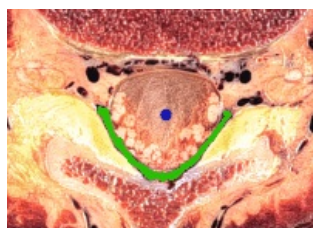


# Epidural Steroid Injections Anatomy of the Epidural Space

The epidural space is an anatomic structure that surrounds the dura mater within the spinal canal and extends to the brain itself. In some areas it is a real space and in others only a potential space. The space itself consists of fat and blood vessels. Its importance is based on the fact that many physicians have selected this site as a depository for injected medications as a treatment for low back pain.



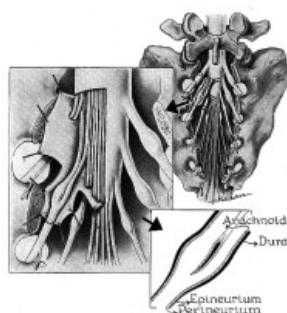
The illustration to the left represents a post-mortem axial section of a normal lumbar spinal canal. The vertebral body is shown at the top and the lamina of the vertebrae at the bottom. The epidural space surrounds the dura mater. Only the posterior portion of the epidural space is outlined in green as this is the area of clinical interest.

The blue dot has been inserted intrathecally, that is, within the subarachnoid space. The subarachnoid space is one of the most fragile, delicate and sensitive areas of the human body. This space contains the brain, spinal cord and nerve roots of the cauda equina. It is filled with cerebro-spinal fluid which acts to support and nourish the nervous system. The subarachnoid space is very sensitive to insult while the epidural space is very resistant to insult. Unfortunately they are separated by only a thin membrane, the dura mater lined by an even thinner membrane, the arachnoid membrane.



In this diagram the site of the epidural space is highlighted with a green dot (which lies on the dura). In this representation the dura and the underlying arachnoid membrane are both shown. Note that the epidural space is separated from the subarachnoid space by only these thin membranes. When a needle is used to deposit substances, such as steroids, in the epidural space the procedurist (physician performing the injection) has the responsibility of accurately placing the material in the epidural space because only a slight inaccuracy permits the steroid entry into the subarachnoid space thus introducing the risk of **adhesive arachnoiditis**.

Even though the epidural space is fairly resistant to the presence of potentially toxic materials (unlike the subarachnoid space) repeat injections can produce sufficient inflammatory change to obliterate the space. If posterior surgery is performed the posterior epidural space can also be obliterated. It is not unusual to see patients, without epidural spaces, due to previous local surgery, who have been advised to have epidural injections by physicians who are ignorant of this information.



In his classic 1953 textbook, "Sacral Nerve-Root Cysts", **Isadore Tarlov** discussed the normal anatomy of lumbar and sacral nerve roots not only from the standpoint of congenital cysts but also the relationship of the end of the subarachnoid space sleeve to the dorsal root ganglia. Tarlov noted that this usually occurred at the proximal pole of the ganglia but "occasionally, however, the transition from arachnoid to perineurium occurs as far outward as the distal pole of the ganglion or the proximal centimeter of the peripheral nerve.

He further observed: This anatomical variation is of great importance in paraspinous injections...if the needle lodges in the outward continuation of the subarachnoid space over the dorsal root ganglia or peripheral nerve, the injected novocaine or alcohol may enter the subarachnoid space. Serious complications may thus arise." The drawing to the left is from Tarlov's textbook. In order

to avoid these problems the **highest level of patient safety** needs to be maintained with ESI.

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