



Acute Unilateral Quadriceps Weakness Following Spinal Anesthesia for Total Knee Arthroplasty: A Case Report

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Introduction

Total knee arthroplasty (TKA) is a surgery commonly performed for patients experiencing advanced knee osteoarthritis¹. Spinal anesthesia is commonly used to facilitate TKA, and potential complications include hypotension, acute urinary retention, or very rarely neurologic complications². TKA itself has the potential to exacerbates already impaired muscle function, where patients can lose 60-83% of knee extension strength immediately postoperatively, with the mainstay of treatment being physiotherapy³.

History of Presenting Illness

PMH:

- Benign Prostatic Hypertrophy: on oral therapy
- Hit by car 50 yrs ago, tibial plateau fracture, lateral meniscectomy
- Hypothyroidism
- No previous neurological deficit

HPI:

- Spinal anesthetic with 13.5 mg of 0.75% bupivacaine
- Two attempts by two practitioners
- No peripheral nerve block preformed
- Right total knee arthroplasty

Concerns:

- Acute urinary retention requiring self-catheterization
- Acute profound right quadriceps weakness

Physical Exam:

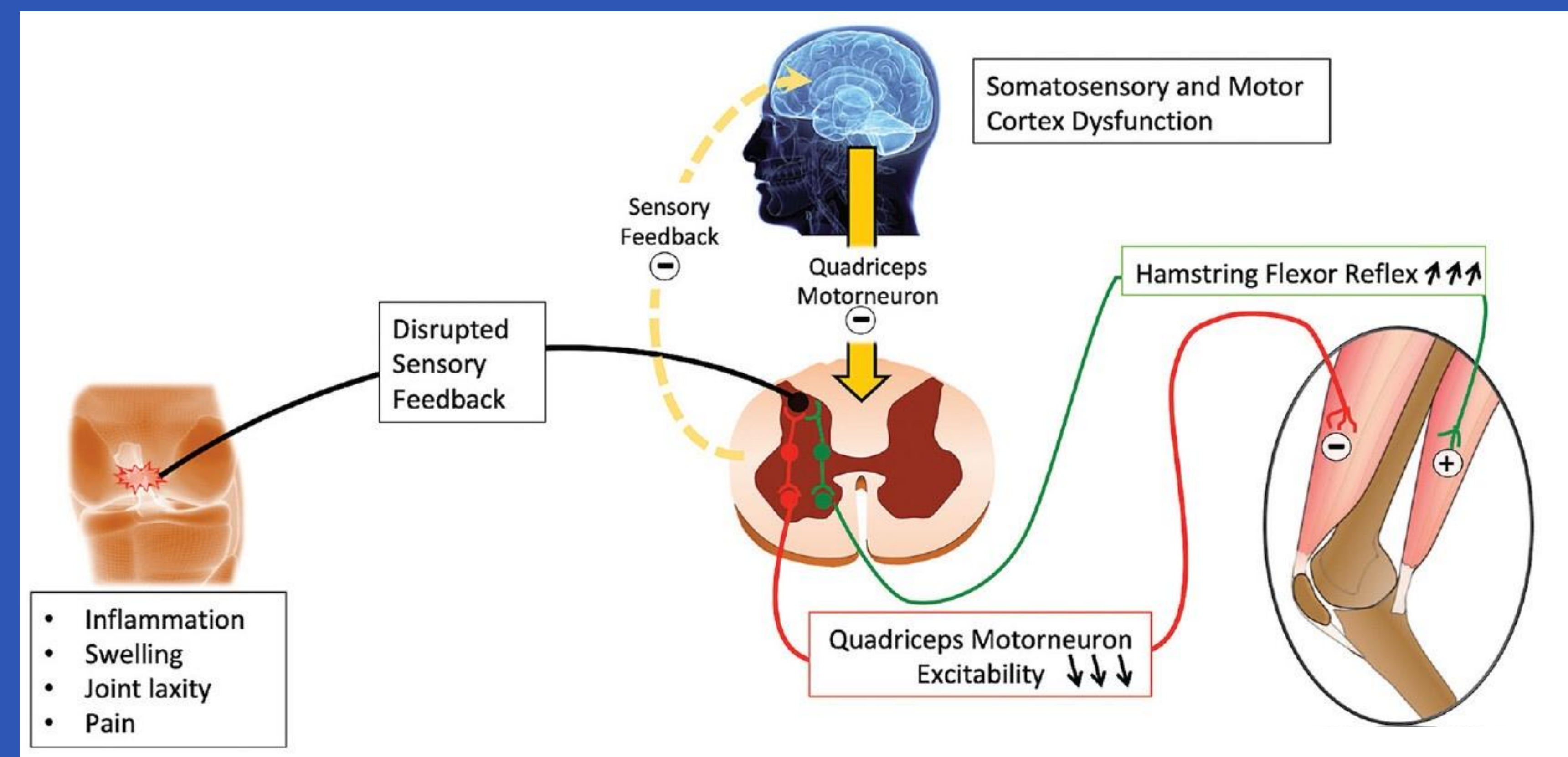
- Visible atrophy of right thigh compared to left
- No sensory deficits – normal light touch and no loss of sharp/dull differentiation
- No saddle anesthesia
- Normal strength in left leg
- Right quadriceps flexion strength 3/5, all other muscle groups normal 5/5

Methods

Data and images were obtained from the electronic medical records. All patient-identifying information has been removed before inclusion into this report. Informed patient consent was obtained.

Concerns were raised for **spinal cord injury** given the combination of **urinary retention** and **muscle weakness**.

However, the presentation is more in keeping with **arthrogenic muscle inhibition** given intact sensation and ipsilateral motor impairment.



Pathophysiological processes leading to arthrogenic muscle inhibition (AMI). ACL, anterior cruciate ligament. Modified with permission from American Journal of Sports Medicine⁴

Diagnostic Assessment



MRI L-spine: No evidence of spinal cord injury or foraminal narrowing. Old L2, L3 vertebral body fractures and degenerative changes

Electrodiagnostic Testing: No evidence of any focal entrapment neuropathies, lumbar radiculopathies, lumbosacral plexopathy, or polyneuropathy on nerve conduction studies or electromyography.

Discussion

Unilateral weakness suggests a peripheral injury, and motor changes without any sensory changes would be extremely unusual for a femoral nerve injury. The urinary retention could be explained by his longstanding BPH, exacerbated by the spinal anesthetic.

One proposed mechanism for this acute muscle weakness is arthrogenic muscle inhibition (AMI) - a presynaptic, ongoing reflex inhibition of musculature surrounding a joint after distension or damage to structures of that joint⁴. AMI is a sequential and cumulative neurological process that inhibits surrounding musculature after joint trauma, hypothesized to be a protective mechanism to avoid further joint damage⁵.

References

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- 3)Mizner R.L. et al. *J Bone Joint Surg Am* vol.87,5 (2005):1047-1053.
- 4)Delaloye JR et al. *Am J Sports Med* vol.48,3 (2020):565-572.
- 5)Dos Anjos T et al. *Sports Health* vol.16,3 (2024) :383-389.