Complications of revision spinal surgery

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Surgical treatment for symptomatic cervical and lumbar spondylosis has become prevalent in recent years. With this increased intervention, increasing numbers of patients experience persistent symptoms and require revision spinal surgery. Although many aspects of the workup and operation are similar for both primary and revision surgery, there are special considerations that must be examined when determining if a patient is a candidate for revision surgery.

Preoperative workup should include evaluation for spinal instability. Intraoperatively, scar tissue may complicate the procedure, and care must be taken to avoid incidental durotomy. The prognosis for a revision surgery can be predicted best by the patient’s outcome after the primary surgery. As with any surgical procedure, patient selection is imperative for successful outcome.

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concurrent vertebral instability. Flexion and extension radiographs should also be obtained prior to any primary spinal surgery. Although instability does not usually result from a standard cervical or lumbar laminectomy, it is more likely to develop in patients in whom ligamentous instability is demonstrated prior to the primary surgery. Fritsch, et al. reported that instability was documented in up to 60% of patients who have undergone multiple revisions.

Magnetic resonance imaging is also a vital part of the preoperative workup. In the potential candidate for revision surgery, the MR imaging should include T₁ and T₂ weighted sequences, with and without administration of Gd. Gadolinium administration can help the clinician differentiate between recurrent disc herniations and scar tissue. Herniated disc fragments should not enhance on Gd-based MR images, whereas scar tissue will enhance. This is important because revision surgery for scar tissue-related symptoms most often has poor results.

Postmyelography computerized tomography scanning can also be very useful in determining a patient’s need for revision spinal surgery. Although this modality is not used as often as it was prior to the advent of MR imaging, it can provide useful information not readily apparent on other radiographic modalities. Postmyelography computerized tomography scanning can demonstrate the anatomy of the nerve root sleeves as they exit the neural foramina. It can also reveal nerve root clumping or disturbances of flow of the contrast material that can indicate arachnoiditis.

Surgery-Related Issues

In patients who have undergone several prior spinal surgeries, devascularization of the tissue is frequently involved with the surgical wound. This devascularization can impede wound postoperative healing and may predispose to wound infection. Perioperative antibiotic therapy should be conducted. Meticulous care must be taken during wound closure to ensure that appropriate fascial layers are reapprroximated, and closure should be undertaken in several layers by using resorbable (vicryl) sutures. Skin sutures should be left in place for a longer period of time (10–14 days) than for a primary operation.

When performing a primary cervical or lumbar laminectomy, care should be taken not to destabilize the facet joints. This is especially important in patients in whom ligamentous instability is demonstrated; in this situation, the surgeon should consider performing arthrodesis. Prior hemilaminotomy, either in the cervical or lumbar region, should not predispose to instability.

Adjacent-Level Degeneration

With the advent of techniques for anterior cervical surgery and the recent popularity of anterior arthrodesis, complications have been noted to develop in the long-term follow-up period. Anterior decompression not involving fusion has been found to predispose to kyphotic deformity or pseudarthrosis. This may lead to central canal stenosis and resultant myelopathy. Anterior arthrodesis has also been shown to predispose to adjacent-level degeneration. The immobilization of one motion segment may cause increased stress at the adjacent level, most frequently at the level superior to the fusion (Fig. 1). Spondylosis or disc herniation at the level above a previous fusion may cause new radiculopathy or myelopathy. In this situation, decompression and extension of the previous fusion may be required.

Extensive cervical laminectomy may result in kyphotic deformity (Fig. 2). Postlaminectomy kyphosis may cause axial neck pain and myelopathic symptoms. In this setting, multilevel combined anterior–posterior reconstruction is necessary to reestablish normal cervical alignment.

Scar Tissue and Incidental Durotomy

Epidural fibrosis and scarring significantly increase the difficulty of revision spinal surgery, especially in the lumbar region. Extensive epidural scar tissue and dural adhesions increase the likelihood of incidental durotomy. These may not be recognized at the time of surgery. The surgeon must establish a plane between the scar tissue and the dura mater. Implantable barriers have been devised to prevent the formation of scar tissue; however, they have not been proven effective and are not widely used in the US.

Incidental durotomy can create many problems during spinal surgery. The authors of several studies have shown that the incidence of durotomy in revision spinal surgery is higher than in primary surgery. Cammisa, et al. reported an overall 3.1% incidence of durotomy in 2144 spinal procedures; however, its incidence in primary surgeries was 1 to 3.1%, whereas the incidence in revision surgery was 8.1%. Unfortunately, no statistical analysis was performed in their study. Patients in whom dural tears were recognized and treated appropriately at the time of surgery did not suffer any significant long-term sequelae. Small incidental durotomies that are not noted at the time

Fig. 1. Imaging studies obtained in a 37-year-old man who had undergone C5–6 anterior decompression and arthrodesis. He presented 4 years later with neck pain and cervical myelopathy. Left: Lateral cervical radiograph. Right: Parasagittal T₁-weighted MR image. Note the large disc herniation at C4–5 directly above the previous arthrodesis. This patient required C4–5 anterior decompression and extension of the fusion.
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of surgery can lead to formation of pseudomeningoceles. If a small incidental durotomy is not treated appropriately at the time of surgery, a pseudomeningocele may develop (Fig. 3). If the pseudomeningocele is small and asymptomatic, it may be treated with conservative therapy. Bed rest and possibly lumbar drainage may be of benefit. If, however, the pseudomeningocele is large, causing back pain, or if there is the presence of drainage from the wound, reexploration must be performed.

At the time of surgery, the wound may be irrigated and a valsala maneuver performed to evaluate for the presence of small incidental durotomies. Closure of small dural defects may be conducted using No. 5-0 or 6-0 prolene suture. If a durotomy is made on the lateral aspect of the thecal sac, gaining access for primary repair may be difficult. In this case, fibrin glue or other dural substitutes may be used to assist with dural closure. The patient should be undergo bed rest while lying flat for at least 24 hours to facilitate closure and to prevent formation of pseudomeningocele. The wound should be carefully inspected in the postoperative period for signs of compromise. The clinician should have a low threshold for reimaging or reexploration in the presence of clear drainage from the surgical site.

CONCLUSIONS

There are many factors involved in revision spinal surgery that the clinician must consider. As with any surgical procedure, proper patient selection is imperative in achieving a successful outcome. In addition, the preoperative workup in the potential candidate for revision spinal surgery should include evaluation for scar tissue, instability, and possible new lesions. Myofascial pain should also be considered, and only candidates in whom adequate course of conservative therapy has failed should be considered for revision surgery.

The outcome of revision surgery may be predicted by the patient’s outcome after the primary surgery. These factors should be taken into account when considering revision spinal surgery.

References

rectomy patients: follow-up and assessment at re-operation. 

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