Diabetic muscle infarction (DMI) is an under-recognized diabetic complication characterized by muscle pain and swelling. It usually occurs in subjects with long-standing diabetes and known microvascular complications. There are no useful biochemical markers for this disease and it can easily be misdiagnosed as soft tissue infection. The athogenesis of DMI is uncertain. We present the case of a type 2 diabetic patient with liver cirrhosis who was diagnosed with muscle infarction after being treated with terlipressin for gastrointestinal bleeding. This 45-year-old male complained of increasing pain in his right posterior thigh after treatment with terlipressin for 2 days. He was initially diagnosed with soft tissue infection, but he responded poorly to antibiotic treatment. Magnetic resonance imaging suggested acute muscle infarction. We performed a muscle biopsy and the pathologist reported that the muscle was necrotic. After 5 days of bed rest, the patient was able to walk and was discharged uneventfully.

**Key Words:** diabetic muscle infarction, terlipressin


Diabetic muscle infarction (DMI) is an under-recognized diabetic complication characterized by muscle pain and swelling. It usually occurs in subjects with long-standing diabetes and known microvascular complications. There are no useful biochemical markers for this disease and it can easily be misdiagnosed as soft tissue infection. The exact pathogenesis of DMI is unclear. This case report presents a type 2 diabetic patient who was diagnosed with DMI after being treated with terlipressin for gastrointestinal bleeding.

**CASE PRESENTATION**

This 45-year-old male had been diagnosed with type 2 diabetes with nephropathy, retinopathy and neuropathy. He was also known to have hepatitis C-related liver cirrhosis and had experienced several episodes of esophageal varices and gastric ulcer bleeding prior to admission. On this occasion, he was brought to our hospital due to another episode of hematemesis. The patient refused gastroscopy and his gastrointestinal bleeding was therefore treated with pantoprazole and terlipressin. After treatment for 2 days, he complained of increasing pain in his right posterior thigh. Physical examinations revealed a tender and swollen mass over his right posterior thigh. Laboratory data showed a white blood cell count of 8990/μL, C-reactive protein of 26.6 ng/mL, creatine phosphokinase of 359 U/L, and an erythrocyte sedimentation
rate of 107 mm/hr. A soft tissue infection was initially suspected, for which he was treated with antibiotics. Because he responded poorly, we arranged for magnetic resonance imaging (MRI) (Figure 1). The radiologist strongly suspected that the patient could have acute muscle infarction, but that a muscle abscess could not be ruled out. To make an accurate diagnosis, we performed a muscle biopsy, and the pathologist reported that the muscle was necrotic (Figure 2). No microorganisms were detected. Based on these findings, the patient was diagnosed with DMI. Antibiotic treatment was discontinued and complete bed rest was advised. After 5 days hospitalization, the patient was able to walk and was discharged.

**DISCUSSION**

Angervall and Stener reported the first case of DMI in 1965 [1]. Since then, slightly more than 100 cases have been reported in the English literature. DMI usually occurs in patients with long-standing diabetes, especially type 1 diabetes, with known late complications such as nephropathy, retinopathy, or neuropathy [2]. There is a slight female predominance and the mean age at presentation is about 43 years [2,3]. The most commonly involved sites are the quadriceps (62%), hip adductors (13%), hamstrings (8%), and hip flexor muscles (2%) [4].

Typical presentations of DMI include acute onset pain in the affected muscle, local swelling, and sometimes a palpable mass. Local heat and erythematous appearance are not usually found on examination of the skin. The diagnosis must be differentiated from muscle strain, hematoma, myositis, fasciitis, abscess, deep vein thrombosis, and thrombophlebitis [5]. There are no useful biochemical markers for this disease, though increased plasma levels of creatine phosphokinase, a raised erythrocyte sedimentation rate, and raised leukocyte count might alert physicians of the possibility of DMI [2,3]. However, because these abnormalities are nonspecific and easily ignored, it is easy to initially misdiagnose DMI as soft tissue infection.

Nearly all patients with DMI have abnormal findings on MRI. Swollen and edematous muscles demonstrate increased signal intensity on T2-weighted, post-gadolinium sequences [6]. MRI also makes it possible to exclude other diseases that mimic DMI. Sonography is an alternative diagnostic tool; classic findings include a well-marginated, hypoechoic, intramuscular lesion with features of internal linear echogenic structures coursing through the lesion [7]. DMI can be confirmed by muscle biopsy. Light microscopy will show irregular areas of hemorrhaging, muscle necrosis, and the appearance of granular tissue and collagen. Replacement of necrotic muscle fibers by fibrous tissue, myocyte regeneration, and mononuclear cell infiltration occurs in the late stages [8]. Although a definite diagnosis can be made by performing a muscle biopsy, this should be reserved for atypical cases [3,8].

The main treatment strategy includes bed rest and pain relief with analgesics. Surgical excision is not
DMI associated with terlipressin therapy

recommended because it extends the length of hospi-
tal stay and has been associated with higher recurrence
and mortality compared with nonsurgical treatment
[9]. Symptoms usually resolve in approximately 4–8
weeks, though in nearly 50% of these patients, the
disease may recur [4]. The long-term prognosis is
generally poor, due to the coexistence of lethal macro-
vascular diseases. The mean mortality is 10% within
2 years from the onset of DMI [2].

The pathogenesis of DMI remains unclear. Some
authors have suggested that it results from ischemia
caused by embolization of atheromatous material
[1,10]. However, arteriosclerosis obliterans has also
been thought to be responsible [11]. Some authors have
shown that alterations in the coagulation-fibrinolysis
system and antiphospholipid syndrome might be in-
volved [12,13]. In this case report, the patient de-
veloped DMI after being treated with terlipressin, a potent
vasoconstrictor. Some reports in the literature have as-
sociated the use of terlipressin with serious cardiovas-
cular events and ischemic colitis [14,15]. In this case,
no abnormalities in the patient’s coagulation system
or phospholipid antibodies were detected during treat-
ment, and magnetic resonance angiography of the
affected leg revealed intact vascularity. Thus, it is prob-
able that the vasoconstrictive effect of terlipressin wors-
ened the blood flow in the affected muscles. Because
the blood supply was impaired, the affected muscle
swelled, leading to mild compartment syndrome,
which further worsened the ischemia and resulted in
muscle necrosis.

In summary, we report the first case of DMI prob-
bly caused by terlipressin. This report suggests that
clinicians should be alert to the possibility of DMI
when using vasoconstrictors in diabetic patients,
especially those who are in the late stages of the dis-
ease and therefore often have compromised blood
circulation.

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Terlipressin 治療後發生糖尿病性肌梗塞 — 病例報告

張毓泓\textsuperscript{1,3}, 嚴逢杰\textsuperscript{3}, 謝明家\textsuperscript{2,3}, 林昆德\textsuperscript{1,3}, 辛錫璋\textsuperscript{2,3}, 辛世杰\textsuperscript{3}

高雄醫學大學\textsuperscript{1}臨床醫學研究所\textsuperscript{2}醫學遺傳研究所
高雄醫學大學附設醫院\textsuperscript{3}內分泌暨新陳代謝科

糖尿病性肌梗塞是一種非常少見的糖尿病併發症。通常發生在罹病期長的糖尿病患者。臨床表現為一可以觸摸到疼痛、發熱的腫塊，而經常被誤判為軟組織感染。其病因仍然不十分清楚。本病例報告一位罹患肝硬化的第 2 型糖尿病患者，因為上消化道出血而在接受 terlipressin 治療後發生了糖尿病性肌梗塞。他在接受 terlipressin 治療兩天後開始覺得右後大腿有越來越痛的情形。一開始診斷為軟組織感染並用抗生素治療，可是效果不佳。經過核磁共振 (magnetic resonance imaging) 檢查後判讀可能有急性肌肉梗塞。經由肌肉切片確診肌肉壞死。臥床休息 5 天之後，病人開始可以走動並平安出院。

關鍵詞：糖尿病性肌梗塞, terlipressin
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