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Invited Interesting Image

지나친 토끼뜀에 의한 요추 뭇갈래근 및 넓적다리 근육 군의 횡문근융해의 ^{99m}Tc-HDP 골스캔 소견과 급성신부전증의 골스캔 및 초음파 소견: 1예 보고

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^{99m}Tc-HDP Bone Scan Findings of Acute Rhabdomyolysis of Lumbar Multifidus and Thigh Muscles and Bone Scan and US Signs of Acute Tubular Necrosis in Excessive Rabbit's Leaping: A Case Report

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Marked rhabdomyolysis (RML) complicated by acute tubular necrosis is not a rare disease. It is characterized by disintegration of skeletal muscle fibers due to a variety of causes including excessive physical exercise, trauma, operation, infection, bed-ridden life, alcohol, drugs, toxins, exhaustion and others. Pathophysiological alterations include the liberation and intravasation of intracellular proteins, myoglobin in particular, and electrolytes from injured muscle fibers. RML is complicated by acute renal failure in 4% to 33% of patients.[1,2] RML with anuria was reported to follow even after excessive body build.[3] Most renal failure in RML result from acute tubular necrosis and only rarely from tubulonephritis.[4] The great majority of RML with renal complication can simply be treated by normal saline hydration, bed rest, and furosemide and in some rare cases by hemodialysis.[5]

Clinically, severe RML is suggested by renal shut down and increased serum creatine phosphokinase (CPK) level. ^{99m}Tc-HDP bone scan is a reliable diagnostic tool of both RML and renal failure. The rationale is that broken down skeletal muscles accumulate bone tracer to various degrees according to the extent and severity of injury and renal shut down manifests increased renal uptake along with the "tracer-void bladder" sign. The bone scan is particularly useful in detection of multiple, asymptomatic form of RML. Whole-body imaging is suited for panoramic survey and magnified view for identifying individual muscles or muscle groups. Indeed, enhanced topography of magnified scan permits to identify specific muscles injured. According to Esnault et al.[6] bone scan is able to some extent distinguish the traumatic type of RML from the non-traumatic type. Furthermore and importantly, bone scan provides reliable information on acute tubular necrosis that is pathohistologically featured by interstitial edema, cell infiltration and tubular dilation.[7]

On the whole conventional radiography is not helpful in the diagnosis of RML and renal involvement although it may on occasion reveal diffuse muscular or renal swelling with obliteration of fascial line. CT may demonstrate lowered attenuation and T2-weighted MR image show mottled high signal intensity denoting edema in necrotized muscles.

We report a case of RML with acute renal failure studied using magnification bone scan which specifically identified the muscles injured by excessive rabbit's leap. The injured muscles recognized were the multifidus of the

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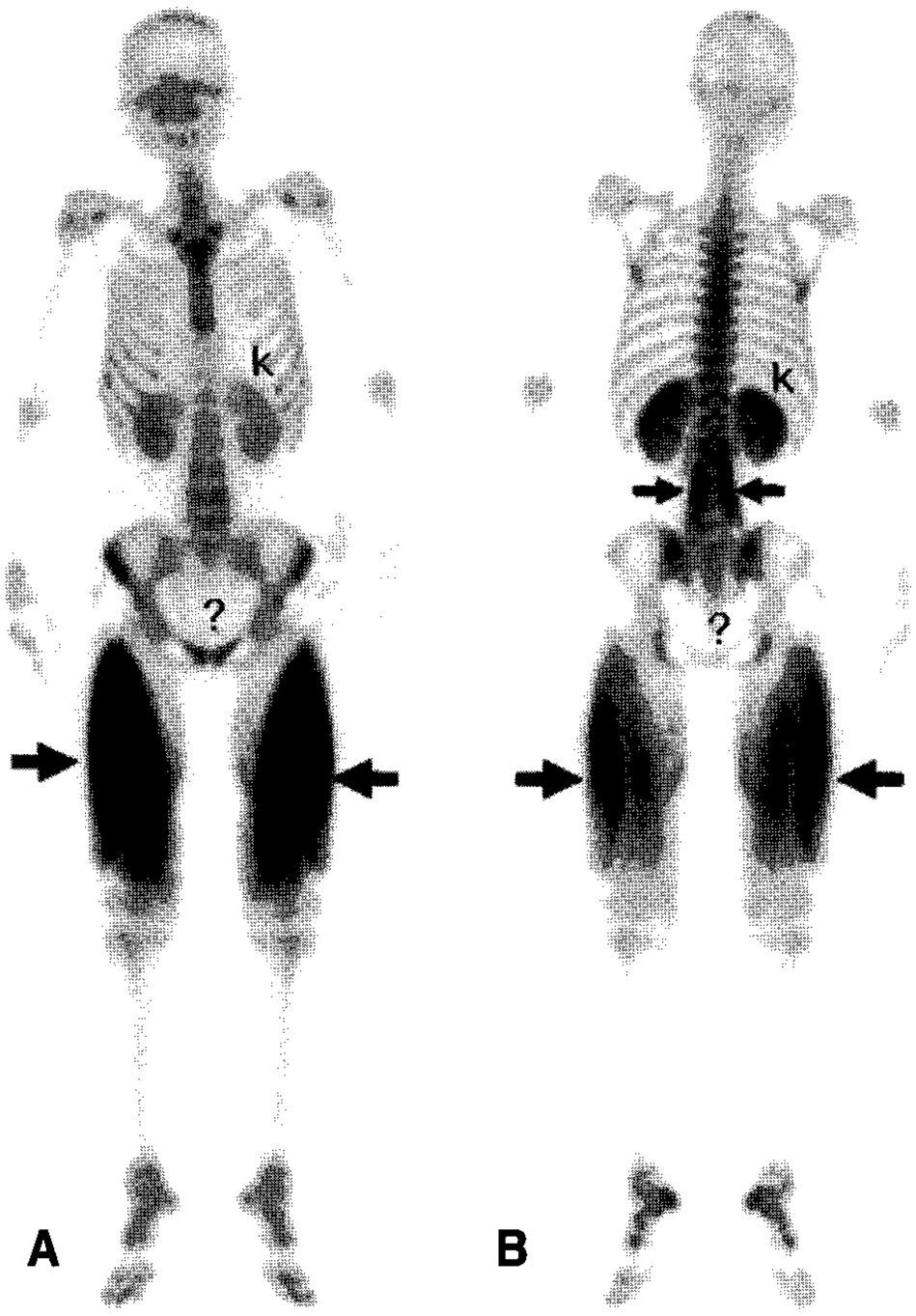

Figure 1. (A) Anterior and (B) posterior views of whole-body ^{99m}Tc-HDP bone scan show intense tracer uptake in the multifidus muscels (upper small arrows) and thigh muscles (lower arrows). Note intense tracer uptake in both kidneys (k) and void bladder (?) denoting acute renal shut down.

lumbar spine and the anterior and posterior muscle groups of the thigh. In addition, ^{99m}Tc-HDP bone scan findings of acute tubular necrosis correlated with that of the sonographic signs are described.

Case presentation

A 17-year-old lady was admitted because of generalized body swelling and episodic passages of bloody urine, 3 to 4 times per day. Patient became oliguric during the first admission day. She had severe pain in the low back and both thighs with nausea and epigastric pain. Symptoms developed two days after 300-time rabbit's leaps made for training purpose in group.

Pertinent admission lab tests were: + urine myoglobin with elevated LDH (5080 IU/L), CPK (76,200 IU/L), BUN (55.5 mg/dl), creatine (4.3 mg/dl), GOT (2673 ml/dl) and GPT (1199 mg/dl). The serum sodium, potassium and chloride levels were 154 mg/dl, 5.68 mg/dl and 108 mg/dl, respectively. Whole body ^{99m}Tc-HDP bone scan performed for the evaluation of painful soft tissue swelling revealed intense tracer uptake in the paralumbar space and thighs (Fig. 1). The involvement was bilateral and symmetric.

The magnified posterior imaging of the lumbar spine

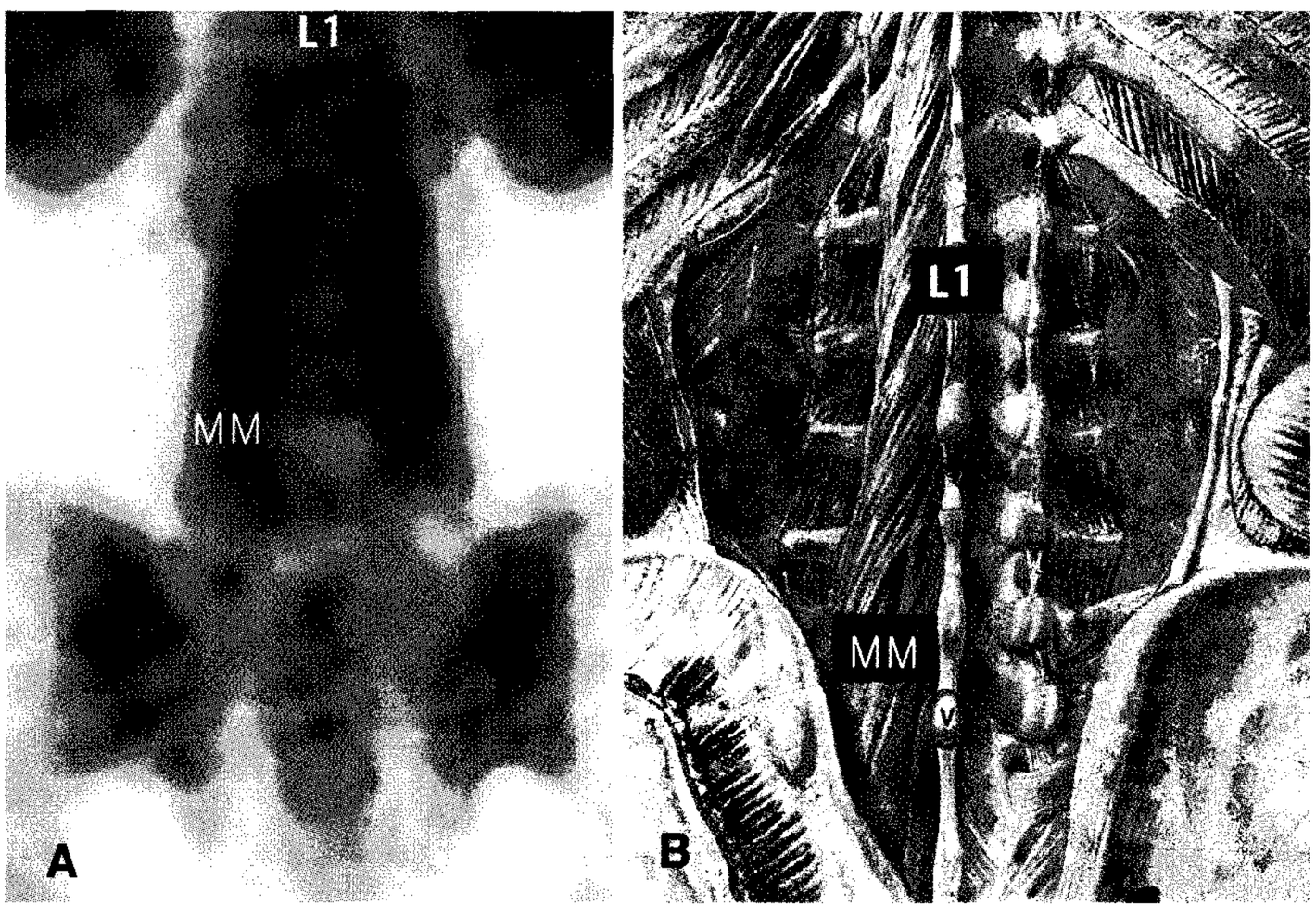

Figure 2. (A) Magnified scan identifies multifidus muscles (MM). L1 is 1st lumbar vertebra (B) Topograph. Adapted with permission from Sobotta: Atlas der Anatomie des Menschen. Elsevier GmbH, Urban & Fischer Verlag Munich. (CT/sma/March2008).

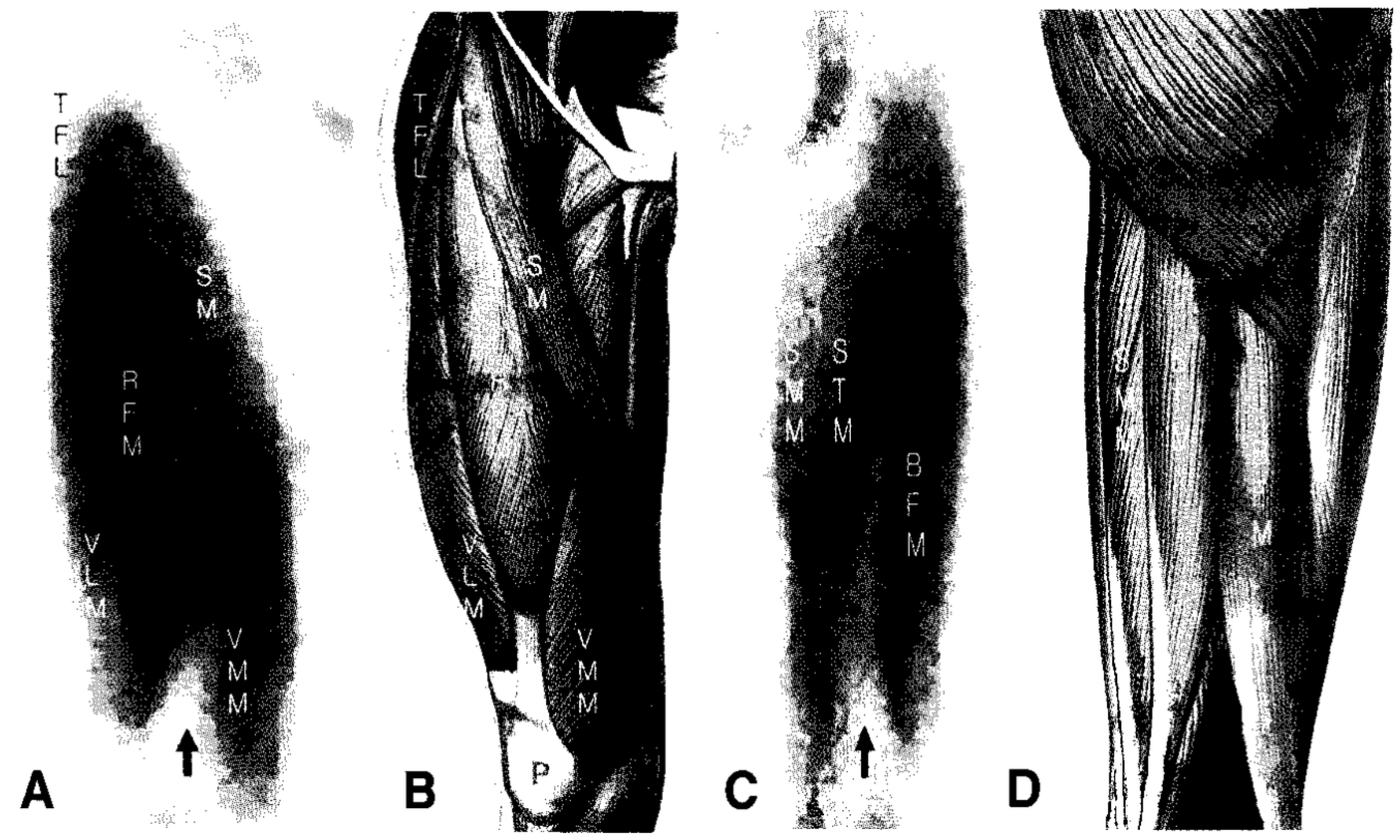

Figure 3. (A) Magnified anterior scan of right thigh identifies tensor fasciae latae (TFL), sartorius muscle (SM), rectus femoris muscle (RFM), vastus lateralis muscle (VLM) and vastus medialis muscle (VMM). Arrow denotes the distal femur. (B) Topograph. P is patella (C) Magnified posterior scan of right thigh identifies semimembranosus muscle (SMM), semitendinosus muscle (STM) and biceps femoris muscle (BFM). Arrow denotes distal femur. (D) Topograph. P is patella. Adapted with permission from Sobotta: Atlas der Anatomie des Menschen. © Elsevier GmbH, Urban & Fischer Verlag Munich. (CT/sma/March2008).

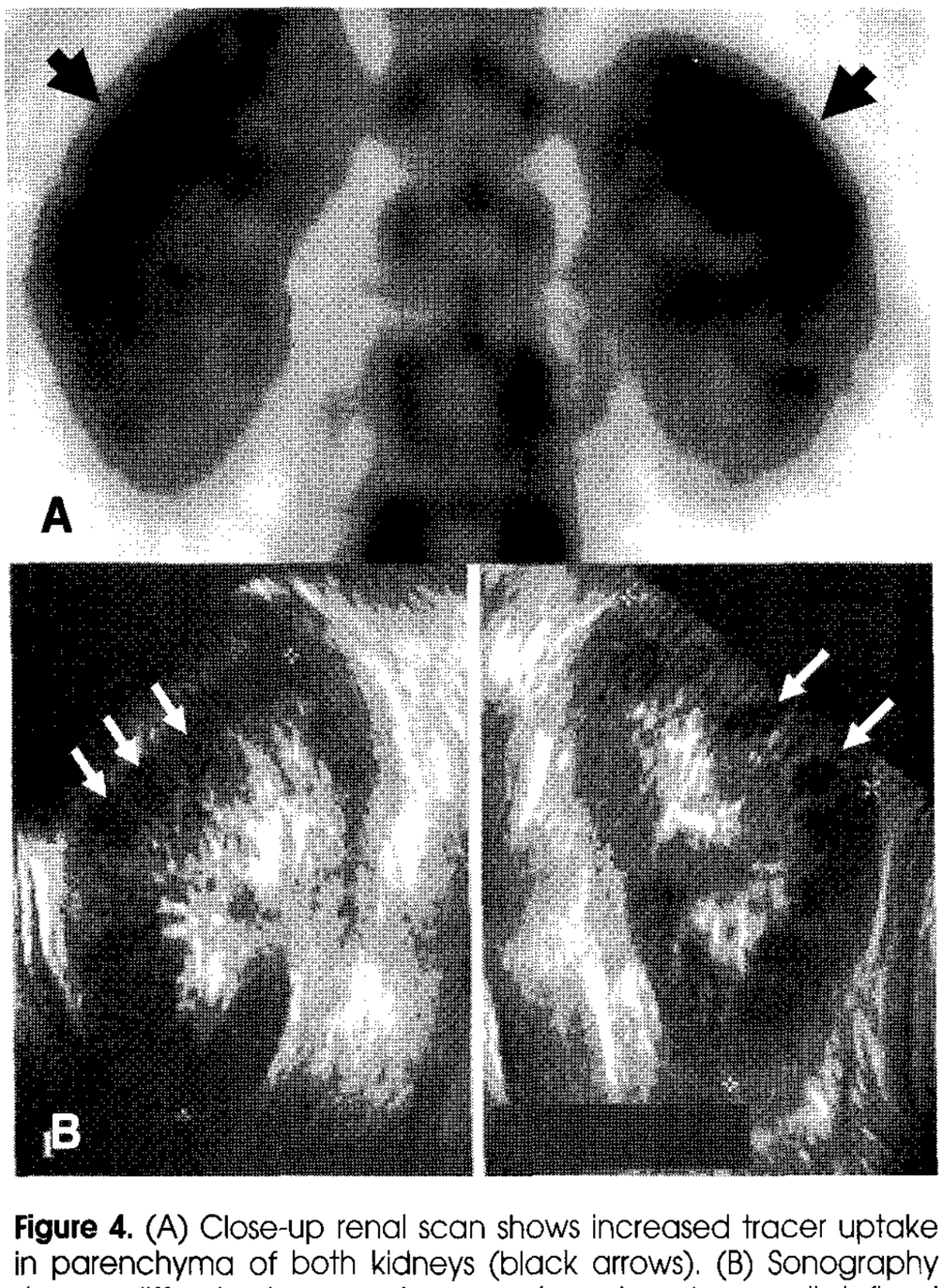

Figure 4. (A) Close-up renal scan shows increased tracer uptake in parenchyma of both kidneys (black arrows). (B) Sonography shows diffusely increased parenchymal echo, well-defined swollen pyramids (white arrows) and mild global enlargement. Note that increased echo well matches with increased tracer uptake.

demonstrated prominent tracer uptake in the multifidus muscles (Fig. 2). The magnified anterior imaging of the thighs demonstrated prominent bone tracer accumulation in the rectus femoris muscle, vastus lateralis muscle, vastus medialis muscle and sartorius muscle (Fig. 3A and 3B) and the posterior imaging portrayed the involvement of the semimembranosus muscle, semitendinosus mucle and biceps femoris muscle (Fig. 3C and 3D). The action of the multifidus muscles of the spine is spinal extension and that of the quadriceps muscles of the anterior thigh and the muscles of the posterior thigh is respectively knee-leg extension and knee flexion, From this observation it was inferred that the major locomotions of rabbit's leap include spinal extension and knee-leg extension and flexion, seriously damaging the muscles in the lumbar spine and thighs when leaping is repeated in excess.

On the other hand, the kidneys observed on ^{99m}Tc-HDP bone scan showed increased tracer uptake in parenchyma (Fig. 4A) with void urinary bladder (Fig. 1), indicating acute renal shut down. Sonography performed a day before bone scan revealed enhanced echo in the renal parenchyma with swollen pyramids (Fig. 4B). The swollen pyramid sign has been reported in biopsy-proven acute tubular necrosis

by Nomura et al.[7] It was of interest that the renal parenchymal tracer uptake and increased parenchymal echo well matched one another.

Patient was treated simply with normal saline hydration and bed rest and uneventfully recovered to be discharged on the fourth hospital day. Lab data on the final hospital day: LDH=20 IU/L (*normalized*) and CPK=600 IU/L (*still higher than normal*), BUN=14.2 mg/dl (*normalized*) and creatinin=1.5 mg/dl (*normalized*) GOT=20 mg/dl (*normalized*) and GPT=72 mg/dl (*higher than normal*), respectively.

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