

Posterior Spinal Fusion

Spinal fusion is surgery when part of the spine is fused. It is a term that encompasses a wide variety of operations for a wide variety of pathologies. For example, it may simply involve a single level uninstrumented fusion in an elderly patient that has a degenerative spondylolisthesis or it may involve a fusion the whole length of the spine for complex spinal deformity. Other problems that may have an instrumented fusion include fractures, tumours, kyphosis and spondylolisthesis.

The role of instrumentation (metalwork) is to hold the spine in position while the bone graft does its job and fuses the levels involved.

The most common type of fusion performed is a single level posterior fusion with instrumentation. This is done for spondylolisthesis, degenerative disorders, recurrent or massive disc prolapse. The fusion is obtained with bone graft while the metalwork holds the spine in place. In only rare circumstances is no metalwork used.

The procedure

The patient lies on their front under general anaesthetic and the level for surgery is identified. A midline longitudinal incision is made and the muscles are gently retracted away from the bone to reveal the spine itself. The implants are sited with xray control and graft placed appropriately. A decompression of nerves or correction of deformity may also need to be performed. Clips or a subcutaneous suture are used in skin and a dressing applied. A drain may be used for 24 hours. In one particular type of fusion (a pars repair for spondylolysis) the segment itself is not fused.

Post-operative care

Sutures Usually suture, occasionally clips. If so, remove at 8-10 days.

Physiotherapy Instructions given on discharge. Formal physiotherapy sometimes arranged depending on individual

Driving When safe. Could you do an emergency stop and be in complete control of your car? Normally 4 weeks

Work Desk based 4-6 weeks, Heavy manual 3 months

Exercise It is important to keep the wound dry until it has healed and not to do anything that will overstretch the sutures. Once the wound is dry, a gradual and progressive return to activities is possible. Do not suddenly go back to full activity and take things sensibly. No heavy lifting or contact sports for 3 months following surgery (i.e. no straining). Normally, from 2 weeks can swim or cycle on exercise bike. When running, to start on a treadmill, then soft surfaces before road running.

Instrumentation

The metalwork used will depend on the operation being performed. A standard construct for a single level operation would involve 4 pedicle screws and 2 parallel rods posteriorly. If possible, in many cases, the disc is also removed and a cage is placed with graft inside. This has the advantage of reconstituting normal segmental height, realigning the spine correctly, decompressing the nerve and increasing the fusion rate. The cage is made of Titanium and the screws titanium so that they are compatible with any subsequent MRI scanning that may be required. Other posterior 'fusion devices' exist e.g. interspinous fusion but these should only be used with interbody anterior support.

Bone Graft

Bone is usually taken from the back of the spine itself and recycled in small pieces and mixed with granules to form a scaffold for new bone formation. Often bone is mixed with demineralised bone matrix – DBM – which is sterile treated donor bone – this increases fusion rate and reduces the need to take extra graft. Rarely a product is used which induces bone formation called BMP. This is so effective it often precludes the need for any graft at all. Only very rarely is bone taken from the pelvis – e.g. revision surgery – but even then BMP should be used instead of taken graft from the pelvis as taking graft is often more painful than the operation itself. BMP may cause inflammation and some have suggested it may increase cancer risk but this has not been proven in many detailed subsequent studies.

Specific Complications

The same complications apply as to any operation on the spine including infection, bleeding, spinal fluid leaks or nerve damage but fortunately these are all rare and in the majority of these there is a solution. In addition to these non-specific problems one should be aware of adjacent segment problems and metalware problems.

If a segment of the spine is fused then this segment will not move. Surprisingly, there will be little or no functional deficit as a result of this and in fact, as one hopes the pre-operative symptoms will have gone then function actually improves. A great deal of time and energy is given by spinal surgeons to discussing how fusing a segment affects the adjacent segments. There is no doubt that increased mobility occurs at adjacent levels to compensate but in many this is asymptomatic. What is not known is what would happen to that level in the absence of a fusion given that it is presumably next to an abnormal level in any case. However, it is not unreasonable to estimate a lifetime risk of having a problem at an adjacent segment to be in the order of 5%. The key when fusing the spine is to align correctly and ideally improve alignment. Failure to do this may increase adjacent segment problems but sometimes to seek perfect alignment is an ideal goal that is too risky to achieve and so a balance has to be found.

Metalware may loosen or break – and always will with time - if the bone graft around it does not fuse. This is known as a pseudarthrosis and occurs in 5% of patients, but is fortunately asymptomatic in most. Rarely, metalwork needs to be removed because it is in the wrong place, it is broken, it is loose, there is a fracture or there is an infection of a combination of the above.

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