

Pendular Knee Jerk in a Spastic Limb- Seeking Poetic Justice for Conventional Neuroscience!

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In a conventional clinical round, my resident presented a case of a Cerebrovascular Event (CVE) with right-sided hemiparesis and requested me to demonstrate ankle clonus. I demonstrated it for him and the other junior residents attending the rounds [Video-1]. I then asked the senior resident to demonstrate all the deep tendon reflexes, which he did correctly, and we all observed the exaggerated deep tendon reflexes in the right-sided upper and lower limbs. A conventional clinical neurologic question-and-answer session regarding tone and reflexes continued for some time, starting with the definition and classification of tone, causes of hypertonia, and the differences between spasticity, rigidity and paratonia. We also discussed the grades of reflexes, clonus and hyperreflexia.

Then, I purposefully stumbled upon the “pendular knee jerk.” I was pleased to hear the response. The senior resident answered, “The pendular knee jerk is seen in cerebellar disease. When we strike the patellar tendon, the leg swings to and fro like a pendulum for more than four times,” and he explained that it is due to hypotonia in cerebellar disease. A “hung-up” knee reflex, which is seen in chorea, also exhibits a pendular quality, again due to hypotonia. In a way, the pendular knee jerk hints at decreased tone (hypotonia).

By that time, the 75-year-old patient had gotten up and was sitting at the edge of the bed with his legs dangling down. I struck the patellar tendon on the right-side, and what I observed sparked my neurologic insight. I recorded it [Video-2]. Was this unconventional neurology? A pendular knee reflex with an added rotatory movement that continued for more than six times.

There was a silent awe and pause of several seconds; all eyes were on me, and my eyes were on the patient’s knee. I repeated the experiment another three or four times to confirm what I had seen, and it was... pendular... for five to six movements, then it became rotatory/circumducting for another four to five oscillations. Now I pondered upon the explanation.

The knee-jerk reflex, or patellar reflex, is a monosynaptic stretch reflex that assesses the integrity of the L2, L3, and L4 segments of the spinal cord. When the patellar tendon is struck with a reflex hammer, it stretches the muscle spindle in the quadriceps muscle. This action generates a signal that travels to the spinal cord and synapses directly (bypassing interneurons) at the L3 or L4 level. Subsequently, an alpha motor neuron transmits an efferent impulse back to the quadriceps femoris muscle, inducing its contraction. This contraction, coupled with the relaxation of the antagonistic hamstring muscles, results in the extension of the leg [1].

In neurologic conditions, an exaggerated knee reflex denotes a lesion in the pyramidal tract (upper motor neuron), while a decreased or absent reflex denotes a lesion in the lower motor neuron. A pendular

knee reflex, defined as the swinging of the leg more than four times after striking the patellar tendon, is observed in cerebellar disease [2].

In patients with cerebellar impairment, hypotonia- characterised by reduced resistance to passive movements—leads to an abnormal dampening of the elicited movement. As a result, following percussion of the patellar tendon, these patients exhibit a pendular knee jerk, where the leg continues to swing more than four times. Thus, a pendular knee jerk is indicative of hypotonia [3].

In this case, when we apply the conventional definition of a pendular knee jerk, which is based on the number of oscillations, the criteria for the clinical diagnosis of pendular knee jerk is established. According to the literature, a pendular reflex is associated with hypotonia. However, in this case, it was observed in a hypertonic limb. Clonus is a grade 4 reflex, demonstrated at the knee and ankle as sustained rhythmic contractions upon sudden, sustained dorsiflexion of the ankle or when a sudden downward stretch is applied to the patella. In rare clinical situations, clonus, the hallmark of hyperreflexia, can transform into a pendular quality when the patellar tendon is tapped. Clonus should not be replaced or mistaken for a pendular jerk; rather, when a pendular jerk is seen in a hypertonic, hyperreflexic limb, clonus explains the neurologic basis of the observation.

Clonus is a rhythmic, oscillating stretch reflex that is usually elicited at the ankle and patella. The cause of the oscillations is related to lesions in upper motor neurons and is generally accompanied by other signs of upper motor neuron lesions, like hyperreflexia, spasticity, loss of superficial reflexes, and a positive Babinski sign [4,5].

In this case, when the patellar tendon was tapped, the clonus manifested as repeated oscillations that mimicked a pendular knee reflex, and the rotatory oscillations were due to adductor spasticity. To conclude, if we traditionally adhere to the definition of a pendular knee jerk, then it follows that “not all pendular reflexes may signify hypotonia. In a spastic limb with grade 4 hyperreflexia, clonus may manifest itself with multiple oscillations.”

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