Nucl Med Mol Imaging
Vol. 42, No. 6, Dec 2008

Invited Interesting Image

초심자의 과격한 수영연습에 따른 급성 횡문근융해와 근육힘줄단위 손상에서 관찰한 ^{99m}Tc-HDP섭취의 국소해학적 운동성 분석: 1예 보고

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Topographic Locomotive Analysis of ^{99m}Tc-HDP Uptake of Acute Rhabdomyolysis and Musculotendinous Unit Injury due to Excessive Swimming Exercise in Novice: A Case Report

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Introduction

Rhabdomyolysis (RM), also referred to as myonecrosis, is not an uncommon disorder of skeletal muscle,[1,2] the incidence of which is on the increase as endurance tests, sports and body build have become popular. Causes vary more commonly including extreme muscular activity,[3] streunous sporting, various diseases, traumas, medications, alcohol drinking, and toxins.[4,5] RM is divided into diffuse muscle fiber damage and musculotendinous unit (MTU) injury. A recent study by Crenshaw et al.[6] revealed that muscular fiber damage caused by racing was associated with elevated intra-muscular pressure, capillary damage, and ischchemia. Pathological changes include diffuse swelling, hyalinization, degeneration and regeneration of muscle fibers. It is to be remembered that myocytes are mainly destroyed in RM whereas perimysial connective is predominantly damaged in myositis ossificans. When muscle fibers disrupt myoglobin escapes into extracellular fluid and plasma resulting in myoglobinemia and often acute renal failure. Plasma creatine phosphokinase level becomes elevated.

We report a case of strenuous swimming-related RM that occurred in the muscles of the shoulder girdles and chest wall analyzed using magnified ^{99m}Tc-HDP bone scan. Of interest magnified bone scan of RM in the present case showed not only ordinary muscular injury but also MTU injury.

• **Received**: 2008. 12. 5. • **Revised**: 2008. 12. 17.
• **Accepted**: 2008. 12. 24.
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Case Report

A 33-year-old male patient hurriedly visited OPD clinic because of gross hematuria that was suddenly passed a few hours before the hospital visit. He had a year-old history of nephritic syndrome successfully treated and clinically judged to have been brought under control.

A few days earlier patient for the first time started swimming just for fun and a day prior to the visit this novice man headlong swam following an instruction in an indoor pool for one and a half hours without pause. He just crawled to float and advance and during so doing he experienced severe pain in the shoulder girdles and bust and the next morning he passed massive bloody urine. Physical examination and plain chest radiography revealed painful swelling of the soft tissue in the shoulder girdles and chest wall suggesting acute RM (Fig. 1). Patient was admitted under the diagnosis of swim-related acute RM. Positive laboratory tests included a marked increase in serum creatine phosphokinase to 6800

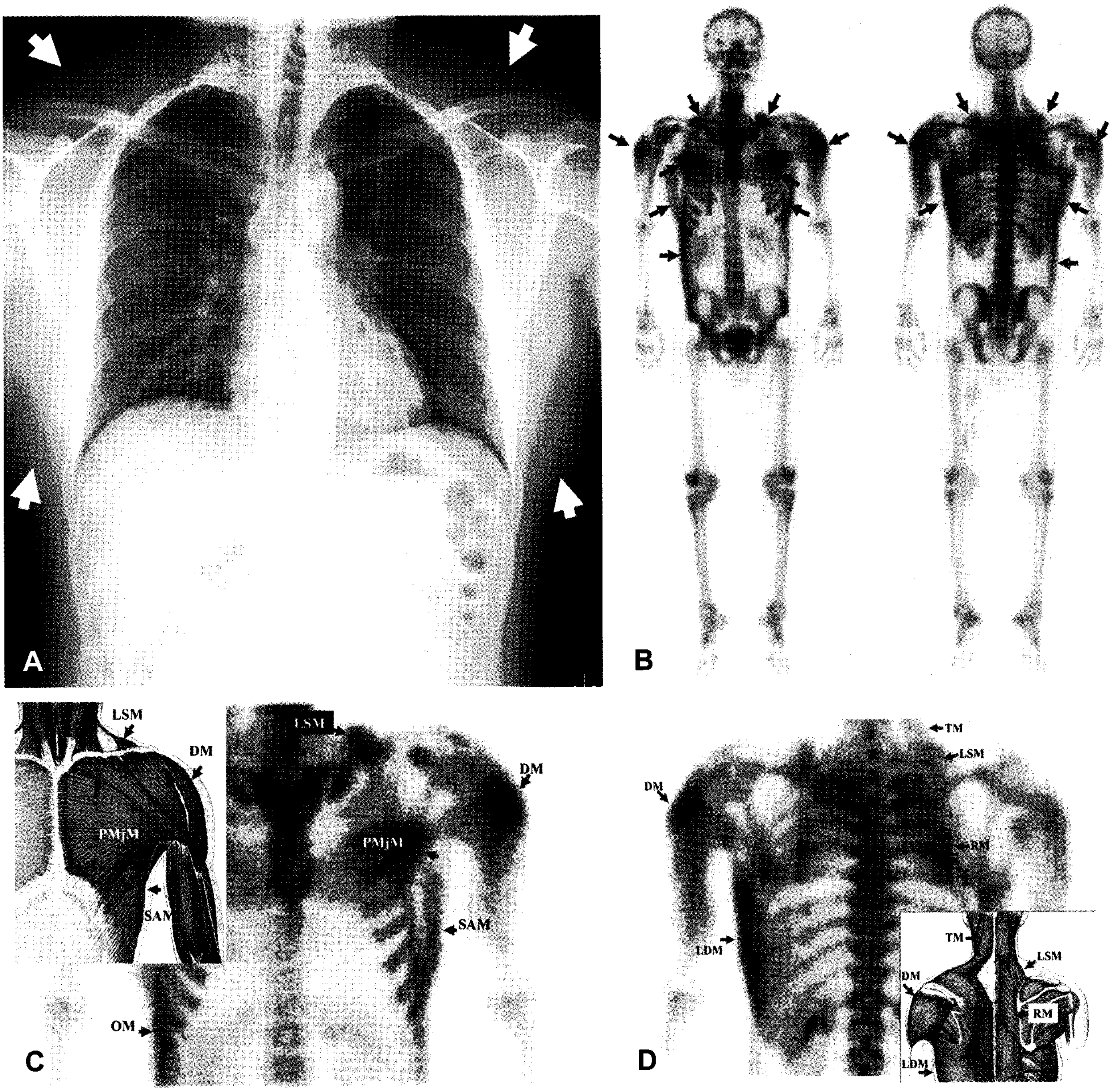

Figure 1. (A) PA chest radiograph shows swelling of muscles of shoulder girdles and chest wall. Note that muscle density is diffusely increased and fascial planes are obliterated (arrows). (B) Anterior and posterior whole-body ^{99m}Tc-HDP bone scan shows bizarre muscular uptake that is more or less symmetrical in distribution on both sides of the body (arrows). Note that intense uptake occurs in shoulder girdles, chest and lateral thoraco-abdominal wall but not in lower trunk or limbs. (C) Electronically magnified anterior scan of the chest shows intense tracer uptake in the musculotendinous units of the levator scapulae muscle (LSM), deltoid muscle (DM), pectoralis major muscle (PMjM), serratus anterior muscle (SAM) and oblique muscles (OM). Inset is adapted from Fig. 5. 59. Gray's Anatomy 37th edition (1989) with permission of Churchill Livingstone, Edinburgh (2008). (D) Electronically magnified posterior scan of the chest shows intense tracer uptake in the musculotendinous units of the levator scapulae muscle (LSM), trapezius muscle (TM), deltoid muscle (DM), rhomboideus muscle (RM) and latissimus dorsi muscle (LDM). Inset is adapted from Fig. 5. 58. Gray's Anatomy 37th edition (1989) with permission of Churchill Livingstone, Edinburgh (2008).

(normal= 56-224) and a moderate increase in sGPT and sGOT to 81 and 100, respectively.

On the second hospital day ^{99m}Tc-HDP whole-body bone scan was performed, revealing extensive muscular uptake in the shoulder girdles and chest wall denoting diffuse RM (Fig. 1B). Scans were electronically magnified for detailed topographic analysis of the individual muscles and entheses injured during reckless swimming. Thus, the anterior scan showed increased ^{99m}Tc-HDP uptake in the deltoid muscle (DM), pectoralis major muscle (PMjM), serratus anterior muscle (SAM) and oblique muscles (OM) (Fig. 1C). On the other hand the posterior scan demonstrated tracer uptake in the levator scapulae muscle (LSM), trapezius muscle (TM), rhomboideus muscles (RM), deltoid muscle (DM) and latissimus dorsi muscle (LDM) (Fig. 1D). Peculiarly, the teres muscles were spared.

All the muscles with prominent ^{99m}Tc-HDP uptake in the chest wall and shoulder girdles were considered to have been actively engaged with strenuous crawling.[8] In addition we found tracer more intensely accumulated in MTUs than in muscles denoting that MTUs were more damagingly strained than muscles. The patient made uneventful recovery with remarkably dropped creatine phosphate level down to 583 and normal return of sGPT and sGOT levels and discharged home on the 6th hospital day. A telephone interview made two months afterward found him to be free of disease.

Discussion

Conventional radiography is not helpful for the diagnosis of RM although it occasionally may reveal muscular swelling with blurred fascial line (Fig. 1A). CT is characterized by lowered attenuation and MRI by mottled high-intensity of edema in necrotized muscles on T2-weighted image. ^{99m}Tc-HDP bone scan has been widely used for the diagnosis of RM since the first report by Matin.[7] Bone scan is a convenient, reliable and highly sensitive examination. Procedures include whole-body imaging (Fig. 1B) and magnified scan (Fig. 1C and D). Whole-body scan is suitable for panoramically grasping injury pattern and magnified scan for identification of individual muscles or muscle group affected.

RM in our case was created by relentless, awkward crawl-type swimming that squeezed and stressed the muscles and tendons in the shoulder girdles and chest wall. Of interest RM analysed on magnified bone scan involved both muscle proper and MTU and in different intensities.

MTU is the portion of a muscle that is attached to a tendon, tendinous insertion or enthesis. Hence, MTU is usually damaged along with the enthesis. Based on the type and extent of damage received, muscle strain can be classified as first, second and third grade. The first grade is mild MTU stretching without permanent injury, the second grade is partial tearing of MTU, and the third grade is complete disruption of a portion of MTU.

MRI is useful in the study of soft tissue injury and in recent years sonography has also become increasingly used. As mentioned ^{99m}Tc-HDP bone scan, especially magnification scan, sensitively depicts metabolic change that occurred in injured muscles and tendons. Unless injury is trivial the bone scan nearly always reveals pathological uptake in a damaged muscle, MTU, and/or tendinous insertion permitting the topographic distinction of injury (Fig. 1C and D). Thus, the diagnosis of myolysis, MTU injury, and enthesitis can specifically be made when one uses magnification technique.

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