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A Traumatic Intermuscular Hematoma Mimicking a Soft-tissue Tumor: A Case Report and Literature Review

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Abstract. *Background/Aim: Certain types of soft-tissue tumors are sometimes combined with bleeding, resulting in difficulty distinguishing them from a mere hematoma when patients with unnoticed soft-tissue tumor sustain trauma. Case Report: A 43-year-old man presented with left calf pain after running practice. Magnetic resonance imaging (MRI) revealed that the lesion seemed to be a soft-tissue mass with surrounding edema, located between the soleus and medial gastrocnemius muscle. An unnoticed soft-tissue tumor with traumatic bleeding was suspected. Two weeks later, MRI revealed that the bleeding had decreased, and the mass had changed to hyperintense on T1-weighted MRI, with heterogenic intensity on T2-weighted MRI. The calf pain had nearly almost resolved. Conclusion: Changes in MRI findings of traumatic hematoma over time are important for the diagnosis. In particular, changes in the intensity of the mass in the subacute phase from the acute phase must be considered when determining the possibility of traumatic hematoma.*

Certain types of soft-tissue tumors are sometimes combined with bleeding (1-6). The histological grades of these tumors differ, including hemangioma or schwannoma as benign tumors, tenosynovial giant cell tumor as intermediate-grade tumors, and synovial sarcoma or extraskeletal osteosarcoma as malignant tumors. These soft-tissue tumors are often reported because of their difficulty being differentiated from a mere hematoma when patients with asymptomatic and unnoticed soft-tissue tumors sustain trauma (7-9). Particularly in athletes or adolescents and young adults with prominent exercise habits, an unnoticed soft-tissue tumor combined with traumatic bleeding may sometimes be incidentally detected when a close examination, such as magnetic resonance imaging (MRI), is performed to evaluate the cause of pain after trauma (10).

However, while soft-tissue tumors mimicking a hematoma after trauma are often reported, few reports have described traumatic hematoma mimicking a soft-tissue tumor (11-16). Although soft-tissue tumors remain after the disappearance of traumatic bleeding, no mass remains after spontaneous shrinkage of traumatic bleeding in cases of a mere hematoma. We herein report a 43-year-old male patient who developed a traumatic hematoma on his left calf after running that resembled a soft-tissue tumor.

This research has been approved by the Institutional Review Board (IRB) of the Ethical Committee of Kanazawa Red Cross Hospital (IRB Number 587), and was performed in compliance with the guidelines of the 1975 Declaration of Helsinki. Written informed consent was obtained from the study participant and his family.

Case Report

A 43-year-old man presented with left calf pain after running practice for a full-distance marathon race and consulted a local doctor the next day. His medical history included an operation for aortic valve stenosis, after which he had been taking anticoagulant medication, and he had no relevant family history.

A physical examination revealed slight swelling with ecchymosis around his left calf and tenderness upon palpation. Laboratory tests revealed no abnormal data, including no coagulation disorders or inflammation reaction. Plain film imaging did not show any calcifications or other abnormalities (Figure 1). A lesion was detected between the soleus and medial gastrocnemius muscle, consisting of a mass and surrounding bleeding on MRI. The mass appeared iso-intense

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on T1-weighted MRI, hyperintense on T2-weighted MRI, and showed strong hyperintensity on T2-fat suppression MRI (Figure 2). Coronal view MRI showed that the bleeding around the mass extended longitudinally to the intermuscular fascia.

A soft-tissue tumor combined with bleeding was suspected, thus he was referred to our hospital for a further examination and treatment two days after the trauma. A reevaluation of the mass using MRI was planned for when the surrounding bleeding had diminished. Thus, a painkiller was prescribed, and conservative observation at our outpatient clinic was selected. He was also prohibited from exercising in order to keep the bleeding from spreading. Two weeks later, MRI was performed again, and the findings were compared with the previous findings. The surrounding bleeding had drastically decreased, and the mass had become well-defined, now showing a hyperintense signal on T1-weighted MRI, and heterogeneous signals of hypo- to hyper-intensity on T2-weighted MRI (Figure 3). The hyperintense signal on T2-weighted fat-suppression MRI was almost unchanged. His calf pain had improved, and he was able to return to daily living activities without limitations.

Based upon the changes in MRI findings and the improvement of his symptom, conservative observation was continued without a biopsy of the mass or nuclear medicine imaging.

One month later, he underwent MRI again, and the mass had completely disappeared (Figure 4). He had no symptoms, and was permitted to continue exercising, including running. He was able to return to running, and the mass had not recurred at six months after its complete disappearance.

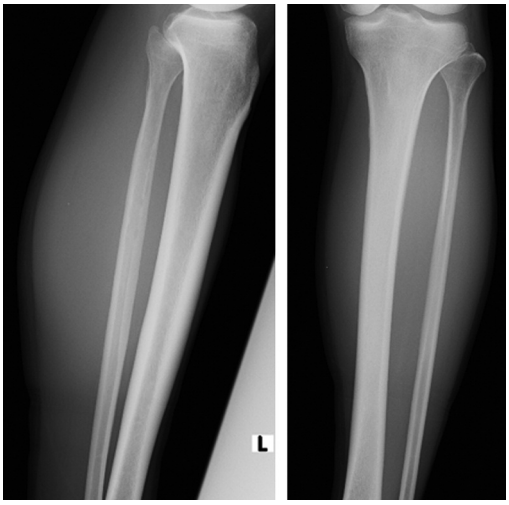

Figure 1. *Radiograph of the left lower extremity showed no calcifications or other abnormalities.*

Discussion

We described a 43-year-old male patient with a traumatic hematoma that resembled a soft-tissue tumor at initial MRI. A biopsy and nuclear medicine imaging studies were essential to determine whether the lesion was a benign or malignant soft-tissue mass. However, these examinations are not required in all cases. The importance of MRI changes at intervals of one to two weeks for differentiating traumatic hematoma from a soft-tissue tumor should be highlighted.

Even in the absence of trauma, bleeding is sometimes seen in benign soft-tissue tumors of hemangioma, ancient schwannoma, or bursitis, and some kinds of malignant soft-tissue tumors (synovial sarcoma, epithelioid sarcoma, leiomyosarcoma, undifferentiated pleomorphic sarcoma, extraskeletal Ewing sarcoma, or extraskeletal osteosarcoma) are also concomitant with bleeding (1-6, 10-12). The findings of fluid-fluid levels on MRI are not often specific for these soft-tissue tumors, but intratumoral bleeding occurs within the capsule of the tumor, and fluid storage is usually contiguous to the tumor (17). Due to differences in the concentrations of the fluid content according to the amount of hemosiderin, the fluid-fluid levels in these soft-tissue tumors are determined. In contrast to the findings in these tumors, traumatic bleeding does not often show fluid-fluid levels, as the bleeding is widespread from the point of the damaged muscle or perforated vessels, and surrounding edema or intermuscular fluid along the fascia can be observed.

In cases with a history of trauma, patients with an unnoticed soft-tissue tumor are often misdiagnosed as having mere traumatic hematoma (7-9, 11, 12). Care must therefore be taken when diagnosing hematomas when cutaneous or subcutaneous ecchymosis is absent or when the mass is located in the deep layers, thus a close examination, such as imaging studies or a biopsy, should be considered to differentiate these lesions from soft-tissue tumors (7). The mean period of diagnostic delay as a soft-tissue tumor was reported to be 6.7 months when the tumor was combined with bleeding (7). If a soft-tissue tumor is found to be malignant at over six months from the initial manifestation of symptoms, distant metastasis is likely, and the patient's prognosis may be poor (18). Making an accurate diagnosis as a soft-tissue tumor is therefore essential; however, the method or differentiating such diagnoses is not standardized. Although a biopsy is critical for the differential diagnosis, it is not performed in all cases with a soft-tissue mass. The initial assessment of the soft-tissue mass using MRI is thus very important for differentiating benign from malignant tumors before making a histological assessment (10, 19, 20).

To our knowledge, no reports have described changes in MRI findings of an intermuscular hematoma over time. Some studies of epidural or cerebral hematoma have described changes in the intensity of MRI findings according to the timing of the examination (Table I) (21, 22). In the

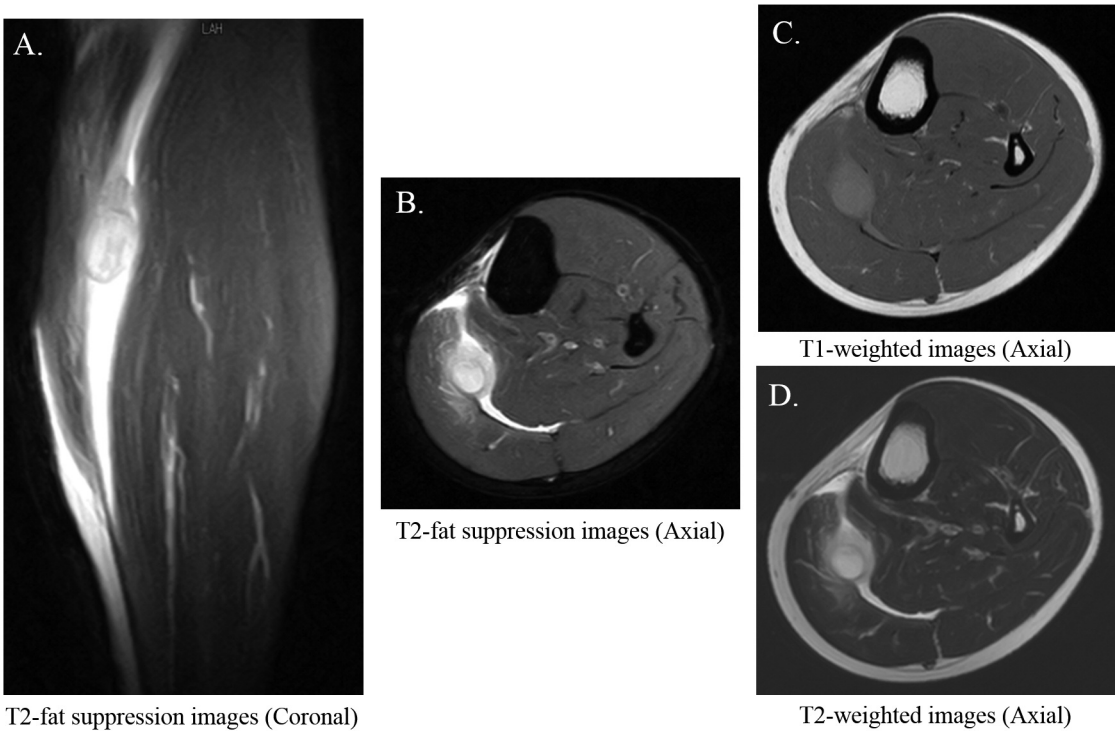

Figure 2. *A coronal view (A) and axial view (B) of T2-fat suppression magnetic resonance (MR) images. An axial view of T1-wieighted MR images (C). An axial view of T2-weighted MR images (D).*

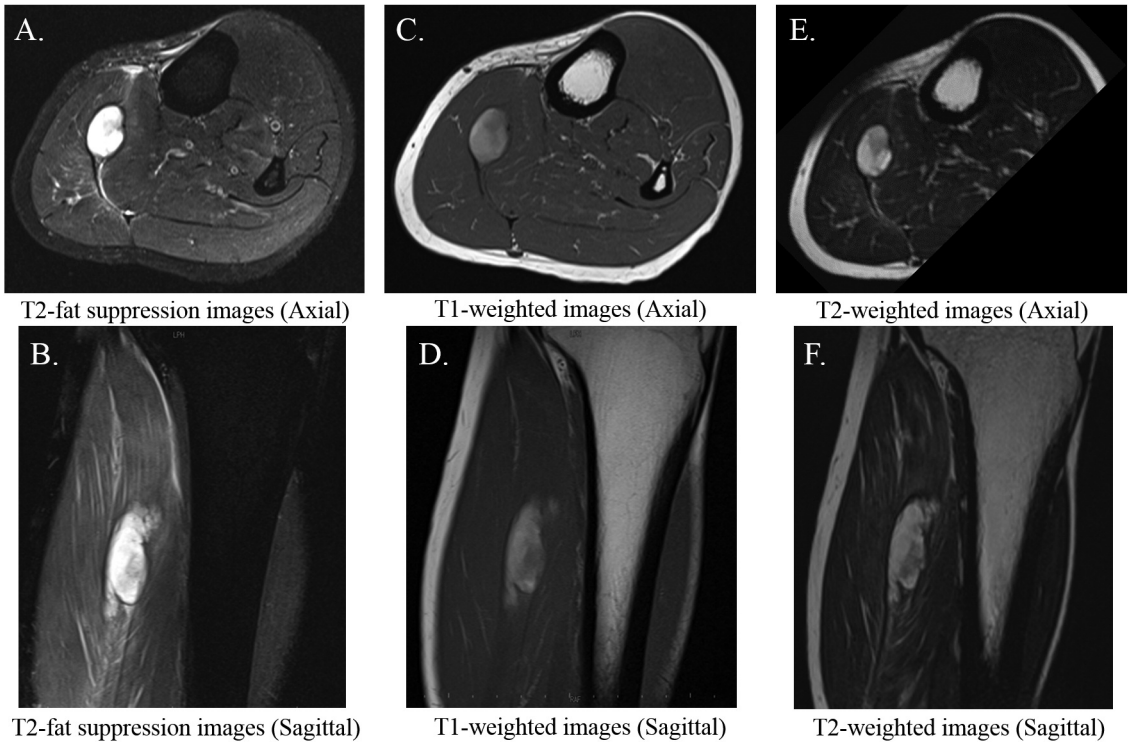

Figure 3. *An axial view (A) and sagittal view (B) of T2-fat suppression magnetic resonance (MR) images. An axial view (C) and sagittal view (D) of T1-wieighted MR images. An axial view (E) and sagittal view (F) of T2-weighted MR images.*

Table I. *MRI features of hematoma over time.*

Phase	Period	T1-weighted MRI	T2-weighted MRI	Component of hematoma
Hyperacute	<24 h	Hypointense	Hyperintense	Oxyhemoglobin
Acute	1 to 3 days	Isointense	Hypointense	Deoxyhemoglobin
Early subacute	3 to 7 days	Hyperintense	Heterogenic intense (from Hypo- to Hyperintense)	Methemoglobin
Late subacute	1 to 2 weeks	Hyperintense	Hyperintense	Methemoglobin
Early chronic	2 to 4 weeks	Heterogenic intense (from Hyper- to Hypointense)	Heterogenic intense (from Hyper- to Hypointense)	Methemoglobin
Late chronic	≥4 weeks	Hypointense	Hypointense	Hemosiderin

MRI: Magnetic resonance imaging; h: hours.

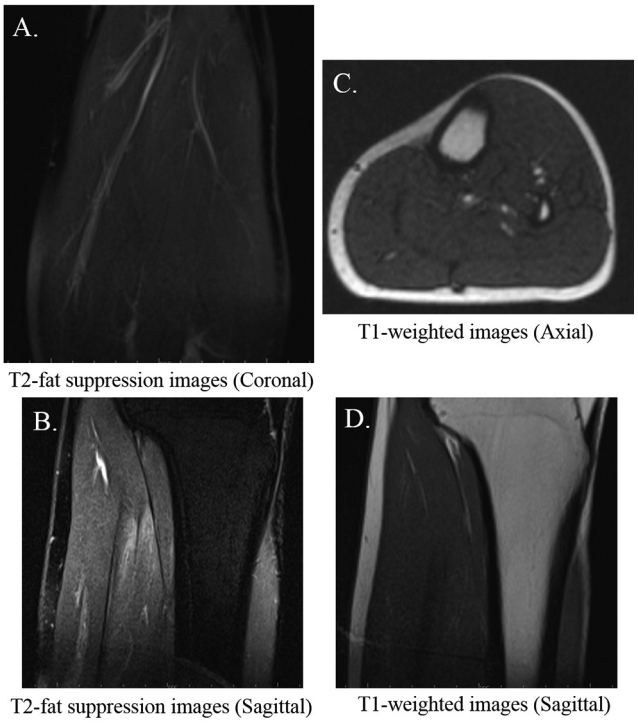

Figure 4. *A coronal view (A) and sagittal view (B) of T2-fat suppression magnetic resonance (MR) images. An axial view (C) and sagittal view (D) of T1-weighted MR images.*

hyperacute phase (<24 h) after the occurrence of hematoma, hypointensity on T1-weighted MRI and hyperintensity on T2-weighted MRI can be detected. In the acute phase (1 to 3 days), the intensity changes to isointensity on T1-weighted MRI and hypointensity on T2-weighted MRI. In the early subacute phase (3 to 7 days), hyperintensity on T1-weighted MRI and heterogenic signals from hypo- to hyperintensity on T2-weighted MRI are observed, and in the late subacute phase (1-2 weeks), both T1- and T2-weighted MRI show a hyperintense signal. However, this latter phase often included heterogeneous signals due to the timing of changes in the components of the hematoma. In the early chronic phase (2-4 weeks), both T1- and T2-weighted MRI show heterogeneous signals, and in the late chronic phase (≥4 weeks), both T1- and T2-weighted MRI change to a hypointense signal and the mass shrinks spontaneously. Regarding the MRI findings of our case at two weeks after the trauma, T1-weighted MRI mainly showed a hyperintense signal, in contrast to the isointense signal on T1-weighted MRI in the acute phase. The change in intensity on MRI and spontaneous shrinkage suggested that the soft-tissue mass itself was an intermuscular hematoma.

In cases of a soft-tissue tumor, the intensity on MRI never changes unless malignant tumor cells proliferate, or intratumoral bleeding occurs, following mixed signals of hypo- and hyperintensity on MRI, and the finding of fluid-fluid levels is usually noted. Thus, in the present case, conservative observation was selected, considering the possibility of a hematoma due to changes in the intensity on MRI.

Several limitations associated with the present study warrant mention. First, a histological evaluation was not performed in this case because the hematoma had completely disappeared. No recurrence was observed during the follow-up period, therefore, the possibility of other diagnoses was not considered. Second, contrast-enhanced MRI and nuclear medicine imaging studies were not performed in this case, as these studies were expensive and the findings on simple MRI were sufficient to diagnose the lesion as a hematoma. Third, the impact of anticoagulant medication on the formation of hematoma was not investigated, as this case had no coagulation disorders according to the laboratory data from the first check-up.

In conclusion, the change in MRI findings for hematoma over time is important for making a diagnosis, in addition to the clinical physical findings. In particular, the changes in the MRI signals from one to two weeks (acute to subacute phase) are essential to consider when dealing with the possibility of hematoma. Furthermore, the findings of gradual absorbing and spontaneously shrinking of the mass on MRI are also helpful for distinguishing such a lesion from a soft-tissue tumor.

Conflicts of Interest

The Authors declare no conflicts of interest in association with the present study.

Authors' Contributions

HT, NY and YA contributed to the concept and design of the study. YA managed the patient for the appropriate treatment and observed them at the follow-up outpatient clinic after treatment completion. TH assisted data acquisition. YA analyzed all the patient's data and wrote the manuscript. All Authors read and approved the final manuscript.

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