What does “back pain with or without nerve root involvement” mean?

A backache or back pain is not a disease per se, but should be understood as a warning signal issued by the body. A number of different causes can account for “back pain” as a symptom, causes that, without treatment, may either disappear all by themselves or have very serious consequences for the patient. The task of the treating physician is to collect the symptoms reported by the patient, interpret them, and arrive at a diagnosis. A careful interview of the patient, plus physical and neurological examinations, can provide valuable information as to whether it is a case of “simple” or “complex” back pain. This initial difference is decisive, for the physician must decide whether additional instrument examinations are required for a differential diagnosis (conventional x-rays, computer tomography, nuclear magnetic resonance imaging and other methods), whether conservative treatment can commence, and even whether a surgical option should be considered.

Simple back pain without spinal nerve root involvement can be caused by a number of individual factors (excessive loads, muscular imbalances within the muscles of the back, trigger points, etc.) and can as a rule be treated effectively and long-lastingly using physical treatment methods, physiotherapy, regular exercise, muscle strengthening exercises and, if necessary, the use of mild anti-inflammatory and painkilling drugs.
Back pain with spinal nerve root involvement is also called radicular pain. This means that the pain is caused by pressure on the spinal nerves, resulting in pain and motor or sensory deficits in the areas supplied by the specific spinal nerves. A total of 31 pairs of spinal nerves emerge from the spinal cord along its entire length, corresponding to the 31 spinal segments. Every spinal segment has a precisely defined area of the body allocated to it for which it transfers neurological information.
The dorsal nerve roots (radix dorsalis) and ventral nerve roots (radix ventralis) combine to form a spinal nerve, which emerges through the intervertebral foramen.
The dorsal root of the spinal nerve is a sensitive sensory nerve root that receives sensory signals from the body and carries them to the brain. The ventral nerve root carries impulses („commands”) to organs or tissues (e.g. muscles), that instruct them to carry out some action.
The term afferent is used to refer to the “sensory” neural function and the term efferent is used for the “executory” function. The allocation of the spinal cord segments always refers to the area where the spinal nerves emerge from the spinal cord through the intervertebral foramen between two adjacent vertebra on the way to their respective areas.

Prof. Dr. med. Jürgen Harms · Klinikum Karlsbad-Langensteinbach · Guttmannstraße 1 · 76307 Karlsbad

The tables below contain examples of spinal segments in the cervical and lumbar spine along with their characteristic muscles and the areas in which pain or dysesthesias (disturbances of sensory function) can be expected in response to pressure applied to the corresponding spinal nerve root:

• Spinal nerve segments of the cervical spine

Segment	Areas of pain or dysesthesia	Characteristic muscle	Reflex weakened
C5	Shoulder and side of the upper arm	m.deltoideus	
C6	Radial upper andlower arm, thumb	m.biceps, m.brachioradialis	Radius periosteum
C7	Back of lower arm, middle and index fingers	Ball of the thumb, m.pronator teres	Triceps
C8	Back of lower arm, pinky and ring finger	Ball of the pinky, mm.interossei, digital flexor	

• Spinal nerve segments of the lumbar spine

Lumbar spine segment	Region in which pain and dysesthesias are felt	Characteristic muscle with motor dysfunction	Reflex weakened	Nerve extension pain
L1/L2	groin	Iliopsoas		Extension pain in nervus femoralis
L3	Outer and front side of thigh	Iliopsoas, quadriceps	Patellar (knee jerk) reflex	Extension pain in nervus femoralis
L4	Outer and front side of thigh, inner side of calf and foot	Quadriceps	Patellar (knee jerk) reflex	Extension pain in nervus femoralis, positive Lasègue
L5	Outer side of lower leg, inner side of top of the foot, big toe	Extensor hallucis longus		positive Lasègue
S1	Back of the calf, heel, outer edges of toes 3-5	Triceps surae	Achilles (ankle jerk) reflex	positive Lasègue

Radicular pains with pronounced abnormalities in the corresponding areas supplied by the specific spinal nerves affected may result from pressure on the spinal nerve roots from the following conditions:
· Herniated intervertebral discs
· Spinal canal stenosis (narrowing of the spinal canal)
· Tumor growth
· Inflammatory diseases of the spinal column

In the presence of clear radicular symptoms, a diagnosis is reached by means of additional instrumental examinations. Therapy is then individually designed based on the clinical and instrumental findings as well as the symptoms.