting event 2 years prior, in which a 2-3 week episode of severe acute low back pain followed a weight training session. Furthermore, this was an event that preceded a 2-year history of recurrent low back pain that was left untreated and undiagnosed. Although speculative, this may have been the development of the initial PRAF lesion as the mechanism of injury and both the classification and age of the fracture (type III) are consistent. Given the age, past medical history, and pain during the initial presentation to the chiropractor, a space occupying lesion and/or fracture such as PRAF is an appropriate differential diagnosis. As such, this differential diagnosis in conjunction with the presence of hard neurological findings warranted imaging and referral. The overall goals were to reduce and centralize pain, restore mobility, address functional limitations and return the athlete to play. This was accomplished through a multidisciplinary effort to aid in both the diagnosis and construction of an appropriate conservative plan of management. Addressing functional limitations through rehabilitation exercises and patient education were critical to centralizing symptoms and improving strength, proprioception, and function. As with other injuries occurring in the skeletally immature lumbar spine, such as pars interticularis fractures, establishing core strength and placing emphasis on lumbopelvic stability are essential to facilitate proper low back loading and may prevent recurrent dysfunction.[13,14] Prior to retuning the athlete to play, care was taken to implement rehab in a sport specific upright posture, focusing on dynamic core stability and perturbation training.

Summary

PRAF is a condition which is most prevalent in adolescent patients and must be considered when these populations present with discogenic symptoms.[2-6] The severity of symptoms are believed to be increased when PRAF is present rather than lumbar disc herniation alone.[5,18] Appreciation for the clinical presentation including progressive symptoms, trauma, repetitive lumbar loading, and patient age are critical to guide appropriate imaging measures to attain the diagnosis of PRAF. Conservative treatment should be initiated first unless red flags are present and include a multimodal approach.[16,21,30,35] Surgery is indicated with a failed trial of conservative care (6-12 weeks), declines in neurological status, intolerable low back and/or leg pain, severely affected function, and any signs of CES.[14]

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