

Review Article**Sacral Stress Fracture: A Rare but Important Cause of Low Back Pain in Athletes****Shahram Mohaghegh^{1*}, Maryam Hajian²**¹Assistant Professor of Sports and Exercise Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran²Community Medicine Specialist, Shahid Beheshti University of Medical Sciences, Tehran, Iran***Corresponding author**

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Abstract: Sacral stress fractures are a frequently overlooked cause of low-back and buttock pain in athletes. A high index of clinical suspicion and use of appropriate diagnostic tools can provide the accurate diagnosis. Early diagnosis and closely monitored and structured rehabilitation program can considerably accelerate return to sport.**Keywords:** Sacral stress fractures, Low back pain, Athlete, Stress fractures.

INTRODUCTION

Sacral stress fractures are unusual causes of low back pain in athletes. They are usually under-diagnosed due to their unspecific symptoms [1]. The diagnosis is important because it is a treatable disease and if not diagnosed can lead to severe morbidity for the athletes. The early identification and proper management of stress fractures of sacrum are integral in the prevention of progression of stress fractures especially in the adolescent athlete population [2]. So the aim of this paper is to briefly summarize current evidences about this rare but important cause of low back pain in athletes for reminding the sports medicine physicians to consider this entity in their differential diagnosis of low back pain in athletes.

EPIDEMIOLOGY AND PATHOGENESIS

The incidence of stress fractures in athletes ranges from 1.4% to 4.4% (2% in men, and 7% in women) [3]. There has not been reported the incidence of sacral stress fractures in literature that may be largely because of unfamiliarity of physicians with this type of stress fracture. Although it has been mentioned that sacral stress fractures occur most frequently in female distant runners [4, 5], nowadays there are increasingly reported cases of sacral stress fractures in variety of sports such as tennis [3], volleyball [6], hockey [7], soccer [8], basketball [9], gymnastics and softball [10] and also in osteoporotic patients [11]. Also there are reported cases in the pregnant women [12] and in the intrapartum [13] and postpartum period [14-16], in male distant runners [17] and in children and adolescents [18].

Pentecost have classified sacral stress fractures into two groups: fatigue and insufficiency fractures [11]. Fatigue fractures occur in a bone with normal structure due to abnormal or repetitive stresses such as fractures occur in military personal and athletes. Insufficiency fractures include cases in weakened bones under normal stress. This type of fractures usually occur in elderly osteoporotic patients or in patients with rheumatoid arthritis, fibrous dysplasia, Paget's disease, osteogenesis imperfecta, osteomalacia and hyperparathyroidism [11] or after lung or lung-heart transplantation [19]. In athletes these type of fractures may be associated with osteopenia secondary to menstrual and/or eating disorders, such as seen in the female athletic triad [4]. Other predisposing factors in athletes consist of lower limbs asymmetry, muscle insufficiency, increased physical demand, genetic and environmental influences, training methods, the use of inappropriate shoes, and changes in pelvic anteversion [20].

According to Denis classification of sacral fractures [21] there are three types of fractures which occur in different zones of sacrum. Zone one fractures are in the sacral wings and usually there are not associated with any neurological symptoms. Zone two fractures occur in sacral foramina but not in sacral canal. These types of fractures are usually associated with unilateral lumbosacral radiculopathy. Zone three fractures are in the body and canal of sacrum and are usually associated with bilateral neurological symptoms, such as saddle anesthesia and loss of sphincter tone. The majority of sacral stress fractures occur predominantly in the zone one (wing of sacrum) and they have a vertical course, parallel to the sacroiliac

joint. Rarely, in severe stresses additional transverse fractures involving the sacral body can occur [11].

CLINICAL FINDINGS

The main symptom of sacral stress fractures in athletes is severe unilateral pain in both the lower back and buttocks [22]. Pain is exacerbated by weight-bearing activity and improves with rest and lying supine. There is not any history of trauma. Palpation often reveals an extremely tender area on the sacrum. Neurological defects are usually absent. They occur when the fracture involves the sacral body (zone three) and include of radiculopathy, mielopathy and sphincter insufficiency and limb paresthesia and can be misdiagnosing [4, 11]. These type of fractures are rare in athletes and the sacral ala is more frequently affected in this population [23]. There is a decreased range of motion in the lower back and sacroiliac tests such as Flexion-Abduction-external rotation (FABER test) and Gaenslen's test and the squish test can be positive [11, 22]. Hop test (jumping up and down in one leg) can produce pain in affected side.

DIAGNOSIS

Although plain radiographs are usually necessary in the evaluation of suspected stress fractures, but patients usually do not have a demonstrable fracture line until about three weeks after symptoms begin. Also in sacral stress fractures plain films can be misleading because of overlying bowel gas and fecal residue [24]. Bone scan or MRI can confirm the diagnosis but may not always sensitive in the early phases [4]. In order to enhance MRI sensitivity, intravenous gadolinium may be used. According to many authors, MRI is the gold standard for the diagnosis of sacral stress fractures and also is the investigation of choice in pregnant or lactating women because of risk of radiation in using alternative tools such as CT or Bone scans. CT is a valid alternative to MRI in localizing fracture line with good sensitivity and specificity [11]. In case of equivocal or nonspecific MRI findings, additional CT evaluation can be used to show the fracture [8]. Although bone scan has high sensitivity in detecting fractures, its specificity to identify anatomical details is not enough [25].

TREATMENT

Pain control can be achieved with use of analgesics such as paracetamol. Because of the risk of delayed union with use of non-steroidal anti-inflammatory drugs (NSAIDs), these drugs are not recommended for pain control by some authors [11]. A period of relative non-weight-bearing until free of pain is necessary which at least lasts one to two weeks but may be much longer (up to 6 months) [4]. As the majority of sacral stress fractures in athletes are stable ones, most of them heal with relative rest for about 4-6 weeks [8]. Gradual return to activity is important for complete healing of the fracture, especially in athletes, as they are likely to return to sport too early [3]. This

can be accomplished initially with non-weight-bearing activities such as swimming, cycling, and water running and then graduated weight-bearing activities [4]. Typically return to sport is possible after 5 months to 1 year [26]. There has been reported that with early diagnosis and closely monitored and structured rehabilitation program focusing on slow progression of increasing loads, a female distant runner can return to sport in 7 to 8 weeks [27]. Also electrical stimulation and pulsed electromagnetic fields (PEMF) have recommended by some authors for accelerating the union of fracture [11, 26]. Vitamin D and calcium must be administrated for athletes with history of female athletic triad (eating disorders, amenorrhea, and osteopenia) [28].

CONCLUSION

As there are increasingly reported number of sacral stress fractures among various fields of sports, especially in repeated weight bearing activities, it is recommended that physicians should consider this entity as an important differential diagnosis especially in athletes with a history of long time weight bearing activities who present with lower back and diffuse buttock pains and do not respond to standard treatments. Early diagnosis and proper rehabilitation are crucial for shortening time of return to sport.

REFERENCES

1. Blake SP, Connors AM; Sacral insufficiency fracture. *Br J Radiol.*, 2004; 77(922): 891-896.
2. Micheli LJ, Curtis C; Stress fractures in the spine and sacrum. *Clin Sports Med.*, 2006; 25(1): 75-88.
3. Silva RT, De Bortoli A, Laurino CF, Abdalla RJ, Cohen M; Sacral stress fracture: an unusual cause of low back pain in an amateur tennis player. *Br J Sports Med.*, 2006; 40(5): 460-461.
4. Brukner P, Khan K; Buttock pain. In *Clinical Sports Medicine*. McGraw Hill, Australia, 2012: 505.
5. Miletic D, Sestan B, Pusic M, Cicvarić T, Tudor A, Roth S, Santic V; Unusual consecutive sacral stress fractures in a female distant runner: a case report. *Eur J Phys Rehabil Med.*, 2012; 48(2): 283-287.
6. Shah MK, Stewart GW; Sacral stress fractures: an unusual cause of low back pain in an athlete. *Spine (Phila Pa 1976)*, 2002; 27(4): E104-108.
7. Southam JD, Silvis ML, Black KP; Sacral stress fracture in a professional hockey player: a case report. *Orthopedics*, 2010; 33(11): 846.
8. Tzoanos G, Tsavalas N, Manidakis N, Karantanis A; Sacral fatigue fracture in an amateur soccer player. *Case Rep Med.*, 2013; 2013: Article ID 985310, 3 pages. Available from <http://www.hindawi.com/journals/crim/2013/985310/>
9. Crockett HC, Wright JM, Madsen MW, Bates JE, Potter HG, Warren RF; Sacral stress fracture in an elite college basketball player after the use of a

- jumping machine. American Journal of Sports Medicine, 1999; 27(4): 526–528.
10. Grier D, Wardell S, Sarwark J, Poznaunski AK; Fatigue fractures of the sacrum in children: two case reports and a review of the literature. Skeletal Radiol., 1993; 22(7): 515-518.
 11. Longhino V, Bonora C, Sansone V; The management of sacral stress fractures: current concepts. Clin Cases Miner Bone Metab., 2011; 8(3): 19-23.
 12. Pishnamaz M, Sellei R, Pfeifer R, Lichte P, Pape HC, Kobbe P; Low back pain during pregnancy caused by a sacral stress fracture: a case report. J Med Case Rep., 2012; 6: 98.
 13. Oztürk G, Külçü DG, Aydoğ E; Intrapartum sacral stress fracture due to pregnancy-related osteoporosis: a case report. Arch Osteoporos., 2013; 8(1-2): 139.
 14. Karataş M, Başaran C, Özgül E, Tarhan C, Ağildere AM; Postpartum sacral stress fracture: an unusual case of low-back and buttock pain. Am J Phys Med Rehabil., 2008; 87(5): 418-422.
 15. Thein R, Burstein G, Shabshin N; Labor-related sacral stress fracture presenting as lower limb radicular pain. Orthopedics, 2009; 32(6): 447.
 16. Lin JT, Lutz GE; Postpartum sacral fracture presenting as lumbar radiculopathy: a case report. Arch Phys Med Rehabil., 2004; 85(8): 1358-13561.
 17. Kahanov L, Eberman L, Alvey T, True J, Yeargin B; Sacral stress fracture in a distance runner. J Am Osteopath Assoc., 2011; 111(10): 585-591.
 18. Lam KS, Moulton A; Stress fracture of the sacrum in a child. Annals of the Rheumatic Diseases, 2001; 60(1): 87-88.
 19. Schulman LL, Adesso V, Staron RB, McGregor CC, Shane E; Insufficiency fractures of the sacrum: a cause of low back pain after lung transplantation. J Heart Lung Transplant., 1997; 16(10): 1081-1085.
 20. Lin JT, Lane JM; Sacral stress fracture. J Womens Health, 2003; 12: 879-88.
 21. Denis F, Davis S, Comfort T; Sacral fractures: an important problem. Retrospective analysis of 236 cases. Clin Orthop Relat Res., 1988; 227: 67-81.
 22. Rodrigues LMR, Ueno FH, Filho ESV, Fujiki EN, Milani C; Sacral stress fracture in a runner: a case report. Clinics (Sao Paulo), 2009; 62(11): 1127-1129.
 23. Miller C, Major N, Toth A; Pelvic stress injuries in athlete: management and prevention. Sports Med., 2003; 33: 1003-1012.
 24. Featherstone T; Magnetic resonance imaging in the diagnosis of sacral stress fracture. Br J Sports Med., 1999; 33(4): 276-277.
 25. Lachman BM; The controversy surrounding sacral insufficiency fractures. Am J Phys Med 2000; 79: 404–409.
 26. Kahanov L, Eberman L, Alvey T, True J, Yeargin B; Sacral stress fracture in a distance runner. J Am Osteopath Assoc., 2011; 111(10): 585-591.
 27. Knobloch K, Schreibmueller L, Jagodzinski M, Zeichen J, Krettek C; Rapid rehabilitation programme following sacral stress fracture in a long-distance running female athlete. Arch Orthop Trauma Surg., 2007; 127(9): 809-813.
 28. Kerr D, Khan K, Bennell K; Bone, exercise and nutrition. In Burke L, Deakin V editor; Clinical sports nutrition. 4th edition, McGraw-Hill Pvt Ltd., Australia, 2012: 215.