

Occipitocervical fusion surgery: Review of operative techniques and results Sunil Kukreja MD; Sudheer Ambekar MBBS, MCh; Anthony H. Sin MD; Anil Nanda MD FACS

Introduction

Surgical fusion at the craniovertebral junction (CVJ) is a technically demanding procedure. A varying degree of clinicradiological presentation at CVJ influences the decision process for OCF surgery. The aim of our study is to discuss the important steps and decision making process in occipitocervical fusion (OCF) surgery based on our clinical experience and literature review.

Methods

Forty nine consecutive patients who underwent OCF participated in the study. Sagittal CT images were used to illustrate and measure radiological parameters. We measured Wackenheim clivus baseline (WCB), clivus-canal angle (CCA), atlantodental distance (ADD) and Powers ratio (PR) in all the patients. Implants of various designs from several manufacturers were used for the OCF. In addition to the morselized bone graft, rh-BMP was used in 11 patients. Nurick's system was used for the neurological assessment.

Results

Clinical improvement on Nurick's grading was recorded in 36 patients. Patients with better preoperative status (Nurick's grade 1-3) had better functional outcomes after the surgery (p = 0.077). Restoration of WCB, CCA, ADD and PR parameters following the surgery was noted in 39.2%, 34.6%, 77.4% and 63.3% of the patients respectively. Deep wound infection was seen in 3 patients and resulted in pseudoarthrosis in 2 of them. Four patients died in this series and one of them died following an odontoidectomy performed for the progressive neurological deterioration following OCF.

Conclusions

Conventional wire-based constructs are superseded by more rigid screw-based designs. Odontoidectomy is associated with a high incidence of perioperative complication. The advent of newer implants and reduction techniques around CVJ has obviated the need of this procedure in a majority of the patients.

Table 1. Summary of diagnosis and surgical indications			
Traumatic Acute - Odontoid fracture	3	Compressive myelopathy	3
Hangman's fracture Jefferson fracture OC vertical distraction injury	4 3 2	Craniocervical instability	8
Old - Odontoid fracture Hangman's fracture	4	Myelopathy + Instability	6
Rheumatoid arthritis	14	Basilar invagination Pannus Basilar invagination + C1/C2Instability	2 4 8
Degenerative	6	Severe C1/2 arthritis with stenosis C1/C2 instability Occipito/C1/C2 instability Anterior clival-craniocervical junction mass	1 3 1 1
Neoplastic – Odontoid osteochondroma Metastasis (lung/breast)	1 2	Mass lesion	4
Multiple myeloma Lymphoma	1	Atlantoaxial instability	3
Congenital - Chiari malformation Os Odointoideum Achondroplasia Osteogenesis imperfecta	2 2 1 1	Basilar invagination Instability + Myelopathy Foramen magnum stenosis Basilar impression	2 2 1 1
Infection	1	Instability + Myelopathy	1





Radiologic evaluation using midline sagittal CT scan

Reduction technique



OCF in patients with degenerative cervical spine



Fusion was performed involving the degenerated segments

Multiple myeloma involving cervical spine



OCF was performed from occiput -C7 levels incorporating the subaxial affected segments

Occipitocervical fusion for lymphoma of axis bone



Substantial cord compression as a result of pseuoarthrosis and kyphotic deformity