

Symptomatic Triradiate Cartilage Injury in a Female Adolescent: A Case Report

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ABSTRACT

Introduction: The growing adolescent athlete has a significant risk for overuse injury due to multiple intrinsic and extrinsic factors. We present the case of an 11-year-old girl gymnast and multisport athlete with symptomatic stress injury to the right triradiate cartilage.

Case description: The injury was recognized on magnetic resonance imaging (MRI) following 6 months of right hip pain with activity. Load reduction strategies did not alter her symptoms, and rest from provocative activity was prescribed. A good outcome was achieved after 6 weeks with resolution of bone marrow edema and pain-free activity progression.

Conclusion: We place importance on the recognition of such overuse injuries to avoid long-term sequelae of growth plate injuries.

Keywords: Adolescent, Case report, Magnetic resonance imaging, Overuse injury, Triradiate cartilage.

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INTRODUCTION

The adolescent athlete is at risk of overuse injuries due to several intrinsic and extrinsic factors. Particularly, there is a vulnerability at the growth plate as it matures. Hormonal changes along with neurocognitive and physical development influence injury risk, in addition to the type of sport and training loads.¹ Often injured athletes will present to the sports medicine practitioner only after an extended period with symptoms. We present the case of a multisport athlete with right hip pain caused by triradiate cartilage stress injury.

CASE DESCRIPTION

An 11-year-old girl, whose primary sport was gymnastics, was referred to a sports medicine practice with 6 months of right unilateral hip-related pain. The onset of pain was related to an inversion maneuver, using her legs for grip, on a gymnastics bar. She felt a "clunk" sensation as the right hip was tractioned due to gravity. After some months of ongoing pain with activity, a magnetic resonance imaging (MRI) scan was organized by a primary care physiotherapist. This was reported as showing moderate bone marrow edema surrounding the triradiate cartilage of the right hip. She halved her athletic load to ninety minutes of gymnastics per week for 8 weeks. Her pain persisted, and she was referred to a specialist sports medicine clinic.

History was obtained from the athlete and both parents. The note was made that the athlete also participated in soccer and sailing. She was otherwise fit and well with a past medical history of anaphylaxis to nuts, exercise-induced asthma and hay fever. Her only medications were intermittent salbutamol metered-dose inhaler and cetirizine orally.

On examination, the athlete was within a normal weight range for age. She had a reduced forward flexion motion of her trunk whilst standing due to tight hamstring muscles, achieving hands to mid-shins only (unusual for a gymnast in our experience). The hip examination revealed the pain was generated with right hip flexion-adduction, flexion-adduction-internal rotation and Patrick's

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test. Cluster of Laslett testing revealed a painful sacroiliac joint (SIJ) distraction test and sacral thrust on the right side. The strength of the muscle at the hip girdle was not reduced. Neurological examination was normal.

A repeat MRI after medical assessment (with an 8-week interval from the initial scan) revealed no improvement in the edema surrounding the physis. The girl was asked to rest completely from provocative sports; she was allowed three 40-minute swim sessions per week to maintain fitness; this activity was pain-free. A third MRI, after a further 6 weeks of rest, revealed the resolution of the bone marrow edema. This scan included views of both hips, SIJs, and the lumbar spine to rule out other pathology. X-ray evaluation was avoided due to the age of the patient.

Following the final 6 weeks of strict rest from provocative activity, the athlete noted the resolution of her right hip-related pain, and she started a supervised strength/stability program with an aim to gradually return to her preferred sports.

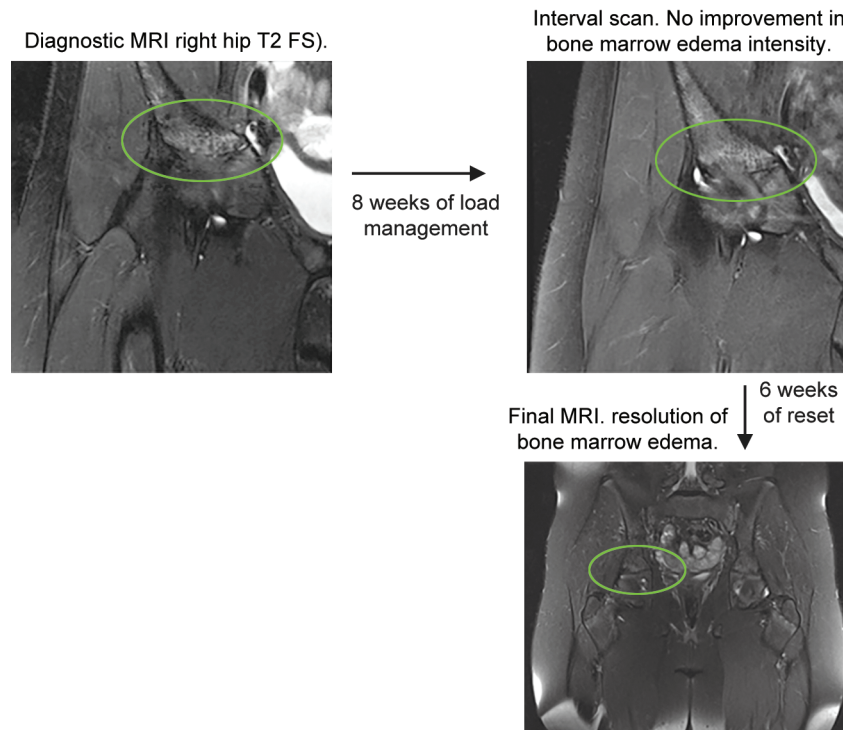


Fig. 1: Fluid-sensitive MRI sequences indicating the progression of bone marrow edema at the posterior aspect of the triradiate cartilage (hyperintensity)

Informed consent to publish the deidentified details of the case and relevant images was obtained from the mature minor and parents (Fig. 1).

DISCUSSION

The normal development of the acetabulum includes the formation of secondary centers of ossification [the epiphyses of the pubis (“os acetabuli”), ileum (“acetabular epiphysis”), and ischium (a small contribution)].² Therefore, the triradiate cartilage is an appositional growth plate, a “Y-shaped” meeting of the three innominate epiphyses. Its concavity is influenced by the spherical femoral head.³

The triradiate cartilage is usually used to assess skeletal maturity. Its degree of closure has influence over other pediatric conditions, including treatment of developmental dysplasia of the hip⁴ and scoliosis progression risk.⁵

Injury can occur to the triradiate between birth and the time of fusion.⁶ We know that pediatric sporting injuries to epiphyses and apophyses often occur close to the age of fusion. This is thought to be a result of increased vulnerability at these sites at this age.¹ The cause is multifactorial; one theory suggests the rapid chondrocyte proliferation in response to increased estradiol levels (aromatization of testosterone in the male adolescent) results in a thickening of the physes and relative mechanical weakness at this site.^{1,7} closure of the triradiate cartilage is staged, beginning at age 12 in females and 14 in males.⁸

The most common injury to the triradiate cartilage is high-impact trauma, forces similar to those required to fracture a pelvis.⁹ A literature search on overuse injuries to this growth plate reveals a single case report in a male subject.¹⁰ Another isolated report discusses a low-impact acute injury from falling in an obese

adolescent boy.¹¹ These injuries were described as Salter–Harris type 1 injuries. The clinicians used the well-recognized Judet (oblique)⁹ views of the pelvis to assist in classification. The first case had 8 weeks of relative rest with improvement in bone marrow edema. The second case completed a brief period of nonweightbearing followed by a gradual increase in protected weight-bearing over 12 weeks. The outcomes were good; both adolescent boys returned to a normal, pain-free gait and did not have any early complications.^{10,11}

The authors thought it prudent to publish this female subject to expand on the current paucity of research.

Complications of triradiate cartilage injury include the formation of an osseous bar, premature physal closure and hip dysplasia following closure.¹² A greater risk of this is observed in the younger child; it is recognized that there is a lower risk of such complications in adolescent injuries.¹³ Although these complications are rare in traumatic injury at this stage, there are insufficient reports of overuse/low trauma cases to draw any conclusion, but the authors believe it is an injury that requires active management.

The reported scenario can be complicated to manage. It has been recognized that MRI is a sensitive imaging modality for physiological changes at the growth plate in adolescence/puberty. One such observation at the knee is symptomatic focal periphyseal edema.¹⁴ Management of this may be close observation of the athlete rather than treatment with rest. It is understood that any widening of a growth plate due to overuse is considered stress pathology.⁷

A clinician with knowledge of short- and long-term consequences of injury will recognize when to accept pain in the active adolescent and when to prescribe rest to the overzealous patient and family.

CONCLUSION

From a sports medicine perspective, it is wise to consider musculoskeletal pain in the active adolescent athlete as an injury prior to labelling the issue as “growing pains” or psychosomatic. Common sites for acute and overuse injuries are at the physis and the apophysis. One must keep their suspicion for pathology high with sports-related pain as there can be long-term consequences of missing such diagnoses in this age group.

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