

Dynamic Stabilisation Systems

Dynamic stabilisation devices are internal braces that allow controlled movement of the affected segment of the spine. Most are derived from pedicle screw and rod constructions. The new generation of devices aim to allow controlled motion to achieve more movement of the spine than conventional devices. The devices are composed of a mixture of screws, cords, spacers, flexible rods, rods with moveable parts, flexible screws and/or inflatable rods. These are used rather than rigid screws and rods which restrict movement.

Pedicle Screws

Pedicle screws are used in spinal surgery to provide a means of gripping a spinal segment. The screws alone do not fixate the spinal segment but act as anchor points that can be connected with rods. Screws are placed at two or three consecutive spine points and then a short rod is used to connect the screws. This stops motion at the segments being fused. On occasion as bone grafts grow the screw and rods can be removed in another surgery but this is not usually recommended unless they cause discomfort (5-10% of cases). Use of pedicle screws is thought to have improved spinal fusion rates from about 60% to 90%. Many surgeons also believe that pedicle screws improve patient recovery as they provide immediate stability for the spine and early mobilisation for the patient. At first the safety and effectiveness of pedicle screws was questioned but this has been resolved and pedicle screws are now FDA approved for use in the lower spine for specific conditions. There is however, a learning curve in placing screws and only surgeons comfortable and experienced with the technique should use them.

In the past there was breakage in screws and rods in approximately 10% of cases but now due to modern screws the breakage rate is down to about 1 in 1,000. There is also a very low complication rate associated with pedicle screws and rods. There is about a one in 1,000 chance of nerve root damage, and a 2% to 3% chance of infection.

Graf ligament

A stabilisation device developed in Europe which uses braided polyester cables looped around pedicle screws to stabilise the spine while allowing motion. Reports on the use of this device show inconsistent results and it is currently only available in the UK.

Dynesys device

A stabilisation device which incorporates pedicle screws, a chord and a plastic spacer. It has been used in Europe with mixed results and is FDA approved but only for use as a addition to spinal fusion of the thoracic, lumbar and sacral spine for certain specific conditions (spondylolisthesis with neurologic impairment) as well as previously failed spinal fusion.

When used as a pedicle screw fixation system, the Dynesys Spinal System is indicated for use in patients who are receiving fusion of the lumbar or sacral spine with autogenous graft only, and who are having the device removed after development of a solid fusion mass.

Clinical trials are ongoing for use of the Dynesys system as a stand-alone device in the absence of a spinal fusion.

Isobar

Uses metal rods with a mobile joint in the rod to allow movement. Used in Europe
There are currently no studies on the use of Isobar

Some devices have maintained the original concept of metal rods, but have designed a mobile joint within the rod. One such device is the IsoBar (Figure 9), which is manufactured by Scient'x, in Guyancourt France. At the time of this article, no published reports on the use of this device were found. The IsoBar is in use in Europe.

Dynamic soft stabilisation system

The Dynamic Soft Stabilization system (Figure 10) uses pedicle screw anchoring rather than traditional straight rods, and incorporates an elliptical metal coil connected to the screws. This device is not approved for use in the US, but has been used in other parts of the world for preliminary evaluation. Twelve-month follow-up of 16 patients indicated favorable outcome with significant reductions in pain.

Stabilimax NZ

Stabilimax NZ is a medical device that utilizes a dual-spring mechanism to provide spinal stabilization. Stabilimax NZ is designed to decrease the movement that causes pain while allowing both bending and twisting motion.

Implantation of Stabilimax NZ requires a relatively short surgical procedure that can be minimally invasive, and a brief hospital stay.