Cureus
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Open Access Technical Report

Published via Indonesia Malaysia Regenerative Institute (IMRI)

Component-Specific Long-Axis Ultrasonography With Dextrose Injection and Hydrodissection for Calcific Proximal Hamstring Enthesopathy: A Technical Report

Received 10/26/2026
Review began 10/30/2026
Review ended 11/06/2026
Published 11/19/2026

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DOI: 10.7759/cureus.119922

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Abstract

Chronic proximal hamstring enthesopathy is often assessed at the ischial origin as a composite lesion. Axial ultrasonography provides regional orientation but may not determine which tendon component is continuous with a focal enthesis abnormality. This technical report describes a component-specific examination and targeting sequence in a 76-year-old woman with recurrent low-back, buttock, and bilateral posterior leg pain extending to the calves. Separate lumbar-directed and posterior pelvic attachment-site injections reduced the low-back and buttock pain, whereas the distal posterior leg pain persisted. Radiographs showed bilateral calcific densities adjacent to the ischial tuberosities. After axial mapping, the semitendinosus (ST), biceps femoris long head (BFLH), and semimembranosus (SM) were traced individually in optimized oblique long-axis planes. The calcific lesions were continuous with the ST components of the conjoint origins; the BFLH and SM attachments showed no corresponding calcification. Evaluation of the SM required progressive transducer rotation and heel-toe adjustment to correct anisotropy, and the sciatic nerve was identified before intervention. The same procedure was performed bilaterally using a 23-gauge, 6-cm needle. Interfascial hydrodissection of the SM-conjoint tendon interface was followed by enthesis-directed injection within the same treatment field. A total of 30 mL of 5% dextrose in water was used on each side (60 mL per session), and six sessions were performed at two-week intervals. The patient reported progressive improvement and no adverse events. The clinical course is reported descriptively to document feasibility and safety and is not intended to establish treatment efficacy. This report demonstrates a stepwise component-specific diagnostic and interventional sequence combining interfascial hydrodissection with enthesis-directed dextrose injection for chronic calcific proximal hamstring enthesopathy.

Categories: Pain Management, Physical Medicine & Rehabilitation, Orthopedics
Keywords: anisotropy, dextrose injection, hydrodissection, musculoskeletal ultrasonography, proximal hamstring enthesopathy, semimembranosus, semitendinosus

Introduction

The proximal hamstring origin comprises the semitendinosus (ST)-biceps femoris long head (BFLH) conjoint origin and a broader, deeper, and more anterolateral semimembranosus (SM) attachment to the ischial tuberosity [1-3]. Consequently, focal enthesis pathology may involve one tendon component while sparing the others.

Axial ultrasonographic landmarks and long-axis assessment of tendon continuity have been described in detail [4,5]. Anatomical and sonographic studies have also clarified the extensive proximal SM attachment and its connective-tissue relationships [6]. Component-based classification has been applied to acute hamstring injuries [7], and current clinical guidance recommends combined axial and long-axis assessment [8]. However, a stepwise clinical sequence that traces the full proximal SM attachment as a distinct diagnostic enthesis in chronic disease has not been clearly delineated.

Chronic proximal hamstring pathology can coexist with lumbar or deep gluteal pain and may be associated with posterior leg symptoms [9,10]. A broader deep gluteal syndrome framework recognizes that muscle-tendon and entheseal lesions may act as primary pain generators and may secondarily irritate adjacent neural structures [10]. Because spinal and extraspinal pain generators may coexist, persistence of one

symptom component after improvement of another should prompt reassessment rather than continued attribution to a single anatomical source. This relationship is relevant at the SM attachment because proximal hamstring-related sciatic nerve tethering has been described clinically [11], and cadaveric ultrasonography has demonstrated close proximity between the SM and sciatic nerve at the ischial tuberosity level [12].

Precise procedural terminology is also required. Hydrodissection is defined by visible fluid-mediated separation of a specified tissue interface, whereas a target-directed dextrose injection does not require immediate plane separation; 5% dextrose in water (D5W) identifies the injectant but does not determine the procedural category [13,14]. Fascial hydrodissection has been reported for chronic hamstring muscle injury [15]. Calcific proximal hamstring enthesopathy remains sparsely described, and previous reports have not integrated component-specific long-axis assessment with lesion-directed intervention [16,17]. We describe a stepwise axial and oblique long-axis examination combined with interfascial hydrodissection and enthesis-directed D5W injection in a patient with chronic recurrent bilateral calcific lesions involving the ST components of conjoint origins. This report is intended to describe the examination and injection sequence; the clinical course is presented only to document feasibility and safety, not efficacy.

Technical Report

Clinical presentation and diagnostic sequence

A 76-year-old woman reported several years of fluctuating low-back pain, buttock pain, and bilateral posterior leg pain extending to the calves. Symptoms improved after a previous treatment course during the winter of 2025 and recurred in 2026. Exact onset, details of the 2025 treatment course, and the recurrence date were not documented with sufficient precision for retrospective reconstruction.

Because the symptoms occurred concurrently, they had initially been attributed to a single lumbopelvic source. During the recurrent episode, lumbar-directed injections reduced the low-back pain, and injections at symptomatic posterior pelvic ligamentous attachment sites reduced the buttock pain. Persistent calf-extending posterior leg pain after improvement of these other symptom components prompted focused evaluation of the proximal hamstring origins.

Manual examination showed weakness during resisted knee flexion. Side-specific Medical Research Council grading was not recorded. Standardized straight-leg-raise or slump testing and formal dermatomal light-touch and pinprick examination were not documented contemporaneously and were not reconstructed retrospectively. Plain radiographs demonstrated bilateral calcific densities adjacent to the ischial tuberosities (Figure *1*). Dedicated proximal hamstring magnetic resonance imaging and electrodiagnostic testing were not obtained during routine care; management proceeded conservatively on the basis of clinically concordant radiographic and ultrasonographic findings. Their absence limits the exclusion of occult tendon tearing and coexisting neuropathy.



FIGURE 1: Bilateral calcific densities at the proximal hamstring origins.

(A) Anteroposterior radiograph of the pelvis and lumbosacral region. (B) Lateral lumbosacral radiograph. Arrowheads indicate calcific densities adjacent to the ischial tuberosities.

Ultrasound equipment and transducer positions

The patient was examined prone using an X-CUBE 90 Elite ultrasound system with an SL3-19X linear transducer (Alpinion Medical Systems Co., Ltd., Seoul, Republic of Korea). Representative images were acquired at 8 MHz, a 4-cm depth, and a 60-dB dynamic range. The examination combined axial mapping with component-specific oblique long-axis tracing. The transducer positions are illustrated in Figure *2*.

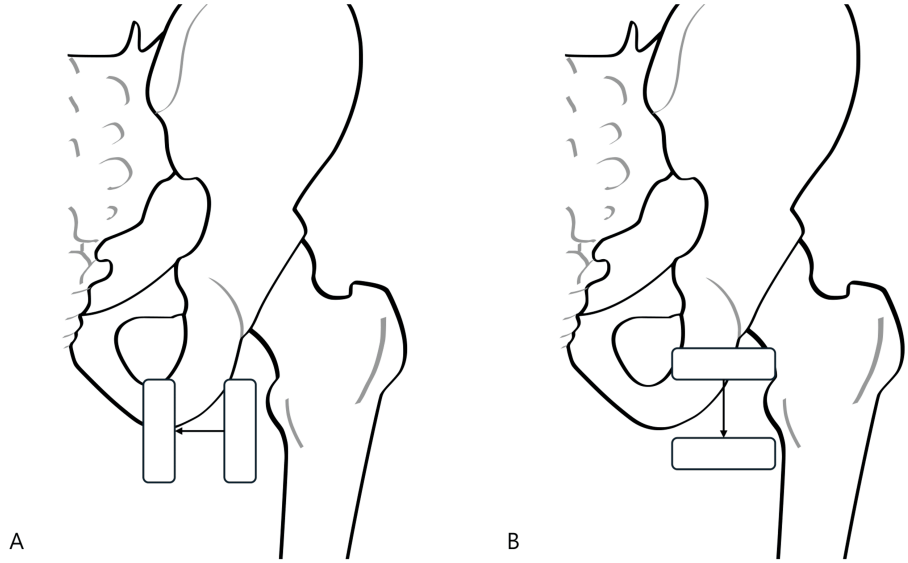


FIGURE 2: Transducer positions for proximal hamstring ultrasonography.

(A) Long-axis placement with mediolateral translation and progressive rotation to align the insonation plane with each tendon component. (B) Axial placement with a craniocaudal sweep from the ischial tuberosity into the proximal posterior thigh. The anatomical base was adapted from “Thigh posterior.svg” by Athikhun.suw, Wikimedia Commons, under the Creative Commons Attribution-ShareAlike 4.0 International license (CC BY-SA 4.0). The authors simplified the source image and added transducer positions and scan-direction arrows; this adapted figure is distributed under the same license.

Axial mapping

The examination began in the axial plane at the ischial tuberosity. The cortical surface, ST-BFLH conjoint complex, deeper SM attachment, sciatic nerve, and regional vessels were identified. Mediolateral and craniocaudal sweeps were performed bilaterally rather than relying on a single static image.

The calcific foci persisted after transducer angulation and orthogonal confirmation, distinguishing them from angle-dependent artifact. More distally, the ST, BFLH, and SM were identified separately and then traced proximally toward the ischial origin (Figure *3*).

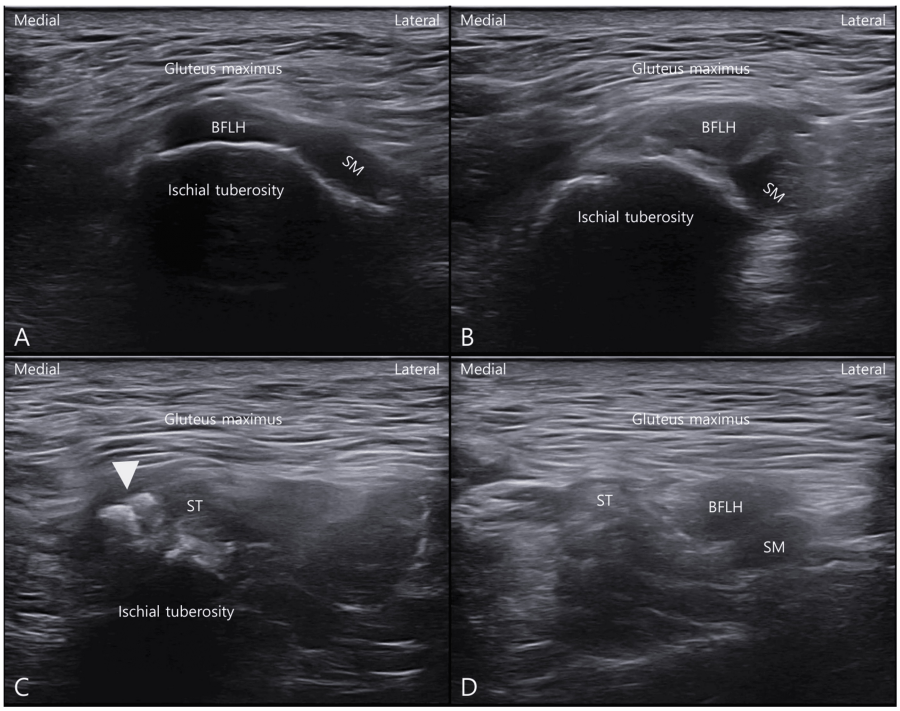


FIGURE 3: Axial ultrasonographic anatomy and calcification at the proximal hamstring origin.

(A, B) The BFLH and SM at the ischial tuberosity beneath the gluteus maximus. (C) The ST component adjacent to the ischial tuberosity; the arrowhead indicates calcification. (D) A more distal image showing the relative positions of the ST, BFLH, and SM.

BFLH: biceps femoris long head; SM: semimembranosus; ST: semitendinosus

Component-specific long-axis tracing and anisotropy correction

Each tendon component was traced from distal to proximal. The ST and BFLH were followed separately toward the conjoint origin to determine the longitudinal continuity of the calcific lesions. The SM was identified distally, where its course was more readily recognized, and then followed cranially to its higher and deeper attachment.

A simple 90-degree rotation from the axial plane did not reliably align the ultrasound beam with the SM fibers. Progressive rotation, heel-toe angulation, and rocking were used to restore fibrillar echogenicity along the curved tendon course. Hypoechogenicity that resolved with angle correction was considered anisotropic artifact; a structural abnormality required persistence after angle optimization and confirmation in an orthogonal plane.

Long-axis tracing demonstrated continuity between the bilateral calcific lesions and the ST components of the conjoint origins. The BFLH and SM attachments showed no corresponding calcific involvement (Figure 4).

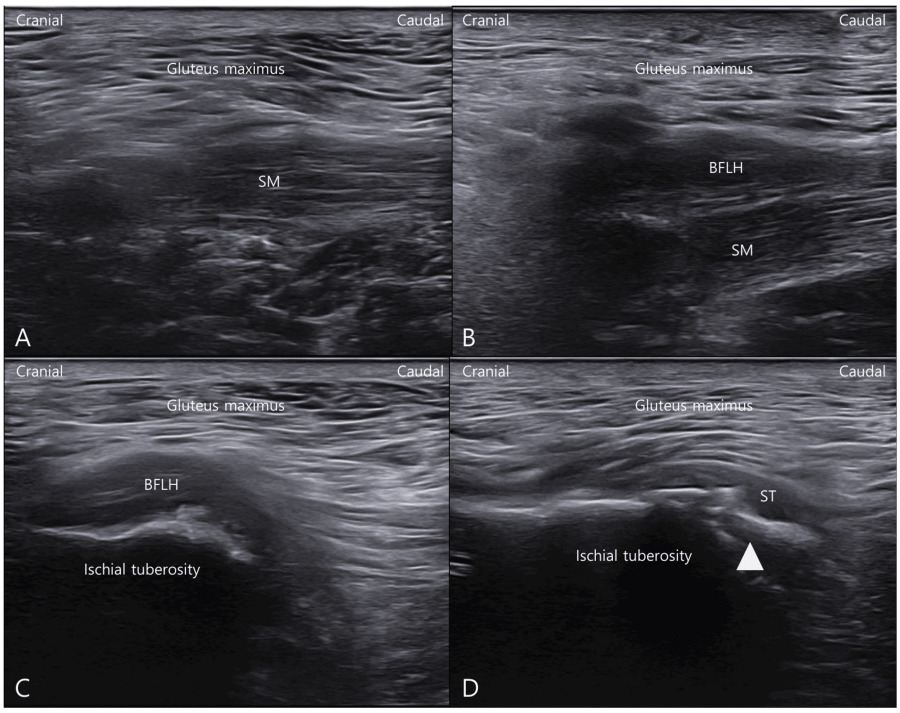


FIGURE 4: Component-specific long-axis ultrasonography of the proximal hamstring origin.

(A) Long-axis view of the SM. (B) The BFLH and SM in separate tissue planes. (C) Long-axis view of the BFLH at the ischial tuberosity. (D) Long-axis view of the ST component at the enthesis; the arrowhead indicates calcification.

BFLH: biceps femoris long head; SM: semimembranosus; ST: semitendinosus

Technical sequence and pitfalls

The examination sequence and principal diagnostic and procedural pitfalls are summarized in Table *1*.

Step	Maneuver	Primary objective	Principal pitfall
1	Axial mapping at the ischial tuberosity	Identify cortex, conjoint complex, SM, and sciatic nerve	Treating a single static image as complete mapping
2	Distal component identification	Separate ST, BFLH, and SM before reverse tracing	Assuming the conjoint origin is a single inseparable target
3	ST and BFLH long-axis tracing	Establish longitudinal continuity with a focal lesion	Misassigning a lesion to the whole conjoint complex
4	SM-specific oblique long-axis alignment	Evaluate the full SM attachment as a distinct enthesis	False hypoechogenicity caused by anisotropy
4A	Independent SM interpretation	Interpret the SM attachment independently from conjoint-tendon findings	Inferring SM pathology from an abnormal conjoint origin
5	Orthogonal confirmation and bilateral comparison	Confirm that the abnormality persists after angle correction	Calling an angle-dependent change tendinopathy
5A	Angle-dependence testing before structural labeling	Reassess suspicious hypoechogenicity after transducer angulation and confirm structural findings in an orthogonal plane	Misclassifying anisotropy or angle-dependent artifact as structural pathology
6	Preprocedural safety mapping and real-time injection monitoring	Identify the sciatic nerve and vessels, maintain needle-tip visibility, and confirm the intended endpoint	Classifying a D5W injection as hydrodissection without observed tissue-plane separation

TABLE 1: Stepwise proximal hamstring ultrasound examination and common pitfalls.

BFLH: biceps femoris long head; D5W: 5% dextrose in water; SM: semimembranosus; ST: semitendinosus

Ultrasound-guided injection

After sterile preparation, the procedure was performed bilaterally using a 23-gauge, 6-cm needle introduced in-plane in the long-axis view from caudal to cranial. The sciatic nerve and regional vessels were reassessed before needle advancement, and the needle tip and shaft remained visible throughout the procedure. D5W was injected into the interface between the SM and the conjoint tendon complex until real-time tissue-plane separation was observed. The needle was then redirected to the calcific proximal enthesis on each side. On each side, 30 mL of D5W was used in total. Phase-specific volumes were not recorded and were not retrospectively estimated; reproducibility of the interfascial phase was defined by the sonographic endpoint of visible tissue-plane separation, after which the remaining injectate was delivered to the calcific enthesis according to real-time spread. The displayed still image documents the interfascial phase (Figure *5*).

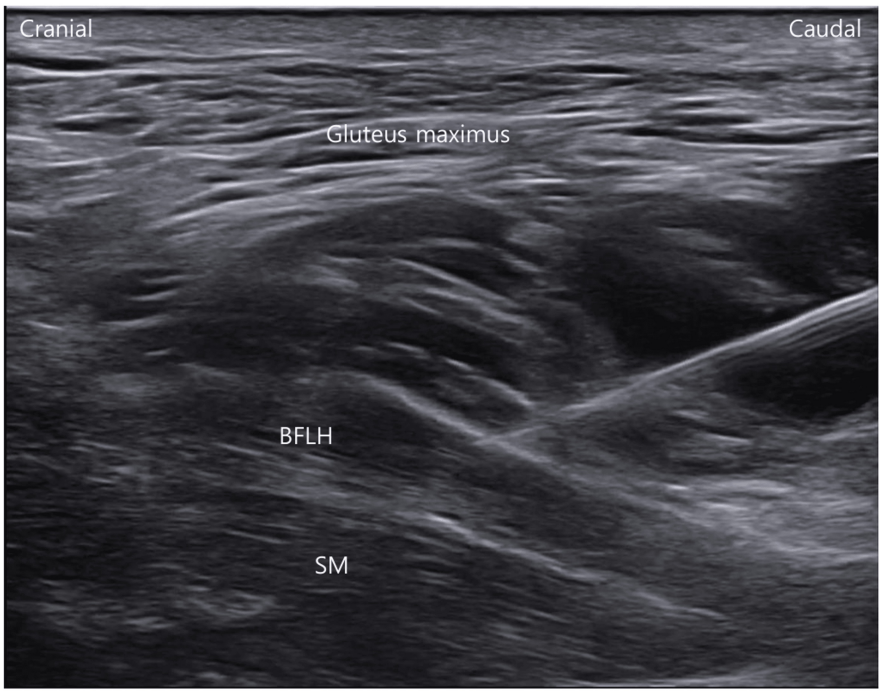


FIGURE 5: In-plane needle approach to the SM-conjoint tendon interface.

A 23-gauge, 6-cm needle is advanced in a long-axis view toward the interface between the SM and the overlying conjoint tendon complex. This still image documents the interfascial phase; subsequent redirection to the calcific enthesis was performed under real-time ultrasonographic guidance but is not shown. A dedicated post-injection still image was not archived; real-time imaging confirmed fluid-mediated separation of the intended interface. Thirty milliliters of D5W was used on each side (60 mL total per session) without a fixed target-specific allocation.

D5W: 5% dextrose in water; SM: semimembranosus

Six ultrasound-guided sessions were performed at two-week intervals. The maneuver with observed fluid-mediated separation was reported as interfascial hydrodissection, whereas delivery to the calcific attachment was reported separately as enthesis-directed D5W injection [13]. The procedural description therefore specifies the target, injectant, technique, and observed endpoint rather than classifying the entire session by injectant alone.

Follow-up and ethical considerations

The patient reported progressive improvement in the residual bilateral posterior leg pain during the six-session treatment course, while the previously improved low-back and buttock pain remained improved. Serial numeric rating scale scores and repeated formal strength grades were not recorded consistently enough for valid session-by-session quantitative analysis. Follow-up was ongoing; therefore, complete resolution and long-term durability were not claimed.

The clinical information that was documented consistently enough for retrospective reporting is summarized in Table *2*.

Time point	Posterior leg pain	Low-back/buttock pain	Knee-flexion finding	Adverse events
Before proximal hamstring-targeted treatment	Persistent bilateral posterior leg pain extending to the calves	Low-back and buttock pain had improved after prior anatomically directed injections	Weakness during resisted knee flexion; no formal MRC grade recorded	Not applicable
During six-session course (two-week intervals)	Patient-reported progressive improvement; serial NRS values were not consistently recorded	Remained improved	Not serially graded	None reported
Latest documented follow-up (ongoing)	Improvement remained ongoing; complete resolution and durability were not established	Remained improved	Not regraded	None reported

TABLE 2: Available clinical course data.

Session-level numeric pain scores and formal strength grades were not reconstructed when they had not been recorded contemporaneously.

MRC: Medical Research Council; NRS: numeric rating scale

No adverse events were reported during treatment or follow-up. Written informed consent was obtained for treatment and for publication of anonymized clinical information and images. Under institutional policy, review by an Institutional Review Board was not required because this single-patient technical report described routine clinical care and did not constitute human-subject research.

Discussion

Diagnostic contribution of component-specific long-axis imaging

Axial ultrasonography is essential for regional orientation but does not, by itself, establish which tendon component is continuous with a focal enthesis lesion. In this case, distal-to-proximal long-axis tracing localized the bilateral calcific lesions to the ST components of the conjoint origins rather than to the proximal hamstring origin as a composite unit.

Detailed sonographic anatomy and the value of longitudinal views are established [4,5]. The extensive proximal SM attachment has also been characterized anatomically [6], and recent studies have classified acute injuries by the involved origin tendon and recommended combined axial and long-axis evaluation [7,8]. Thus, the contribution of this report is not the first use of long-axis imaging; it is the deliberate, component-specific tracing of the ST, BFLH, and full proximal SM attachment in chronic enthesis disease.

Anisotropy and clinical relevance of the SM attachment

The curved SM course makes anisotropy a central diagnostic issue. A fixed sagittal plane may produce marked hypoechogenicity in structurally intact tendon. In this sequence, differential anisotropy helped distinguish the tendon components, but structural interpretation was made only after progressive rotation, heel-toe adjustment, rocking, and orthogonal confirmation.

Separate SM assessment is also relevant to procedural safety because the tendon lies close to the sciatic nerve. A broader deep gluteal syndrome framework recognizes that entheseal lesions may generate pain independently and may secondarily affect adjacent neural structures [10]. Proximal hamstring-related sciatic nerve tethering has been described clinically [11]. A cadaveric deep gluteal injection study demonstrated the close sonographic relationship between the SM and sciatic nerve and showed that injectate in an adjacent fascial pathway may reach both entheseal and neural surfaces [12]. These findings support anatomical plausibility but do not validate the exact interface used in this case, establish a nerve-specific mechanism, or reclassify the patient as having deep gluteal syndrome.

Target selection and procedural terminology

The intervention had two receiving targets and was therefore reported as two procedural components. Hydrodissection required observed fluid-mediated separation of the SM-conjoint tendon interface, whereas delivery to the calcific attachment was described as enthesis-directed D5W injection [13]. Perineural hydrodissection principles and previous fascial hydrodissection for chronic hamstring injury provide procedural context [14,15]. Throughout the image-guided intervention, continuous needle-tip visualization and confirmation of the intended anatomical target were treated as procedural safety endpoints. A technical

report at the soleus fibular enthesis similarly combined lesion-directed D5W delivery with attachment-adjacent hydrodissection while avoiding direct treatment of the nearby nerve [18]. That report supports target-based procedural nomenclature but does not establish mechanistic or therapeutic equivalence with proximal hamstring enthesopathy.

Enthesis-centered target selection has also been described for piriformis enthesopathy associated with predominantly neural symptoms [19]. This clinical analogy supports systematic assessment of deep gluteal attachment sites but not a shared mechanism or a tendon-specific referral pattern. Within the hamstring literature, recent endoscopic cases identified calcific deposits that had not been recognized before surgery, and a nonathlete case report described ultrasound-guided injection at the ischial tuberosity [16,17]. The present report adds preprocedural localization to an individual tendon component; it does not establish that ST pathology produces a characteristic calf pain pattern or that D5W is effective for calcific proximal hamstring enthesopathy.

Limitations

This report describes one patient and an operator-dependent technique. Serial validated outcomes, session-level numeric pain scores, formal repeated strength grades, and standardized neurodynamic or dermatomal sensory examinations were not collected consistently enough for retrospective quantitative analysis. Multiple coexisting pain generators and previous anatomically directed treatments limited causal attribution. Interfascial hydrodissection and enthesis-directed injection were performed during the same sessions, and the 30-mL per-side volume (60 mL total per session) was distributed according to real-time tissue spread without a fixed target-specific allocation. The contribution and dose-response relationship of each component therefore cannot be determined. A dedicated post-injection still image was not archived, although real-time ultrasonography documented interface separation during the procedure.

Dedicated proximal hamstring magnetic resonance imaging and electrodiagnostic testing were not performed during routine care. Component localization therefore relied on radiography and ultrasonography, precluding assessment of occult tendon tearing, marrow abnormalities, other deep gluteal pathology not visible on ultrasound, or an independently confirmed neuropathic mechanism. This absence of confirmatory imaging and electrodiagnostic testing is a recognized limitation of the present report. The association between the ST lesions and the distal symptoms remains clinical rather than mechanistically established.

The absence of SM calcification in this patient also limits direct validation of the sequence for SM disease. Future studies should assess interobserver reproducibility, compare axial-only with component-specific examinations, and determine whether dedicated SM long-axis assessment improves diagnostic accuracy, target selection, or procedural safety.

Conclusions

Axial ultrasonography may be complemented by component-specific long-axis tracing when a focal chronic proximal hamstring enthesis lesion is suspected. The ST, BFLH, and SM require separate alignment, and evaluation of the SM may require active anisotropy correction because of its curved course and proximity to the sciatic nerve. Diagnostic accuracy and interobserver reliability of this sequence remain unestablished.

In this case, the sequence localized bilateral calcification to the ST components and guided an intervention documented separately as interfascial hydrodissection and enthesis-directed 5% dextrose injection. Larger studies are required to determine the reproducibility, diagnostic value, procedural safety, and clinical effectiveness of this approach.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Yonghyun Yoon, King Hei Stanley Lam

Acquisition, analysis, or interpretation of data: Yonghyun Yoon, Hyeongjik Kim, Dongyeun Sung, Youngmo Kim, Jeimylo C de Castro

Drafting of the manuscript: Yonghyun Yoon, King Hei Stanley Lam

Critical review of the manuscript for important intellectual content: Yonghyun Yoon, Hyeongjik Kim, Dongyeun Sung, Youngmo Kim, Jeimylo C de Castro

Supervision: King Hei Stanley Lam

Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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