Atlantoaxial fusion

C1/C2 joint reduction technique with fibular graft/cervical PEEK cage of BI patients together with AAD seems to be an effective and safe surgical method of treatment [1].

Surgical treatment is reserved for patients with symptoms refractory to non-operative management, neurological deficit, or severe spinal cord compression. Surgery usually involves the removal of bone that is causing the compression and stabilization using spinal instrumentation.

Distraction of the C1-C2 joint and maintenance thereof by introduction of spacers into the articular cavity can successfully and durably reduce basilar invagination (BI). Thus, with the adjunct of instrumented fusion and decompression, BI-induced myelopathy can be efficiently treated with a one-stage posterior approach. This intervention is technically challenging [2].

Atlantoaxial instability with and without basilar invagination poses a considerable challenge in management regarding reduction, surgical approach, decompression, instrumentation choice, and extent of fusion. A variety of strategies have been described to reduce and stabilize cranial settling with basilar invagination. Modern instrumentation options included:

Extension to the occiput, C1-C2 transarticular fixation, and C1 lateral mass-C2 pars among others. Since not all cases of cranial settling are the same, their treatment strategies also differ. Factors such as local vascular anatomy, amount of subluxation, need for distraction, and shape of occipital condyles will dictate level and type of instrumentation.

Joint-distraction and intra-operative manipulation surgeries to correct basilar invagination (BI) and atlantoaxial dislocation (AAD) are becoming standard procedures.

Sagittal joint inclination and craniocervical tilt significantly correlated with both BI and AAD ($P < .01$). Coronal joint inclination correlated with BI ($P = .2$). The mean sagittal joint inclination value in control subjects was 87.15 ± 5.65° and in patients with BI and AAD was 127.1 ± 22.05°. The mean craniocervical tilt value in controls was 60.2 ± 9.2° and in patients with BI and AAD was 84.0 ± 15.1°. The mean coronal joint inclination value in control subjects was 110.3 ± 4.23° and in patients with BI and AAD was 121.15 ± 14.6°.

It is a important role of joint orientation and its correlation with the severity of BI and AAD and has described new joint indexes [3].

Indications

NB: The patient will lose ≈ 50% of head rotation with C1–2 fusion.

Instability of the C1–2 joints, including:

1. atlantoaxial dislocation due to incompetence of the transverse ligament of the atlas (TLA):

a) rheumatoid arthritis: symptomatic patients, or asymptomatic patients with subluxation ≥8 mm

b) local infection

c) trauma

d) Down syndrome: due to laxity of the TLA

2. incompetence of the odontoid process

a) odontoid fractures meeting surgical criteria, including

● Type II fractures with >6 mm displacement

● instability at the fracture site in halo-vest traction

● chronic nonunion of odontoid fractures

● disruption of the transverse ligament

b) following transoral odontoidectomy

c) tumors destroying the odontoid process

Vertebrobasilar insufficiency with head turning (bow hunter's sign).

Operative stabilization is clearly indicated when signs and symptoms of spinal cord compression occur. However, many recommend early operative fusion before evidence of appreciable neural compression occurs because 1) the myelopathy in these patients may be irreversible; 2) the overall prognosis is poor once symptoms of cord compression are present; and 3) the risk of sudden death associated with Atlanto-axial subluxation is increased even in asymptomatic patients.

Papadopoulos et al. believe that rheumatoid arthritis patients in relatively good health without advanced multisystem disease and less than 65 years of age should be considered for operative stabilization if mobile Atlanto-axial subluxation is greater than 6 mm. Seventeen patients with severe rheumatoid arthritis and Atlanto-axial subluxation treated with a posterior arthrodesis are presented. A new method of fusion, devised by the senior author (V.K.H.S.), was utilized in all cases. Indications for operative therapy in these patients included evidence of spinal cord compression in 11 patients (65%) and mobile Atlanto-axial subluxation greater than 6 mm but no signs or symptoms of cord compression in six patients (35%). Thirteen patients developed a stable osseous fusion, two patients a well-aligned fibrous union, one patient a malaligned fibrous union, and one patient died prior to evaluation of fusion stability. The details of the operative technique and management strategies are presented. Several technical advantages of this method of fusion make this approach particularly useful in patients with rheumatoid arthritis. Because of multisystem involvement of this disease, a high rate of osseous fusion is often difficult to achieve [4)].

Technique

Atlantoaxial fusion technique.

Complications

Atlantoaxial fusion complications.

Case series

Atlantoaxial fusion case series.

Case reports

Goel et al., reported of 3 relatively rare clinical cases in which the absence of posterior elements of the axis was associated with basilar invagination and multiple other craniovertebral junction musculoskeletal and neural abnormalities. Atlantoaxial stabilization resulted in remarkable clinical recovery in all 3 cases. C2-3 fixation was not done, and bone decompression was not done. On the basis of their experience, the authors conclude that atlantoaxial fixation is a satisfactory form of surgical treatment in patients having an association of basilar invagination with absent posterior elements of axis [5].

References

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