Comparative Study between Cervical Laminectomy and Cervical Laminectomy With Fixation on Clinical Outcome and Spine Stability in Patients with Degenerative Cervical Myelopathy

Thesis
Submitted for the Partial Fulfillment of MD Degree
in **Neurosurgery**

Presented By
Mohamed Abd ElAty Mohamed Abdalla
M.B., B.Ch.
Master of General Surgery

Under Supervision of

Prof. / Adel Nabeeh Mohamed Abdalla
Professor of Neurosurgery
Faculty of Medicine – AinShamsUniversity

Prof. / Mohamed Wael Sameer
Professor of Neurosurgery
Faculty of Medicine – AinShamsUniversity

Dr./ Amr Mohamed NageebEl-Shehaby
Professor of Neurosurgery
Faculty of Medicine-AinShamsUniversity

Dr./ Mohamed Abdalla El-Werdany
Professor of Neurosurgery
Faculty of Medicine-AinShamsUniversity

Faculty of Medicine
AinShamsUniversity
2018

*First of all, thanks to **God**, to whom I relate any success that can be achieved at work in my life.*

*I am greatly honored to express my high appreciation and gratitude to **Prof. Dr. Adel Nabeeh Mohamed Abdalla**, Professor of Neurosurgery, Faculty of Medicine, Ain Shams University, for his gracious supervision, precious advice, and continuous encouragement through the whole research.*

*Words can never express my gratitude and thanks to **Prof. Dr. Mohamed Wael Sameer** Professor of Neurosurgery, Faculty of Medicine, Ain Shams University, for his kind help, meticulous supervision and continuous support and guidance throughout this work.*

*Also I would like to express my gratitude and appreciation toboth**Prof. Dr. Amr Mohamed Nageeb El-Shehaby** and**Prof. Dr. Mohamed Abdalla El-Werdany,** professors of Neurosurgery, Faculty of Medicine, Ain Shams University, for their fruitful encouragement, vast knowledge and valuable advice.*

*Finally, I wish to thank all **my family**especially my wife and my Parents, all my colleagues and any member who shared in this modest piece of work for their cooperation and patience.*

Mohamed Abdelaty Mohamed

Abstract

Degenerative Cervical Myelopathy (DCM) is an age-related disease of the cervical spine and represents one of the most common causes of spinal cord dysfunction. The aim of the study was to compare between mutltilevel cervical laminectomy,and multilevel cervical laminectomy with lateral mass fixation in patients with cervical spondylotic myelopathy regarding the functional clinical outcome and cervical spine normal sagittal alignment. This work is a prospective study of two groups of randomly selected patients. The first group (n= 20) underwent cervical laminectomy while the second group (n=18) underwent cervical laminectomy with lateral mass fixation. Patients were followed up for 12 months duration using functional modified Japanese orthopedic score (mJAO), andmeasurement of C2-C7 cobb`s angle to evaluate post-operative cervical sagittal alignment.The results revealed that both approaches has good functional outcome with no significant changes on the normal cervical lordosis.

Key words: Degenerative cervical myelopathy, Laminectomy, Lateral mass fixation, Modified Japanese orthopedic score, Cobb`s angle.

Contents

List of Abbreviations

ACCF	Anterior cervical corpectomy and fusion
ACDF	anterior cervical discectomy with fixation
ADEM	Acute disseminated encephalomyelitis
ALL	Anterior longitudinal ligament
ALS	Amyotrophic lateral sclerosis
AP	Antero-posterior
AVM	Arterio-venous malformations
CL	Capsular ligament
CSF	Cerebrospinal fluid
CSM	Cervical Spondylotic Myelopathy
CT	Computed tomography
DM	Diabetes mellitus
DTI	Diffusion tensor imaging
EMG	Electromyography
FSU	Functional spinal unit
HT	Hypertension
IAR	Instantaneous axis of rotation
ISL	Inter-spinous ligament
IOM	Intra-operative monitoring
LMSs	Lateral mass screws
LF	Ligamentum flavum

LL	Lower limb
MEP	Motor evoked potential
MIOM	Multimodal intra-operative monitoring
mJAO	Modified Japanese Orthopaedic
MRI	Magnetic resonance imaging
NCV	Nerve conduction velocity
Oc	Occipital
OPLL	Ossification of the posterior longitudinal ligament
PLL	Posterior longitudinal ligament
RLN	Recurrent laryngeal nerve
SD	Standard deviation
SSEP	Somatosensory evoked potential
TSS	Tandem spinal stenosis
ULs	Upper limbs
VAS	Visual analog scale
VB	Vertebral body

List of Tables

List of Figures

Introduction

Cervical spondylotic myelopathy (CSM) is a progressive degenerative disease and is the most common cause of cervical spinal cord dysfunction. CSM can be due to direct compression of the spinal cord, or surrounding blood vessels, resulting in varied clinical symptoms. Spondylosis has been shown as the most common etiology for cervical myelopathy in people aged 55 years or older **(Bakhsheshian *et al.*, 2017)**.

The pathophysiology of CSM is now thought to be multifactorial with both static factors causing stenosis and dynamic factors resulting in repetitive injury to the spinal cord playing a role. It has been postulated that the absolute size of the spinal cord may be an important factor in the development of symptoms from CSM. Cervical myelopathy encompasses a range of symptoms and examination findings including motor and sensory abnormalities related to dysfunction of the cervical spinal cord **(Lebl *et al.*, 2011)**.

Since its advent, magnetic resonance imaging (MRI) has played an indispensible role in the management of patients with cervical spondylotic myelopathy (CSM). There has been major advancement in MR technology over the past several decades, resulting in enhanced resolution and image quality **(Ellingson *et al.*, 2015)**.

The surgical management of CSM has evolved considerably over the past 40 years; however, no surgical treatment is without associated morbidity. Laminectomy was initially regarded as the gold standard treatment of multilevel cervical myelopathy due to the extensive

decompression this procedure afforded. Laminectomy was eventually augmented to include posterior fusion. However, fusion of the cervical spine results in alteration of normal cervical biomechanics, as axial and rotational forces are no longer physiologically distributed to subjacent spinal structures. The alterations to force distribution following fusion procedures of the cervical spine have been associated with increased rates of adjacent segment degeneration **(Woods *et al*., 2011).**

The surgical procedures include anterior and posterior approaches, the choice of which depend on the cervical alignment and the levels and sources of compression. In patients exhibiting preserved cervical lordosis and >3-level canal stenosis laminoplasty or laminectomy with or without fixation was performed. In the case of significant compression on the posterior side, posterior approach was also selected, even if the patients exhibited <3-level compression **(Kong *et al*., 2013).**

If necessary, fusion can be done in conjunction with laminectomy or laminoplasty and can better preserve lordosis but at the consequence of greater limitation of motion and potential fusion/instrumentation-related complications **(Rhee and Basra, 2008).**

After the introduction of lateral mass screw fixation by the Roy-Camille in 1972, various protocols on lateral mass screw positioning were suggested in consideration of nerve root and vertebral artery injury, facet joint violation, successful bone fusion and convenience of screw fixation **(Kim *et al*., 2012).**

Cervical laminectomy, by removing the posterior bony elements, allows the spinal cord to migrate dorsally away from anteriorly situated compressive pathology, while also affording direct relief from dorsal stenosis/spondylo-arthrosis. Laminectomy, whether offering ventral or dorsal decompression, improves cervical cord perfusion **(McAllister *et al*., 2012).**

However, although the effectiveness of cervical laminectomy was documented repeatedly, there were still concerns over postoperative kyphotic deformity, cervical instability, and late deterioration **(McAllister *et al*., 2012)**.

Aim of the Work

To compare between mutltilevel cervical laminectomy, and multilevel cervical laminectomy with lateral mass fixation in patients with cervical spondylotic myelopathy regarding the functional clinical outcome and cervical spine normal sagittal alignment.