

Lipohemarthrosis of the Hip Joint in Apparently Isolated Greater Trochanter Fractures

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Background: Lipohemarthrosis in the hip joint, a critical indicator for detecting occult femoral neck or acetabular fractures, has not been reported in cases of isolated greater trochanter (IGT) fractures. This study retrospectively reviewed 3-dimensional computed tomography (3D-CT) images of what appeared to be IGT fractures to find out the frequency of lipohemarthrosis and its implication for the necessity of internal fixation.

Methods: From October 2004 to December 2019, 90 cases of suspected IGT fractures were evaluated using 3D-CT. After excluding 6 cases due to inadequate follow-up and 8 cases with poor imaging quality caused by metallic implants, 76 cases were included in the final analysis. The cohort consisted of 48 women and 28 men, with a mean age of 77 years (range, 39–97 years). The 3D-CT images were meticulously reviewed to identify lipohemarthrosis in the affected hip joints. Additionally, magnetic resonance (MR) images were available for 13 cases.

Results: Sixty-three cases were IGT fractures; no cortical disruption was detected in the intertrochanteric area on CT images. Of these, 56 cases were successfully treated conservatively. Lipohemarthrosis was detected in 5 cases (7.9%), of which 2 were successfully managed with conservative treatment. The remaining 13 cases were classified as incomplete intertrochanteric fractures, with anterior cortical disruption identified in the intertrochanteric area on CT images. Lipohemarthrosis was observed in 3 of these cases (21.3%). In all cases evaluated with MR imaging (10 IGT fractures and 3 incomplete intertrochanteric fractures), varying degrees of intramedullary intertrochanteric extension were observed. Among these, lipohemarthrosis was detected in only 2 cases of IGT fracture, where the intramedullary extension did not cross the midline on mid-coronal images. One case was surgically fixed, but the other case was treated conservatively with success. Notably, 4 cases with intertrochanteric extension crossing the midline did not exhibit lipohemarthrosis.

Conclusions: Lipohemarthrosis was more frequently observed in incomplete intertrochanteric fractures than in IGT fractures. However, the presence of lipohemarthrosis alone should not be regarded as an indication for internal fixation.

Keywords: *Lipohemarthrosis, Greater trochanter fracture, Incomplete intertrochanteric fracture*

After Schultz et al.¹⁾ defined a greater trochanter (GT) fracture with intertrochanteric intramedullary extension on

magnetic resonance (MR) images as an incomplete intertrochanteric (IIT) fracture, the necessity of treating these fractures with internal fixation was emphasized. However, the indication for internal fixation varies among surgeons. Some surgeons opt for internal fixation when any extension is detected, regardless of its extent,²⁾ while others perform internal fixation only when the extension exceeds a certain threshold (e.g., crossing the midline),^{1,3-9)} and some prefer conservative management irrespective of the extension.¹⁰⁻¹²⁾ Additionally, it has been argued that because MR imaging is highly sensitive, unnecessary surgeries can

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be avoided by reserving internal fixation for cases where cortical bone breakage is evident in the intertrochanteric area on 3-dimensional computed tomography (3D-CT) images.¹³⁻¹⁵ Therefore, identifying additional imaging findings that can aid in the decision-making process for internal fixation would be highly valuable.

Lipohemarthrosis observed on CT images of the hip joint after trauma is a well-recognized indicator of femoral neck or acetabular fractures, particularly in diagnosing occult femoral neck fractures.^{16,17} Recently, the authors incidentally discovered lipohemarthrosis in the hip of a patient with an isolated GT (IGT) fracture that had a minimal intertrochanteric extension on MR images but showed no cortical breakage in the intertrochanteric area on 3D-CT images (Fig. 1). A literature review yielded no reports addressing this phenomenon. Consequently, the current study retrospectively reviewed the 3D-CT images of apparently IGT fractures encountered by the authors to determine the frequency and significance of lipohemarthrosis in the hip joint in cases of IGT fractures. The hypothesis of this study was that lipohemarthrosis would be a suggestive finding for internal fixation in IGT fractures.

METHODS

The study design and protocol of this retrospective study were approved by the Institutional Review Board of Seoul National University Hospital (IRB No. H-2407-062-1551). Informed consent was not required because of the study's retrospective design.

Between October 2004 and December 2019, a total of 108 cases of suspected IGT fractures were treated at a single institution. All fractures resulted from low-energy injuries, such as slips or falls, and no cases of pathologic fractures were identified. Among these, 90 cases underwent evaluation with 3D-CT. After excluding 6 cases due to inadequate follow-up and 8 cases where the images were unclear due to dispersion from implants used for previous fractures on the contralateral side, 76 cases were included in the final analysis. No patient included in the study had a history of previous trauma or surgery around the affected hip.

In 69 cases, IGT fractures were detected on initial plain radiographs. In the remaining 7 cases, no fracture was identified on radiographs; however, GT fractures were detected by 3D-CT, which was performed based on clinical symptoms and signs that strongly suggested the possibility of a GT fracture. The study cohort consisted of 48 women and 28 men, with a mean age of 77 years (range, 39–97 years). All cases that were managed conservatively

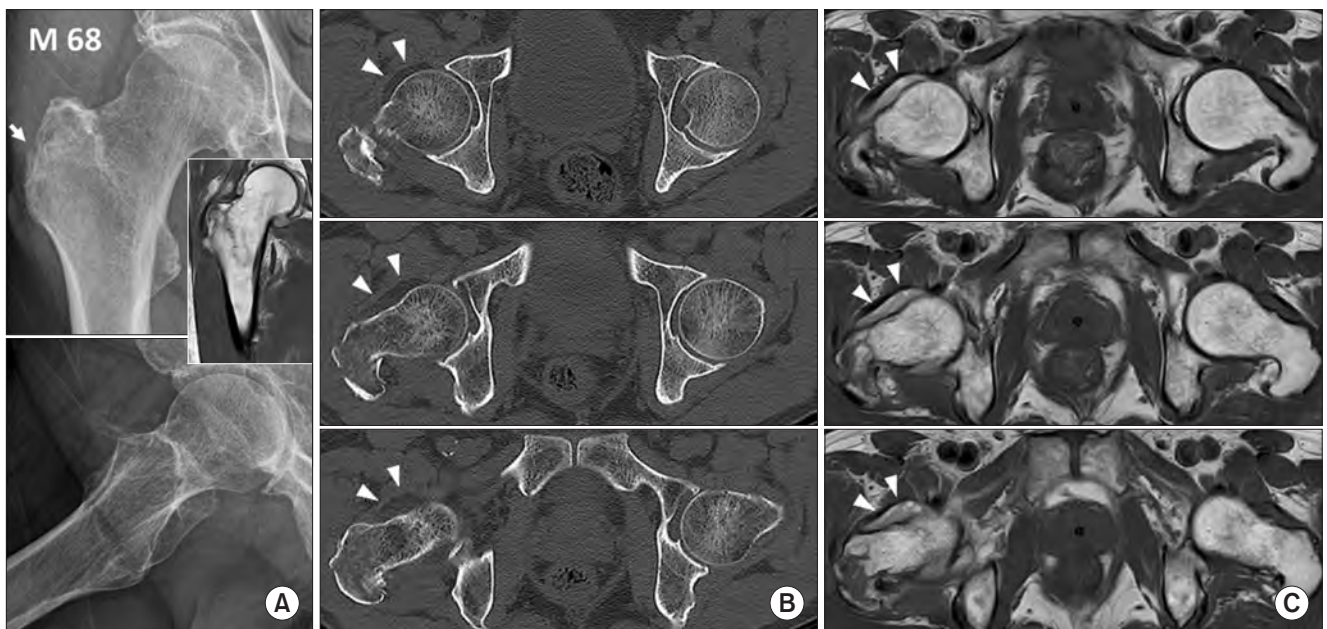


Fig. 1. Images of a 68-year-old man who had an isolated greater trochanter fracture (GT) following a simple fall. Plain radiographs demonstrated an isolated GT fracture (arrow). The intramedullary intertrochanteric extension, visible on the mid-coronal T1 magnetic resonance (MR) image (inset), did not cross the midline (A). Lipohemarthrosis in the affected hip joint was identified on axial computed tomography images (arrowheads, B) and was further confirmed on axial T1 MR images (arrowheads, C).

were followed up for a minimum of 2 months, with an average follow-up period of 28.7 months (range, 0.75–134 months). Additional MR scans were performed in 13 cases. All MR exams were conducted either before or at the time of the initial diagnosis.

All images were independently reviewed by 2 experienced orthopedic surgeons (HJK and KN) to detect the presence of lipohemarthrosis in the affected hip joint. Capsular distension with a fat-fluid level or fat globules was defined as lipohemarthrosis (Fig. 1).^{16,17)}

RESULTS

Incomplete cortical breakage in the intertrochanteric area was identified in 13 cases on 3D-CT images. In all instances, the cortical breakage was located in the anterior portion of the intertrochanteric area, while the posterior portion remained intact. Among these 13 cases, 10 hips were treated surgically using either a compression hip screw or a proximal femoral nail. The remaining 3 cases were managed conservatively. These included a young, reliable patient who declined surgery and adhered to non-weight-bearing with crutches; a patient who was a poor surgical candidate due to underlying comorbidities; and a patient whose cortical breakage along the anterior cortex was initially overlooked on imaging studies. The latter patient subsequently developed a complete fracture 2 weeks later and underwent surgery. In the remaining 63 cases, no cortical breakage was detected in the intertrochanteric area on CT images. Of these, 56 cases were treated conservatively with successful outcomes. The other 7 cases underwent surgical fixation, either based on MR findings or due to surgeons' anxiety or potential uncertainty regarding the fracture stability.

Lipohemarthrosis was detected in 8 cases on 3D-CT images: 5 cases (7.9%) out of 63 IGT fractures, including 1 case with a combined acetabular fracture, and 3 cases (23.1%) out of 13 IIT fractures. Among the 5 IGT fractures, 3 cases were surgically fixed and 2 cases were treated conservatively with successful outcomes (Fig. 2). All 3 hips of lipohemarthrosis with IIT fractures were treated surgi-

cally. There were 2 cases of basicervical fractures, and only 1 exhibited lipohemarthrosis. In the other 2 cases of IIT fractures with lipohemarthrosis, the fracture lines were extracapsular.

In all cases evaluated with MR imaging (10 cases of IGT fractures and 3 cases of IIT fractures), intramedullary intertrochanteric extension of varying degrees was observed. Among these, lipohemarthrosis was detected in only 2 cases of IGT fractures, and in both cases, the intramedullary intertrochanteric extension did not cross the midline on mid-coronal images. One case was surgically fixed, but the other case was treated conservatively with success. Notably, 4 cases with intertrochanteric extension crossing the midline did not demonstrate lipohemarthrosis.

DISCUSSION

There is general consensus on the necessity of additional imaging, such as MR or CT, in cases of IGT fractures detected on plain radiographs.^{18–20)} When intramedullary intertrochanteric extension is confirmed on MR images, most surgeons determine the need for internal fixation based on the extent of the extension; however, standardized criteria have not yet been established.^{1,3–12)} This lack of consensus raises concerns about the potential for unnecessary surgeries.^{13–15)}

CT imaging offered clinical advantages, including lower cost and shorter imaging times, making it particularly suitable for patients in poor general condition due to other concomitant injuries.^{21,22)} It is generally accepted that internal fixation may be warranted when cortical breakage is observed in the intertrochanteric area. Although MR can reveal intramedullary intertrochanteric extension even in the absence of cortical breakage, this study highlighted that it is inevitable to be cautious and uncomfortable when performing conservative treatment for the cases with the extension.

In this study, excluding cases with acetabular fractures, the incidence of lipohemarthrosis in IGT fractures was 6.3%. However, the precise mechanism behind the occurrence of lipohemarthrosis could not be determined.

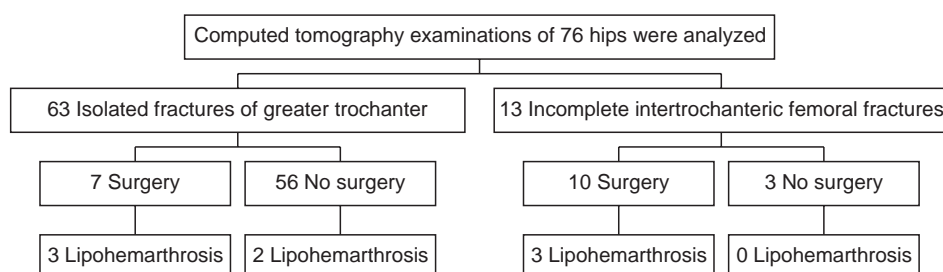


Fig. 2. Flowchart of diagnosis made based on computed tomography, subsequent treatment methods, and the presence of lipohemarthrosis.

Although the incidence of lipohemarthrosis was higher in IIT fractures than in IGT fractures, the success of conservative treatment in 2 out of 5 IGT fracture cases with lipohemarthrosis, along with the detection of lipohemarthrosis in cases with minimal intertrochanteric extension on MR images, suggested that lipohemarthrosis alone should not be considered an indication for internal fixation.

Lipohemarthrosis could be due to intracapsular extension of the fracture, and a basicervical type IIT fracture could be a reason in this context. Given that lipohemarthrosis was observed in 1 case of a basicervical type IIT fracture and in 1 case of an IGT fracture with an accompanying acetabular fracture, it is recommended that if lipohemarthrosis is detected in a suspected IGT fracture, a more thorough review of the images should be conducted to rule out an occult femoral neck or acetabular fracture.

One limitation of this study is the limited number of lipohemarthrosis cases, not large enough to get a definite answer to the hypothesis. We hope this report to make surgeons to have interest in lipohemarthrosis in IGT frac-

tures expecting identification of its pathogenesis and clinical significance through further studies.

The incidence of lipohemarthrosis in apparently IGT fractures of initial diagnosis before CT examination was 10.5%. Though the number of lipohemarthrosis cases was not large enough to make a decisive conclusion, the results of this study did not support lipohemarthrosis itself as an indication for internal fixation.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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