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Case Report

Clinical features of central isolated unilateral foot drop: A case report and review of the literature

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Abstract

Background: Intracranial cause of isolated unilateral foot drop is very rare. There may be a delay in the diagnosis of the cause of central foot drop or patients with such lesions might be misdiagnosed and subjected to unnecessary interventions. One of the reasons for the diagnostic uncertainty might be the absence of upper motor neuron (UMN) signs in the initial examination of such patients.

Case Description: We present a very rare case of a 78-year-old woman who had presented with a five-year progressive right-sided unilateral isolated foot drop from a left-sided parasagittal tumor. Previously, she had undergone biopsy of an abnormality on the right C7/T1 facet, which was found to be benign. On examination of the patient, she had UMN signs in the ipsilateral foot. On magnetic resonance imaging scan of her head, a 3-cm left parasagittal lesion, consistent with it being a meningioma, was noted. The patient had significant medical history and declined to undergo surgical removal of the lesion.

Conclusion: We review the literature on central foot drop from various intracranial pathologies and discern its clinical features. Patients with central foot drop often have UMN signs; however, these may be absent causing diagnostic uncertainty, and physicians should be vigilant of these variations in the presentation.

Key Words: Foot drop, parasagittal, meningioma, spastic

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BACKGROUND

Foot drop is weakness in dorsiflexion of the foot and is often accompanied by weakness of extension of the toes and eversion of the foot.[19] This is distinct from flail foot. In the latter, there is weakness of all the muscles below the knee, including weakness of the planter flexion.

When patients present with foot drop, they are initially investigated for common causes of foot drop such as L5 radiculopathy or peroneal nerve palsy. As such, when a patient with parasagittal lesion presents with foot drop, the diagnosis is often delayed or attributed to an incidental prolapsed L4/5 disc and treated inappropriately. The confusion is compounded in those patients with foot drop from parasagittal lesions who do not exhibit clinical features of a upper motor lesion , and patients with

concurrent lumbar spinal disease.

We present a very rare case of a 78-year-old woman who had presented with a five-year progressive right-sided unilateral isolated foot drop from a left-sided parasagittal tumor. We review the literature on central foot drop from various intracranial pathologies and discern its myriad clinical features.

CASE DESCRIPTION

We were referred a 78-year-old woman with a five-year history of progressive right-sided foot drop. She also complained of five-year history of back pain and pain in the anterior thighs with weakness in the legs on walking. The patient denied any headache. The only sensory symptom she had was a three-week history of paresthesia in the right little finger.

Her medical history included coronary artery bypass graft and aortic valve repair five years ago. She also had removal of an ovarian cyst, vaginal polyp, and breast lumps, all of which were benign.

The referring physicians had initially obtained magnetic resonance imaging (MRI) of the lumbosacral spine, which showed moderate lumbar spine stenosis at L3/4 level. Subsequently, the patient had an MRI of the cervical and thoracic spines which showed an abnormality relating to the right C7/T1 facet, without any discernable neural compression. Biopsy of this lesion showed it to be benign.

On our review, the lower limbs had normal tone bilaterally, including the ankles. On the right side, the power of right dorsiflexion was 3/5, contraction of extensor hallucis longus was 4/5, and plantar flexion was 4/5. The power in the other muscle groups in the lower limbs was normal. The knee reflex was normal bilaterally. The ankle reflex was mildly brisk on the right side and normal on the left side. There were 3-beats of clonus on the right side which became more sustained and pronounced with distraction. There was no clonus on the left side. Babinski test was positive on the right side and negative on the left side. Sensation to light touch was normal bilaterally.

The patient then had an MRI scan of her head. This showed a 3-cm well-demarcated, contrast-enhancing lesion with dural tail and surrounding cerebrospinal fluid cleft in the left parasagittal region [Figures 1-3]. This was strongly suggestive of a parasagittal meningioma.

CONCLUSION

Central causes of foot drop are very rare. Only eighteen cases of central foot drop have been reported in the English language literature; six of them are from parasagittal meningiomas [Table 1].

Patients can present with isolated unilateral foot drop.

Figure 1: Sagittal T1-weighted MRI showing 3-cm well-circumscribed parasagittal lesion with surrounding cerebrospinal fluid cleft

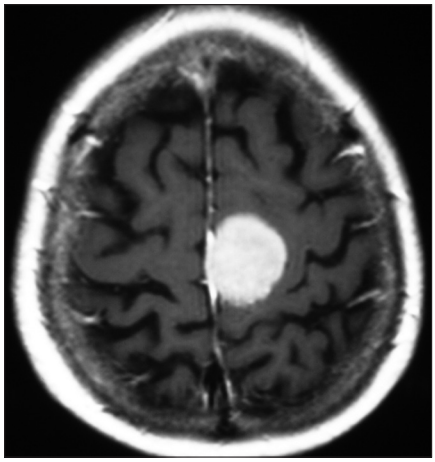

Figure 2: Axial T1-weighted contrast-enhanced scan showing homogeneous contrast-enhanced left parasagittal lesion with a dural base

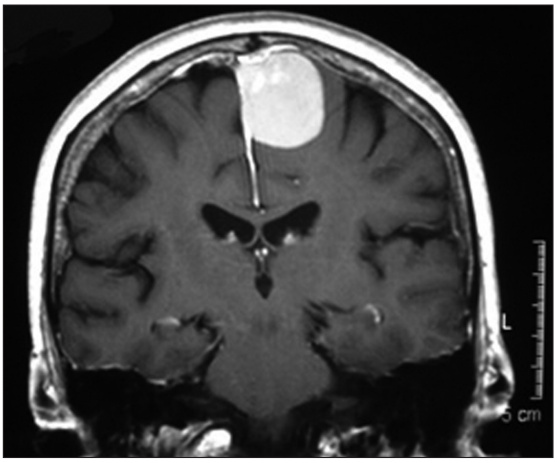

Figure 3: Coronal T1-weighted contrast-enhanced scan showing homogeneously enhanced left parasagittal lesion with probable sagittal venous sinus involvement

Table 1: Types of lesions causing central foot drop

Pathology	Number of cases
Meningioma‡[5,9,13,15,20,22]	7
High grade glioma[5,14]	2
Low grade glioma[5,8]	2
Cerebral contusion[3,9]	2
Cerebral metastasis[21,7]	2
Abscess[9]	1
Demyelinating plaque[9]	1
Unknown*[9]	1
Total	18

‡Include the case being reported by us although, the meningioma was a radiological diagnosis, *Patient had been lost to follow-up

This may be due to a lower motor neuron (LMN) or upper motor neuron (UMN) pathology. The most common cause of foot drop is a lesion in the common peroneal nerve, L5 radiculopathy, or L4 radiculopathy. The other peripheral causes of foot drop include lesions of the anterior horn cells, lumbar plexopathy, lesion of the lumbosacral trunk of the lumbosacral plexus, sciatic neuropathy, leg compartment syndrome, stroke, vasculitides, diabetes, surgical nerve injuries during total knee or hip replacement. Muscular dystrophy can also cause foot drop.

Another term used for central foot drop is "Spastic foot-drop." Lesions along the UMN for the foot, extending from the motor cortex sub-serving the foot to the corticospinal tract (cervical myelopathy), can cause foot drop. The lesions could be tumors, infarctions, abscesses, demyelinating plaques, or spinal cord compression.

Mid-parasagittal lesions can cause foot drop.[2,10,17] This is due to local mass effect on the motor cortex serving the ankle and toe movements, which is on the medial homunculus of the primary motor cortex at the mesial surface and top of the lateral surface of the precentral gyrus. Lesions in the parasagittal region that have been reported to cause foot drop include high-grade glioma, low-grade astrocytoma, metastasis, meningioma, abscess, and cerebral contusions. This area can also be affected by anterior cerebral artery stroke.[11,12] Lesions to the supplementary motor area for the foot in the posterior superior frontal gyrus (adjacent to area 4) can also lead to contralateral foot drop as well.

Head and neck cancers have also been associated with foot drop[6] but, the cause has been postulated to be an indirect effect of the cancer. Patients with head and neck cancers often suffer significant weight loss. When patients have had weight loss and have a habit of crossing their legs, there is a risk of common peroneal nerve compression at the neck of fibula because of decrease in the padding between the common peroneal nerve and the head and neck of fibula.

Parasagittal meningiomas causing contralateral isolated foot drop are very rare with only six cases reported in the literature. However, this is the only case to the authors' knowledge of an isolated foot drop from parasagittal meningioma with no history of associated headache or sensory deficit.

In three cases where foot drop has been reported with parasagittal meningioma, the foot drop was the prominent clinical feature in patients with hemiparesis rather than an isolated foot drop. It is the latter which often causes diagnostic problem with peripheral nerve causes of foot drop.

In the case reported by Lath and Vedantam, there was true drop foot associated with parasagittal meningioma but accompanied by sensory deficit over the ipsilateral L5 and S1 dermatomes.

In the cases of drop-foot associated with parasagittal meningioma reported by Baysefer *et al*., no description was given of the rest of the neurological examination of the lower limbs.

Headache is not a common feature in patients suffering from supratentorial causes of foot drop. Of the seventeen cases of nontraumatic central foot drop reported in the literature, only four patients had a headache. In two cases, the cause of the foot drop was meningioma and another patient had an abscess. In one case, the pathology of the parasagittal tumor was not established as the patient was lost to follow-up.

In the case of foot drop associated with parasagittal meningioma reported by Tun *et al*., there was also ipsilateral brisk knee reflex noted.

In comparing our case with other reported cases of foot drop, it should be noted that in the present case, we only had a radiological diagnosis of foot drop. As our patient had declined surgery, we could not obtain a pathological confirmation of our diagnosis.

Our patient had concurrent lumbar and thoracocervical spine problems that led to diagnostic uncertainty about the cause of the foot drop. Diagnosis of the central cause of foot drop can be delayed and patients have been reported to undergo unnecessary operations.

Though the majority of clinical features of foot drop from parasagittal lesions are of UMN, there may be nonspecific or LMN s signs present[1] [Table 2].

Tone

A patient with central foot drop would be expected to have increased tone in the ipsilateral ankle. In our patient, the tone in the lower limbs, including at the ankles, was normal. Lath and Vedantam also reported normal tone in the lower limbs in their patient with foot drop associated with a parasagittal meningioma.

Table 2: Clinical features of patients with central foot drop

Clinical features		
Headache	Yes (n=4)[5,9,20]	No/NM(n=15)[3,5,7-9,13,15,21,22]‡
Focal seizure	Yes (n=2)[13,14]	No/NM(n=17)[3,5,8,9,13,14,16,20-22]‡
Sciatica	Yes (n=0)	No (n=8)[8,9,13,20,21]‡
Sensory deficit	Yes (n=2)[9,13]	No/NM (n=15)[3,5,7-9,14,15,20-22]‡
Atrophy	Yes (n=0)	No (n=8)[7,8,9,13,20]‡
Tone	Increased (n=3)[7,14,15]	Normal (n=3)[9,13]‡
Hemiparesis	Yes (n=6)[9,15,22]	No/NM (n=13)[3,5,7-9,13,14,20,21]‡
Knee reflex	Brisk (n=9)[5,9,13,15,20,22]	Normal (n=6)[3,8,9,14,21]‡
Ankle reflex	Brisk (n=9)[5,9,13,18,20,22,]‡	Normal (n=4)[5,8,9,21]
Clonus	Present (n=3)[9]‡	Absent (n=6)[3,4,9,13,22]
Babinski	Positive (n=9)[5,9,13,15,20]‡	Negative (n=6)[3,7,9,14,21,22]

NM: Not mentioned, ‡Case being reported

Ankle reflex

Our patient displayed brisk ankle reflex on the side of the foot drop. Brisk ankle reflex has also been reported by other authors. However, in the patient reported by Atac *et al*., with central foot drop from contusion to the supplementary motor area for the foot in the posterior superior frontal gyrus, no abnormal ankle reflex was noted. Lee and Wang also did not observe brisk reflexes in their patient who had central foot drop from an anaplastic oligoastrocytoma.

Clonus

Our patient displayed clonus on the side of the foot drop. Eskandary *et al*. reported two patients with foot drop who had ipsilateral clonus. However, the patient reported by Lath and Vedantam and Atac *et al*. had no clonus.

Babinski test

Our patient displayed extensor plantar response on the side of the foot drop. Extensor plantar response is a common finding in cases of central foot drop. However, Atac *et al*. and Lee and Wang did not observe positive Babinski test in their patients.

Pain

Our patient had back pain and anterior thigh pain. However, in other reports, there was no accompanying low back pain or leg pain.

Outcome of interventions

There was improvement in the foot drop in four cases where the patients had undergone surgical removal of the causative parasagittal lesion. In two of these cases, the pathology was meningioma. In three cases, there was no change in the severity of foot drop following surgical intervention.

When a patient presents with isolated foot drop, the examiner should consider the possibility of it being due to a parasagittal lesion. The examiner should be aware that foot drop from parasagittal lesions could present with UMN, LMN, or nonspecific signs, or possibly a combination of these.

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Commentary

When I was in training for the neurological sciences at the University of Illinois in the early 1960s, there was only one department that encompassed both neurology and neurosurgery. Therefore, my fellow residents and I were trained in both specialties and, after successful completion of the program, we could have taken the board certification examination in either or both specialties. Years later, after the original Chairman of the Department, Eric Oldberg, retired, the department was divided into two: one Neurology and the other Neurosurgery. I elected to follow the route of Neurosurgery.

In those days, the term "foot drop" was exclusively reserved for the lower motor neuron variety of the problem whereas the upper motor neuron version was referred to as a spastic leg, wherein the antigravity muscles are more hyperactive than the others, resulting in the plantar thrust of the afflicted foot. When reviewing the literature on the topic as I analyzed this report, I found that from about 1975 or so, "foot drop" began appearing in the literature as applied to either form of plantar positioning of the foot, but that the central variety also had other findings associated with an upper motor neuron lesion, which led the authors of this report to seek a more central source in this case. So much from a historical and anatomical perspective.

The meningioma in this thorough and well-referenced report has no perceptual edema around it, attesting, in part at least, to the slow growth of the lesion and the reason that the "drop foot" appeared to develop in conjunction with weakening of the lower extremities over a 5-year period. Peritumoral edema around the meningiomas may be related to the invading potential of such tumors[23] and the lack thereof, in this case, supports the authors' decision of not to operate on the lesion, as requested by this elderly patient. Also, the presence of peritumoral edema carries a poorer prognosis for outcome, and is found more often in men than in women.[24,25] Hence, there are a number of lessons to be learned from this report.

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