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Assessment of Anterior Dynamic Cervical Implant in Surgery of Cervical Disc Degeneration

Thesis
Submitted for partial fulfillment of M.D.in Neurosurgery

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List of abbreviations

A	Artery.
ACD	Anterior cervical discectomy.
ACDF	Anterior cervical discectomy and fusion
ACF	Anterior cervical corpectomy and fusion.
ALD	Adjacent level degeneration.
ALL	Anterior longitudinal ligament.
A-P	Antero posterior view.
ASD	Adjacent segment degeneration.
c-b ratio	Canal to body ratio.
CoR	Center of rotation.
CSM	Cervical spondylotic myelopathy
CT	Computed tomography.
C-TDR	Cervical total disc replacement.
DCI	Dynamic cervical implant
ECE	External carotid artery.
EMG	Electomyeography.
FEA	Finite elemental analysis
FXA	Functional X ray analysis
ICA	Internal carotid artery.
JOA	Japanese orthopedic association.
lat	Lateral view.
M	Muscle
MRI	Magnetic resonance imaging.
N	Nerve.
NDI	Neck disability index.
OPLL	Ossifiedt Posterior longitudinal ligament.
PEEK	Polyether ether keton.
PLL	Posterior longitudinal ligament.
PXR	Plain X-ray.
RLN	Recurrent laryngeal nerve.
ROM	Range of motion.
SLN(eb)	Superior laryngeal nerve (external branch)

SLN(ib)	Superior laryngeal nerve (internal branch)
TDR	Total disc replacement.
TE	Trachea esophageal.
TiCaP	Titanium Calcium-Phosphate.
TiO_2	Titanium oxide.
UHMWPE	Ultra high molecular weight polyethelene.
UJ	Uncovertbral joint.
V	Vein.
VA	Vertebral artery.
VAS	Visual analogue score.
VB	Vertebral body.

Assessment of Anterior Dynamic Cervical Implant in Surgery of Cervical Disc Degeneration

Introduction:

Cervical spondylosis causing radiculopathy or myelopathy is one of the most common problems seen by the spine surgeon and is often treated with anterior cervical discectomy and fusion (ACDF). This procedure, although it is highly effective at decompressing neural elements and stabilizing the spine, is associated with significant long-term morbidity, including postoperative dysphagia, promoted adjacent-level degeneration (Michael A.et al., 2009)

Although ACDF has been the mainstay treatment for cervical disc disease since the 1950s (Smith GW, 1958),interest in motion preservation in spinal surgery is almost as old. The first attempt at cervical arthroplasty reported by Fernstrom in 1966 involved the placement of metallic ball bearings into the disk space of the treated segments. Clinical results were, however, disappointing because of a high incidence of segmental hyper mobility, endplate subsidence, and clinical failure. Interest in cervical arthroplasty waned until the 1990s when a renewal of efforts was spurred by progress in lumbar arthroplasty (Buttner-Janz K, 1989) and with increased recognition of long-term complications of cervical fusion surgery, specifically with regard to adjacent segment degeneration.

Adjacent segment degeneration, reported to become clinically symptomatic in up to 25% of patients by 10 years of follow-up)(Katsuura A et al., 2001) ,and is believed to be promoted by increased stress and motion at these levels. These factors have been demonstrated to occur biomechanically and clinically (Dmitriev AE, 2005) and likely promote the degeneration by disrupting delicate nutrient pathways to the avascular nucleus pulposus ,it was found that degeneration of adjacent levels was significantly associated with loss of physiological cervical lordosis. (Katsuura A, 2001)

This points to emergence of cervical arthroplasty as an alternatives to arthrodesis that offers the promise of restoring normal spinal movement and reduce a kinematic strain on adjacent segments.

The goal of cervical arthroplasty is to restore normal biomechanics of the treated segment, thereby normalizing motion and stress in adjacent levels and reducing the incidence of long-term failure in the form of adjacent segment degeneration. Cervical arthroplasty might also have the added benefits of reducing incidence of postoperative dysphagia and complications associated with the treatment of multilevel disease (McAfee, 2003)

The first modern cervical disk replacement to be tested clinically was the Cummins–Bristol artificial joint (Cummins et al., 1998) Although there were significant complications, including screw breakage and pullout, in this initial experience, 16 of 18 patients had continued motion at the treated joint and no patient had adjacent-level

degeneration in up to 65 months of follow-up providing some initial optimism for the concept (Wigfield C, 2002)

Aim of The Work

To evaluate efficacy and safety of cervical arthroplasty (using dynamic cervical implant) in cervical degenerative disc diseases as regard preservation of cervical biomechanics to prevent adjacent segment degeneration.