A new classification of lumbar motion segments for microdiscotomY

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Summary. Planning and performing lumbar microdisco-
tomy – with or without a microscope – requires a three-di-
メンナル understanding of the spinal canal and its sur-
rounding structures. A new disc-related classification is
helpful. Lumbar motion segments are divided into disc,
infradiscal and supradiscal levels in the craniocaudal
plane and into medial, paramedial and lateral zones in the
horizontal plane. Traversing roots, with or without a nerve
root sheath, and exiting roots have specific locations to
the levels and zones. A comparative study of conserva-
tively and surgically treated patients showed that not only
the size of the disc herniation but also the direction of mi-
gregation of the extruded disc material has a bearing on the
form of treatment that is indicated.

Key words: Microdiscotomy – Disc classification – Four-
step interlaminar approach – Anatomy – Lumbar spine

Disc-related classification

A disc and the adjacent vertebrae form a segment (the
Junghanns motion segment). A segment is divided verti-
cally into levels and horizontally into zones (Fig. 1).

Frontal view

Levels

At the centre of a segment is the disc level, with the
supradiscal level above and the infradiscal level below.
Supra- and infradiscal levels border on the middle of the
vertebra, which is identical with a line between the infe-
rior borders of the pedicles.

Protruded disc material can stay at the disc level or
dislocate in a supra- or infradiscal direction.

Zones

From the midline of the segment in a lateral direction
there are three zones: medial, paramedial and lateral. The
medial zone has a right and a left part. The middle of the
paramedial zone is identical with the centre of the inter-
laminar approach at L5/S1 and, after removing parts of
the upper lamina, also at L4/5 and higher segments.
Fig. 1. Disc-related classification of the segment. Above the disc level is the supradiscal level, and below it is the infradiscal level; these border on the middle of the vertebra. In the lateral direction are the medial, paramedial and lateral zones.

Fig. 2. Lower lumbar spine with traversing and exiting nerve roots

All findings in this area are paramedial (posterolateral, paracentral).

Most contained or non-contained disc herniations are in this area. They lie under or close to the traversing root at the disc level or the supradiscal or infradiscal level. If a pathology medial to the traversing root is closer to the segment midline it lies in the medial zone.

The lateral zone begins at the medial borderline of the pedicle and includes the foraminal area and the extraforaminal (far out) area. Disc herniations lie lateral to the traversing root and usually have contact with the exiting root in the foramen, causing a double root syndrome. All levels have the same zones except the infradiscal level, which does not really have a lateral zone – the pedicles are there.

**AP view and roots**

Myelogram and AP reconstructions on MRI show dural sac and nerve roots with bony structures behind.

In lower lumbar segments nerve roots pass (traverse) the disc and infradiscal area before they leave (exit) the spinal canal through the intervertebral foramen of the segment below. The vertical part of the nerve root which passes the paramedial zone is called the traversing root until it enters the lateral zone at the medial border of the pedicle. From there on it is called the exiting root (Fig. 2).

The interlaminar approach to the lumbar spine always ends up with the traversing root in front and the exiting root in a cranial and lateral direction in the intervertebral foramen. The pedicle is in a caudal and lateral direction. The traversing roots are intrathecal until they leave the dural sac and enter the nerve root sheath at the entrance point (axilla point). The main part of the lumbar traversing root lies intrathecal. The lumbar traversing roots pass the disc and supradiscal levels intrathecaly. The sheath-surrounded part of the L3/4 and L5 traversing roots is very short. The entrance point into the nerve root sheath (axilla point) for the L5 root is intradiscal medial to the L5 pedicle, and for the L3 and L4 roots it is caudal to the pedicle (Fig. 3). For the S1 root it is just below the L5/S1 disc. This means that an approach to the disc and supradiscal level in L3/4 and L4/5 segments and to the supradiscal level in L5/S1 only shows the lateral part of the dural sac with the traversing root inside not surrounded by a nerve root sheath. A medial part of traversing root does not exist at these levels of the spinal canal and separation should therefore not be attempted.