ATLANTO-AXIAL (C1-C2) POSTERIOR CERVICAL FUSION USING POSTERIOR CLAMPS

Thesis

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LIST OF ABBREVIATIONS

AAA	accessory atlantoccipital
AAD	Atlanto-axial dislocation
AAO	Anterior atlantooccipital
AARD	Atlanto-axial rotatory dislocation
ADI	Atlanto-dens interval
ALL	Anterior longitudinal ligament
AP	Anteroposterior
AS	Ankylosing spondylitis
ASIA	American spine injury association
C	Cervical
C0	occiput
CCJ	Craniocervical junction
CJVA	Cervival junction vertebral artery
CJVA	Cervical junction vertebral artery
CSI	Cervical spine injury
CT	Computed tomography
CTA	Computed tomography angiograhy
CVJ	Cranio-vertebral junction
EMS	Emergency medical service system.
FIM	Functional independence measure
FMI	Functional measure of independence
Ft	Feet
GCS	Glasgow Coma Scale
HTV	Halo-thoracic vest
ICD	International Statistical Classification of Diseases and Related Health Problems
JOA	Japanese orthopedic association score
LAO	Lateral atlantooccipital
Mph	Mile per hour
MDCT	Multi-detector computed tomography
MPR	Multiplanar reformation
MRI	Magnetic resonance imaging
MVA	Motor vehicle accident
NASCI	National acute spine cord injury
NDI	Neck disability index
NEXUS	National Emergency X-radiography Utilization Study
NG	Nasogastric
PACS	Picture archiving and communication system
PAO	Posterior atlantooccipital
PLL	Posterior longitudinal ligament
RA	Rheumatoid arthritis
ROM	Range of motion

SCI	Spinal cord injury
SCIWORA	Spinal cord injury without radiographic abnormality
SEH	Spinal epidural hematoma
STIR	Short time to inversion recovery
T1	Longitudinal relaxation
T2	Transverse relaxation
T2*	Transverse relaxation obtained using gradient echo sequences
TA	Transarticular
TAS	Transarticular screw
TOL	Transverse occipital ligament
VA	Vertebral artery
VBS	Vertebral body sagittal distance

ABSTRACT

Objectives: The present study was designed to determine the surgical yield of cervical C1-C2 fixation by implantation of hooks for the treatment of patients with C1-C2 instability**.**

Patients & Methods: The present study included 20 patients; assigned for C1-C2 fusion for non-neoplastic disease; diagnosis and inclusion was confirmed by magnetic resonance imaging(MRI). The applied technique for C1-C2 hook fixation was conducted according to Holness et al., using either iliac crest or artificial bone graft. Postoperative bracing (firm collar) was applied for 8-12 weeks. Outcome Measures included radiological evaluation of successful bone fusion, neurological evaluation using the American Spinal Injury Association (ASIA) motor score, neck and arm pain scoring, neck disability index (NDI) and the functional independence measure (FIM) presented as total motor score. Evaluations were conducted preoperatively and at end of follow-up period of at least 6 months.

Results: The study included 11 patients with odontoid fracture, 3 transverse atlantal ligament injuries, 4 os odontoideum and 2 had rheumatoid C1-C2 instability. Preoperative neurological evaluation detected 8 patients were ASIA grade B, 7 were ASIA grade C and 5 patients were ASIA grade D. All surgeries were conducted smoothly without intraoperative complications and an autogenous iliac crest graft was applied in 18 patients, while artificial bone grafts were used in 2 patients. Radiological examinations conducted at end of follow-up period at least 6 months showed evidence of fusion, defined as the absence of C1-C2 movement on lateral flexion-extension radiographs and continuity of trabecular bone formation between C1 and C2 across the graft and disappearance of spine instability in 13 patients (65%). Postoperative clinical evaluation revealed significant improvement of neurological ASIA grading and 7 patients (35%) showed complete recovery without motor or sensory deficit . Both pain and neck disability scores was decreased postoperatively compared to preoperative scores. Postoperative total FMI motor power scoring was higher compared to preoperative measures.

Conclusion: Posterior C1-C2 fixation using c1 c2 hooks is technically simple to apply and can be done safely without concomitant intra- or postoperative complications. High success rates in obtaining fusion and significant improvement at the end of follow-up with high quality-of-life scores make this method of posterior fixation and fusion an ideal surgical modality for higher cervical spine instability.

Keywords

C1-2 fixation, cervical instability, rigid fixation, hooks

INTRODUCTION

Trauma is one of the major causes of instability of the high cervical spine. In addition, the C1-2 intervertebral level of the spine roughly corresponds to the cervicomedullary junction; therefore, correction of instability is desirable to avoid the potential risk of serious neurological sequelae (**Kontautas** *et al.,* **2005).**

Cervical spine injuries (CSI) occur at an annual incidence of 210 per million, causing annually8 to 21 spinal cord injuries (SCI) per million. Motor vehicle accidents are the most common trauma mechanism, with 3:1 male predominance. Despite being relatively rare occurring in only 2.4% of blunt trauma admissions, the social and economic impact of cervical spine injuries is extensive, because the majority of cervical spine injuries complicated by spinal cord injury occur in young adults, with median age of only 31years, often with life-long consequences. (**Koivikko** *et al.,* **2004).**

The evaluation and management of cervical spine injuries is a core component of the practice of emergency medicine. The incidence of serious cervical spine injuries is low but associated rates of death and disability are high; therefore, the emergency physician must have a strong knowledge base to identify these injuries as well as clinical skills that will protect the patient's spine during assessment. Cervical spine injury causes an estimated 6000 deaths and 5000 new cases of quadriplegia in the United States each year. Males are affected 3 times as frequently as females. Two to three percent of blunt trauma patients who undergo cervical spine imaging are diagnosed with a fracture. The second vertebra is most commonly injured, accounting for 24% of fractures; the sixth and seventh vertebrae together account for another 39% of fractures. From a clinical perspective, it is crucial for the emergency physician to diagnose a fracture. In the NEXUS (National Emergency X-radiography Utilization Study) trial, 56.7% of cervical spine fractures were unstable and another 13.9% were otherwise classified as clinically significant. Older age is an important risk factor for cervical spine injury: