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Scoliosis and litigation

In 2010/2011, 2053 spinal fusions were carried out for scoliosis, of which 1328 were in children. In contrast there were 224 549 admissions in total for spinal disorders[1] and therefore scoliosis cases proceeding to litigation are relatively uncommon. There may be other reasons for the lower incidence of litigation in scoliosis patients including the fact that almost all of these operations are carried out in tertiary centres as planned cases during daylight hours. Multidisciplinary teams of surgeons, physicians and other healthcare professionals manage the patients, and in many cases two senior surgeons operate together which may reduce the risks in these cases. Furthermore, the consenting process is generally carried out by more senior members of the team; the patients and their families are usually in no doubt that this is a major operation not without significant risk, and patients are rarely given the impression that complete correction of the deformity will take place. Although curve progression and prevention of pain are the main indications for surgery, improvement in cosmesis is also an important aim of the surgery. However, I am not aware that failure to improve appearance has been a cause for litigation.

The majority of claimants in scoliosis cases are children and their families. Because many operations are carried out early in childhood, there is a very long trail of cases. Adults have to commence proceedings within three years of the perceived injury, while children have until the age of 21 to do so. In many cases the surgeon in charge of the case may be retired or may have died.

The causes of allegations of negligence/breach of duty include neurological injury; failure of instrumentation or other instrumentation problems; nonunion of fusion; choice of wrong levels; failure to identify pre-operative abnormalities; failure to use spinal cord monitoring; failure to investigate complications, such as neurological injury, in a timely fashion post-operatively; failure to make the diagnosis and failure to follow up the patient.

By far the commonest cause of litigation in these cases is neurological injury, sometimes to nerve roots but more commonly spinal cord injury.

ADULT SCOLIOSIS SURGERY

In adult scoliosis surgery, nerve root injury is a more frequent cause of litigation, probably because the lower lumbar spine is more commonly instrumented and because of the abnormal anatomy encountered in these cases, compounded by the secondary degenerative changes and secondary deformity seen in adults, which can make placement of pedicle screws more difficult and precarious. Intra-canal surgery is more often indicated in the adult population to decompress spinal stenosis and this can also be a cause of nerve root injury. Furthermore, recovery from nerve root injury in adults tends to be less successful than in the paediatric population, making litigation more likely.

PAEDIATRIC SCOLIOSIS SURGERY

In paediatric scoliosis surgery, injury to the spinal cord is unfortunately the commonest cause of a claim for neurological injury. Claimants and their families are almost invariably warned pre-operatively about the risk of spinal cord injury and potential paralysis. The effects of spinal cord injury are so serious that most parents will explore the potential for making a claim in these cases, because they have a responsibility for the child, and the effects of the injury are likely to be lifelong. The frequency of spinal cord injury in scoliosis surgery varies with the underlying cause of the deformity and the type of surgery which is carried out. Short segment anterior surgery for idiopathic scoliosis is probably the safest surgery in this respect, while vertebral resection for stiff congenital curves is probably the most risky for spinal cord injury.

SPINAL CORD SURGERY RISK FACTORS

The risk factors for spinal cord injury include:

1. ***Underlying diagnosis.*** Some diagnoses have potential risks for spinal cord injury in their own right. In these cases there is usually little that the surgeon can do to prevent the injury occurring although there may be associated avoidable factors.
2. ***Spinal anatomy including spinal vascular anatomy.*** Surgery in the thoracic spine has more risk for spinal cord injury than in the cervical and lumbar regions, and the spine around the T9 level seems to be at particular risk because of the watershed pattern of vascular supply there. Congenital scoliosis is of concern because the anatomy can be abnormal and unpredictable, and in some cases the spinal cord is particularly at risk. In addition, more complex surgery is often undertaken in these cases (for example anterior and posterior surgery), which is more likely to cause vascular damage to the cord. Some surgeons have advised temporary clamping of anterior segmental vessels to assess whether division of the vessels will cause a vascular injury. Vertebral resection is probably the most risky procedure here because it is commonly carried out for congenital scoliosis, involves potential interruption of anterior and posterior vascular supply, the spinal canal is entered, with potential for haematoma formation, and the spinal cord is manipulated.
3. ***Complexity and duration of surgery.*** Failure to make an early diagnosis, leading to more complex surgery later in life which is then complicated by a spinal cord injury may trigger litigation.
4. ***Failure to appreciate intra-spinal abnormalities.*** For example, if there is an

undiagnosed diastematomyelia and scoliosis correction is carried out, traction on the cord can result in spinal cord injury.

5. ***Cervical cord injury is a rare complication of instrumented fusion of the thoracic spine.*** I am aware of three cases where this has occurred. The reason for the complication fusion was unclear in all three cases, and was not proven. Suggested reasons for the complications included sludging of the blood supply of the cervical spine due to over-transfusion, direct injury to the cord from placement of the spinal cord monitoring, and positioning of the cervical spine in hyperextension with compression of the cervical cord. Because the effects in these cases are so devastating, hospital trusts may find it difficult to defend the cases.

CASE EXAMPLES

I have included three case examples based on my experience. However, because these cases tend to be unusual, I have modified them to a degree due to confidentiality issues.

Case 1

A middle-aged patient presented with back pain and a progressive curve with some neurological symptoms. Seen many years earlier as an adolescent, there was the possibility that this represented a congenital scoliosis. The radiographs demonstrated what appeared to be an idiopathic curve with degeneration. There were extensive degenerative changes with stenosis on the lumbar spine MRI scan. The upper curve was 50 degrees (T5 to T10), the lower curve 60 degrees (T11 to L4). No spinal cord monitoring was used, there were no hooks available and the proximal instrumentation ended at T7. The patient awoke with a partial cord injury and the MRI demonstrated a congenital lesion in the thoracic cord associated with a post-operative vascular lesion. Revisional surgery was required when the instrumentation failed.

Learning points:

1. Whole-spine MRI should have been carried out to look for a congenital lesion
2. The instrumentation availability should have been checked before surgery commenced
3. Do not instrument to mid curve – instrumentation is best Cobb to Cobb
4. Spinal cord monitoring should have been used and might have alerted the surgeon to a problem

Case 2

A child presented late with untreated congenital scoliosis, with a progressive curve. Plans were made for surgery, but surgery was delayed for almost two years. During that time the curve progressed from 60 degrees to 90 degrees. This changed the complexity of the surgery – initially anterior and posterior fusion was planned but the increased, stiffer curve required vertebral resection. The surgery was complicated by paralysis which did not resolve.

Learning point:

If surgery is delayed in young children, careful monitoring of the curve is required, and surgery should be carried out before the curve progresses substantially, avoiding more risky surgery.

Case 3

An adolescent girl presented with progressive idiopathic scoliosis and underwent surgery. She had an associated condition and was taking Indomethacin which was continued both peri- and post-operatively. She developed nonunion at two levels which required revision surgery. The nonunions were thought to be due to the Indomethacin. On subsequent enquiry the Indomethacin could have been substituted with another drug over the period of the surgery.

Learning point:

Take measures to prevent complications occurring; in this case by stopping Indomethacin, in other cases by advising cessation of smoking, or, for example, stopping anticoagulant agents prior to surgery to reduce bleeding.

In summary, various measures can be taken to prevent allegations of negligence in scoliosis surgery. There are the obvious checks which apply to any surgery (correct patient, blood available if required, for example), along with some more specific ways of preventing litigation in scoliosis surgery:

1. Monitor the curve carefully, especially in children, and carry out surgery in a timely fashion
2. Be aware that some patients have a higher than normal risk of complications (e.g. neurological injury, bleeding, failure of instrumentation, for example in osteogenesis imperfecta)
3. Consent the patient for the given risks carefully and with adequate time for the patient and family to understand the consenting process. Try to avoid consenting the patient on the day of surgery. This is, after all, a major elective operation with substantial potential risks
4. A whole-spine MRI scan is preferable
5. CT scan if complex deformity or congenital deformity, and for adults with difficult pedicle anatomy
6. Make sure you have the correct implants for the operation
7. Make sure the patient is not on anticoagulants/anti-inflammatories
8. Give antibiotics at induction
9. Make sure that drug dosages and transfusions volumes are appropriate for the size of the patient
10. Use spinal cord monitoring where appropriate, and place the electrode carefully when used. Motor monitoring is usually preferable as it gives earlier warning of changes
11. Verify that the levels being operated on are correct
12. Use specialised techniques to prevent implant pull out where indicated (for example, cement augmented screws)
13. Do not instrument to the middle of a curve
14. If there is a spinal cord injury at the time of surgery implant, removal is sometimes indicated
15. If there is a cord injury emergency, MRI is advisable to be sure that there is no haematoma or other structure causing compression of the cord which mandates emergency revision surgery
16. Early CT scan can be very helpful to identify screw positioning if, for example, there is a nerve root injury
17. If there is neurological compromise due to a compressive lesion, decompression (for example by removing an offending screw) should be carried out as an emergency if there is cord compromise, or as early as is reasonably possible if there is root compromise
18. Two consultant surgeons operating may reduce the risks of complications in very complex cases
19. In the future navigation may improve screw positioning and reduce the risk of neurological injury

CONCLUSION

Scoliosis surgery can be associated with devastating complications, and is probably best carried out in specialist centres. Two-surgeon operating has been adopted in some centres for more difficult cases, and this may reduce the incidence of problems, although this has not been proven. Various measures are described which may help to reduce the incidence of complications and litigation.

REFERENCES

1. No authors listed. The National Spinal Taskforce: Commissioning spinal services – getting back on track. http://www.nationalspinaltaskforce.co.uk/pdfs/NHSSpinalReport_vis7%2030.01.13.pdf (date last accessed 11 March 2015).