Revision Cervical Spine Surgery

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KEYWORDS

- Revision surgery • Cervical spine
- Adjacent segment disease • Same segment disease

Revision cervical spine surgery can be a complex and risky endeavor. The indications for revision surgery are numerous and include pseudarthrosis, infection, adjacent segment disease, same segment disease, instrumentation failure, and progressive deformity. The evaluation, diagnosis, and management of each of these problems can be challenging. It is essential that the underlying problem be identified through a comprehensive history taking and physical examination as well as appropriate imaging studies. It is also essential to understand why the initial procedure failed so that a similar situation can be avoided during revision surgery. When planning revision surgery, the surgeon must consider the cause of the underlying problem (eg, biological, mechanical, and so forth), the potential for complications, and clinical outcomes that can reasonably be expected. This information should be clearly explained to the patient during the informed consent process. This article provides the spine care provider with an understanding of how to appropriately evaluate and manage the most common cervical conditions that require revision cervical spine surgery.

CONSIDERATIONS FOR REVISION SURGERY

History Taking

Patient history and examination are essential to determining whether or not a patient is a candidate for revision cervical spine surgery. History taking should include a thorough discussion of the initial procedure. Questions that should be asked include the following: why did you have your initial procedure; what symptoms were you having before your initial procedure; following the initial procedure, did you get relief from some or all of your symptoms; if so, how long did this relief last; are the symptoms you are having now similar to those you had before your initial procedure; and if not, how are the symptoms different. These questions will give the spine care provider some sense of whether the initial problem was successfully treated and whether the current symptoms represent persistence of the initial problem, recurrence of the initial problem, or a new problem at an adjacent level. Questions regarding constitutional symptoms (ie, fever, chills, nausea, vomiting, unexplained weight loss, fatigue) should also be addressed during the history taking to assess for problems such as infection or tumor. Questions pertinent to the nature, duration, severity, and location of pain, numbness, and/or tingling as well as questions relating to weakness, problems with balance and fine motor skills, and bowel and bladder function are essential as they are when assessing any spine patient. Red flags such as progressive weakness, constitutional symptoms, and unrelenting pain are suggestive of an urgent or even emergent situation. The patient should also be asked about hoarseness and/or swallowing problems that may be attributed to the initial procedure and may affect the surgical approach for the current problem.

Physical Examination

Whether a patient presents for primary or recurrent problem, a thorough physical examination is indicated that includes inspection, palpation, range of motion test, a full neurologic evaluation, and

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Orthop Clin N Am 43 (2012) 123–136
doi:10.1016/j.ocl.2011.09.001
0030-5898/12/$ – see front matter

provocative tests specific to the cervical spine. It is not uncommon that shoulder, elbow, or wrist pathology can mimic cervical spine pathology. Such pathologic conditions must be ruled out during the patient evaluation to avoid unnecessary revision cervical spine surgery. This is particularly true when the initial procedure did not provide any relief of the patient's original symptoms, suggesting that pathologic condition of the upper extremity rather than the cervical may be the cause of the original symptoms. On inspection, the location and appearance of the initial incision should be noted. Erythema, incisional drainage, and incisional tenderness may indicate the presence of infection. The side of the incision is particularly important when performing anterior cervical surgery because it oftentimes dictates the side of the approach during revision surgery.

Imaging

Imaging techniques that are most often used to evaluate a patient for revision cervical spine surgery include plain radiography, computed tomographic (CT) scan, and magnetic resonance imaging (MRI). Plain radiography should typically include anteroposterior, lateral, and flexion/extension views. Cervical alignment (ie, loss of lordosis, kyphosis) should be measured on the lateral radiograph. The status of an existing fusion should be assessed, looking for the presence of bridging trabecular bone or continued motion. The presence and location of instrumentation should be noted. Subtle loosing of existing screws in the form of haloing can indicate pseudarthrosis (**Fig. 1**). Implant failure in the form of screw pullout and screw and/or rod breakage should be noted.

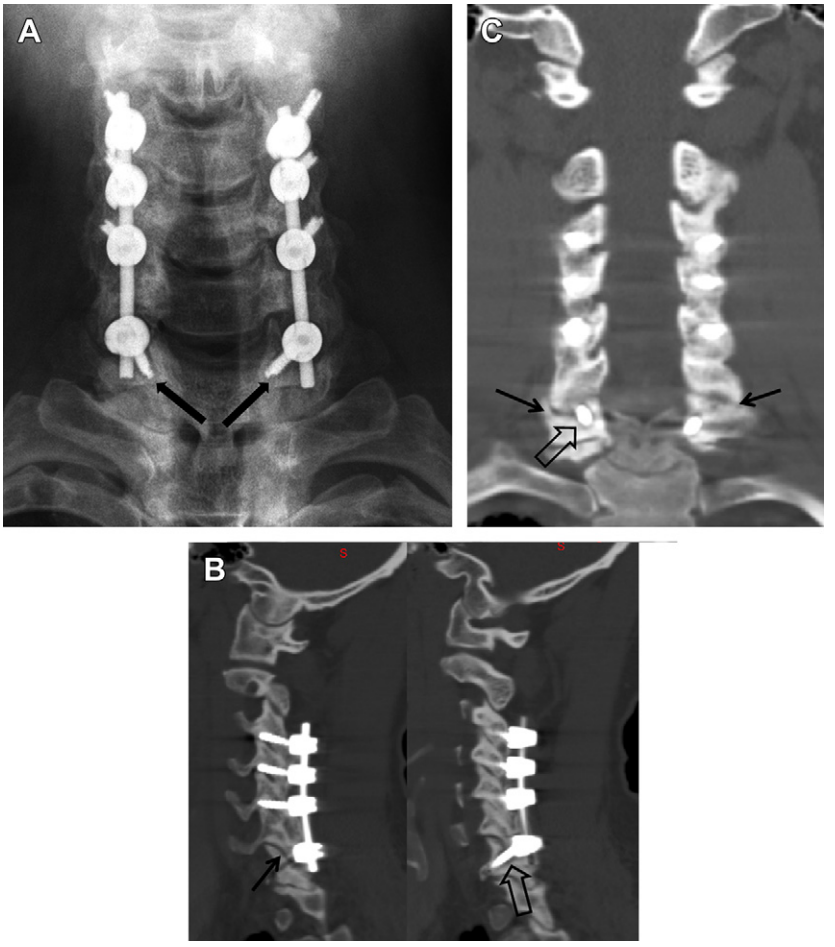

Fig. 1. (*A*) Postoperative anteroposterior cervical radiograph of a patient 12 months after a posterior cervical laminectomy and fusion from C3 to C7. Haloing is seen around the bilateral C7 pedicle screws (*black arrows*). (*B*) Postoperative sagittal CT reconstructions of the cervical spine at the same follow-up, again demonstrating haloing (*open black arrow*, *right*). The CT demonstrates a solid bony fusion from C3 to C6 but a pseudarthrosis at C6-7 (*solid black arrow*, *left*). (*C*) Postoperative coronal CT reconstruction also demonstrates the solid fusion from C3 to C6, the pseudarthrosis at C6-7 (*solid black arrows*), and haloing (*open black arrow*).