

Meningeal Signs: Kernig's Sign and Brudzinski's Sign

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Meningitis, an inflammation of the meninges, is a life-threatening illness. If left untreated, meningitis has a high, almost absolute mortality and certain types of acute bacterial meningitis can be lethal within a matter of hours.¹ Therefore, early and accurate diagnosis and effective treatment are critical.

Several clinical signs facilitate the diagnosis of meningitis. Kernig's sign and Brudzinski's sign (**Sidebar**) are easy to elicit and can alert physicians to the precarious situation of a patient with meningitis. Both of these signs are thought to be caused by the irritation of motor nerve roots passing through inflamed meninges as the roots are brought under tension.

HISTORIC PERSPECTIVE

Meningitis has been recognized since antiquity.² As early as the 15th century BC, Hippocrates taught that "If during fever, the neck shall have been suddenly twisted, the deglutition be rendered difficult without a tumor, it is a fatal sign."³ Centuries later, King Henry II of France (1519–1559) is believed to have died from meningitis that he contracted after sustaining a scalp injury during sport.^{4,5}

Meningitis was first described as a specific disease entity by British physician Thomas Willis (1621–1675) and Italian anatomist and pathologist Battista Morgagni (1682–1771).^{6,7} The earliest recorded epidemic of meningitis on the American continent that might have been caused by bacterial meningitis was recorded at Medfield, MA, in 1806.⁸ Autopsy data that showed pus between the patients' dura mater and pia mater substantiated bacterial meningitis as the causative factor.

MENINGEAL SIGNS

Kernig's Sign

Russian physician Vladimir Kernig was born in Lepaia, Latvia, in 1840. Kernig received his medical degree in 1865 and joined the Obuhorsk Hospital in

KERNIG'S SIGN

Elicitation: Flexing the patient's hip 90 degrees then extending the patient's knee causes pain.



Saint Petersburg, Russia, where he held a position until World War I.

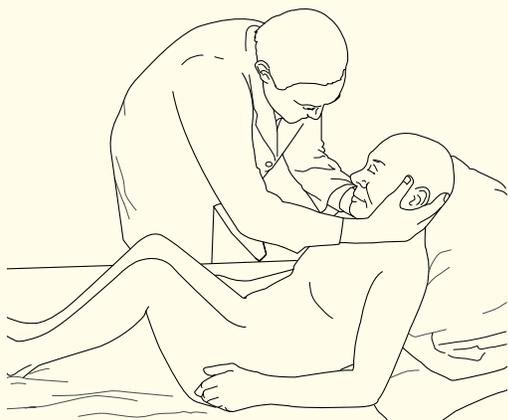
Kernig first described the sign in the Saint Petersburg *Medizinische Wochenschrift* in 1882.⁹ During Kernig's examination, the patient was seated upright with hips and knees flexed. Kernig would then attempt to extend the patient's knee. He noted that, in patients with meningitis, he was unable to extend the knee beyond 135 degrees without causing pain.

Today, the maneuver is usually performed with the patient supine with hips and knees in flexion. Extension of the knees is attempted: the inability to extend the patient's knees beyond 135 degrees without causing pain constitutes a positive test for Kernig's sign.

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BRUDZINSKI'S NECK SIGN

Elicitation: Flexing the patient's neck causes flexion of the patient's hips and knees.



Brudzinski's Sign

Jozef Brudzinski, a Polish physician in the early 20th century, became the dean of the University of Warsaw (Warsaw, Poland) and chief physician at the Hospital of Karl and Maria (Warsaw, Poland). By the beginning of the 20th century, Kernig's sign was well known and in widespread use in the medical community. However, Brudzinski's contribution to the understanding of meningeal signs is unique because Brudzinski used animal experiments to study the signs he elicited in patients with meningitis.^{10,11}

Brudzinski's neck sign. Brudzinski actually described several different signs in patients with meningitis. Brudzinski's neck sign is most commonly recognized and is often simply referred to as *Brudzinski's sign*.

With the patient supine, the physician places one hand behind the patient's head and places the other hand on the patient's chest. The physician then raises the patient's head (with the hand behind the head) while the hand on the chest restrains the patient and prevents the patient from rising. Flexion of the patient's lower extremities (hips and knees) constitutes a positive sign. Brudzinski's neck sign has more sensitivity than Kernig's sign.¹⁰

Brudzinski's contralateral reflex sign. Brudzinski's contralateral reflex sign has two components: the identical and reciprocal contralateral reflex. The patient's hip and knee are passively flexed on one side; if the contralateral leg bends in reflex, identical contralateral

reflex is demonstrated. Reciprocal contralateral reflex occurs when the leg that has flexed in response to the passive flexion of the contralateral hip and knee begins to extend passively.

SUMMARY

The importance of early recognition and treatment of meningitis cannot be overemphasized. With all the technological advances today, the medical community has yet to discover an economical, readily available screening test to supplant these easy-to-elicited physical signs. A positive result on these tests is an indication for the institution of antibiotic therapy, and treatment initiation need not be delayed until the performance of a lumbar puncture and receipt of the results. Overall mortality is still high, but with appropriate and timely treatment, most adult patients recover from meningitis and lead a normal life. Children recovering from meningitis occasionally experience sequelae such as hearing loss or cranial nerve deficit. These tests for meningitis are appropriately named to honor Kernig and Brudzinski, both of whom greatly contributed to medicine by facilitating the diagnosis of this life-threatening disease.

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