The necessity of Plating Instrumentation in Single Level Cervical Discectomy with Bony Fusion

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

By

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Introduction

Cervical disc disease and spondylosis figure in the earliest recordings of human ailments. But the pathologic changes that develop with increasing age were not reported until the early ninteenth century. Treatment was generally supportive until Sir Victor horsely decompressed the cervical spinal cord by a C6 laminectomy. The anterior approach to compressive lesions was the development of Robison, Cloward, and Boldery. [1]

Anterior cervical fusion was first performed by Bailey and Badgley in 1952.][2] The techniques of anterior cervical fusion were subsequently advanced by Smith and Robinson; Cloward emphasized the importance of simultaneous spinal decompression with cervical fusion procedures. At first, single-level anterior fusion procedures yielded good results, but with the efforts to correct multilevel disease the incidence of pseudarthroses and kyphotic deformities approached 40%. [3] Efforts were subsequently undertaken to produce cervical stabilization devices for multilevel anterior cervical procedures and traumatic (or potentially unstable) single-level fusions.

The need for interbody fusion after cervical discectomy is still debated, and the option of discectomy only has been advocated by many authors who have reported acceptable results. [4,5]The concept of reconstructing the disc space, however, remains attractive to many other surgeons, and interbody fusion following discectomy for cervical myelopathy or nerve root compression is an accepted surgical adjunct to help minimize postoperative morbidity.[6,7]

The advantages of interbody fusion include: 1) maintenance of cervical alignment; 2) arrest of spur formation or resorption of spurs; 3) elimination of potential instability; and 4) preservation of disc height and angulation, thereby reducing potential compromise of the neural foramen compromise. [8,9]

An anterior plate and screw internal stabilization device was first developed by Bohler in 1964.[10] During the 1980s Caspar collaborated with the Aesculap to produce a standardized set of instruments and a plating technique.[11] Many surgeons found, however, that the bicortical purchase required by the Caspar plate system was cumbersome and time consuming.

Several experimental biomechanical studies have provided useful criteria for evaluating clinical instability in the cervical spine.[12,13] The presence of a potential cervical segmental instability following single level cervical discectomy is fact if the "check list for the determination of clinical instability in the spine"[14] developed by White and Panjabi in 1990 is put in consideration. According to it the post discectomy cervical spine acquires a minimum of three points owing to destruction of the anterior elements (defined as the posterior longitudinal ligament and the structures anterior to it), and abnormal reduction of the disc height. More points could be added if relative sagittal rotation and translation were included, rendering the spine unstable, which needs five or more points to be considered an unstable spine.

The use of anterior plates for single-level cervical fusions is controversial. Previous studies that evaluated single and multiple-level fusions have shown increased and decreased fusion rates when cervical plates are used. The rigid plate placed anteriorly provides a construct that resists a variety of potential distortional forces, including flexion, and extension as well as rational and laterally applied forces. In addition when the bone graft placed underneath the plate is held in contact under load, the plate becomes part of the load-bearing cross-sectional area, thus adding to stability.[15] Motion control is the most desired effect of applying external orthosis. However, the ability of the orthotic devices to achieve this effect is disputable due to the complexity of movements provided by the motion segment, as well as the presence of skin and subcutaneous tissue, which limit the efficacy of the devices by restricting access to bony

landmarks. Because of the variability of body habitus among individuals, it should be expected that motion control is variable as well as the patient compliance.[16]

Single-level discectomy and fusion in the treatment of cervical disc disease and spondylosis has a high degree of success [17], but Revision procedures for failed previous anterior fusion have shown an improved success rate when fusion is supplemented with internal fixation, which also eliminates the need for extensive external immobilization due to the immediate additional segmental cervical stability provide by the anterior plating systems. [15]

The goals of internal metallic fixation, as an augmentation to anterior cervical fusion are (1) to improve the fusion success rate, (2) decrease the incidence of graft extrusion, (3) to Maintain proper spinal alignment, (4) eliminate the need for external orthotic immobilization, and (5) last but not least to Eliminate the presence of potential cervical segmental instability.[15]

The objective of the study was to determine whether a difference exists in between subjects undergoing single-level ACDF with and without anterior cervical plating instrumentation for symptomatic cervical disc disease. Collapse or settling of grafted bone into the vertebral endplates with resulting kyphotic deformity of the cervical spine is a commonly described complication of anterior discectomy and fusion. Despite the increasing use of instrumentation for the treatment of multiple level cervical spine degenerative conditions, little is known regarding fusion with anterior cervical plating instrumentation compared with conventional fusion without plating in the management of single level cervical discectomy.

Aim of the Work

The purpose of this study was to compare the clinical and radiographic success of single-level discectomy performed with and without anterior cervical plate fixation and the essence of fixation.

Patients

This study will be conducted upon patients presenting with single level cervical disc disease admitted at the departments of neurological surgery in Ein Shams And Menoufia University hospitals, within a period of two years from the onset of the study, with a minimal follow up period of six month.

For the sake of comparison the candidates for this study will be selected according to the following criteria:

- Single level disc lesions (prolapse or spondylosis)
- Patients have undergone no previous spinal surgeries or trauma.
- Presence of brachialgia not responding to medical treatment and / or presence of a neurological deficit

Methods

Patients in this study will be submitted to

1- Complete history taking.
   a) age b) sex
   c)occupation d) complaint

2- Complete physical

3- Neurological examination
   a) motor system b) sensory system
   c) reflexes d) sphincters
   e)specific tests

4- Preoperative investigations:
   a) Routine laboratory investigations
   b) Radiological evaluation including:-
      i- plain x-rays of the cervical spine
      ii- dynamic films of the cervical spine
      iii- MRI of the cervical spine
   c) Electrophysiological Studies if indicated.

5- Surgery:
   The patients are going to be operated upon using the standerd anterior approach including microscopic discectomy and osteophytectomy if needed with cut of the posterior longitudinal ligament to expose and completely decompress the venteral aspect of the dura. In addition Smith-Robinson fusion using a tricortical iliac crest autograft will be performed. The patient were divided into two groups, where one of the groups will have additional anterior cervical plating instrumentation.

6- Follow up:
   The patients will be followed up clinically and radiologically.
   The follow up will be performed in the first post operative day, then weekly for two weeks, then monthly for a period of six month.

Results

The results of this study will be analyzed and tabulated according to the general statistical methods and will be compared with previous studies.

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ABSRACT

The techniques for anterior cervical surgery with application of internal fixation have become a standered part of the spine surgeons armamentarium, but the role plates in single level cervical discectomy has been a point of debate in literature. Anterior instrumentation may provide several important benefits: (1) enhanced stability and strength during the fusion period, perhaps resulting in improved and more rapid fusion rates; (2) prevention of Kyphosis from collapse of involved levels; (3) prevention of graft dislodgment; (4) making additional posterior surgery unnecessary in some patients, (5) eliminating the need for external fixation in many patients, leading to improved patient comfort and satisfaction; and (6) allowing more rapid patient mobilization in the acute postoperative period, resulting in fewer postoperative complications associated with prolonged recumbence, more rapid hospital discharge, and overall lowering of hospital costs.

The purpose of this study was to compare the clinical and radiographic success of single level-discectomy performed with and without anterior cervical plate fixation and the essence of fixation. This study was conducted as a prospective investigation that included 50 patients receiving single-level Anterior Cervical Discectomy and Fusion (ACDF) for symptomatic cervical disc disease that was unresponsive to conservative therapy. Of the fifty patients 25 patients received additional anterior plates (ACDP), while the remaining 25 patients had ACDF without plates.

ACDP does allow better early patient relief as regards the neck pain and neck disability. But once bone fusion occurs the results of the two procedures are comparable.

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