ORIGINAL RESEARH

Hypertension and other Risk Factors Affecting Surgical Outcome of Cervical Degenerative Disease at A University Hospital in Saudi Arabia

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ABSTRACT

Introduction: Cervical degenerative disease is a generalized disease process affecting all levels of the aging cervical spine the objective of this article is to find out the clinical risk factors affecting the surgical outcome in cases of degenerative cervical spine disease at King Abdul Aziz University Hospital, Jeddah,

Material and method: Retrospective study From January 2005 to December 2010.The medical files were reviewed for the possible risks that might affect the patients' outcome. The outcome result was divided into two categories (favorable and unfavorable). The odd ratio (OR) with 95% confidence interval (CI) was used to assess the effect of bivariate data. The logistic regression analysis was used to assess the effect of the multivariate data.

Results: A total of 120 cases were reviewed. 63 (52.5%) were females and 57 (47.5%) were males. The mean age was 55.2 +/- 12.8 years. The most common degenerative cervical spine changes were found at C 5-6 levels. Factors affecting the outcome favorably were: pain radiation (*P*=0.001), history of numbness (*P*=0.04), history of weakness (*P*=0.01) and finding out altered sensation on the examination (*P*=0.04). Factors affecting the surgical outcome unfavorably were: hypertension (*P*=0.001), a combination of hypertension with diabetes and smoking (*P*=0.001) and multiple level involvement (*P*=0.001).

Conclusion: Clinical factors affecting the surgical outcome of cervical degenerative disease are: multiplicity, hypertension, history of pain radiation, numbness, weakness and finding abnormal sensation. The radiological images with the electrophysiological factors need to be considered before reaching final outcome prediction.

Keywords: Cervical, spine, hypertension, Jeddah, outcome, surgery

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INTRODUCTION

Cervical degenerative disease (CDD) is a generalized disease process affecting all levels of the cervical spine. Cervical spondylosis encompasses a sequence of degenerative changes in the intervertebral discs, osteophytosis of the vertebral bodies, hypertrophy of the facets and laminal arches, and ligamentous and segmental instability.[1] With advancing age, the cervical spine undergoes degeneration in both the disc and the facet joints. This process may result in pain.[1,2] The disc nucleus can herniate and the facet can develop arthiritis, both can lead to foramenal stenosis and nerve root compression.[1-3] Compression of the degenerated structures on the neural elements can result in a variety of conditions such as cervico-cephalic headache, radiculopathy or myelopathy.[1,4-6] This can result in neural element compression and subsequent clinical manifestations.[7]

In North America, spine epidemiological study shows an incidence of 41 per million and prevalence of 605 per million for patients with myelopathy secondary to degeneration of the spine. As well, 4.04 patients per 100,000 person get hospitalized as a result of cervical degenerative myelopathy with increasing number of surgeries.[8]

The treatment for symptomatic degenerative spine disease patients begin with conservative modalities, such as, analgesics, physiotherapy, change of behavioral habits, Non-steroidal anti-inflammatory medications (NSAIDs), etc.[9-11] in case of failure or presence of weakness, surgical treatment is indicated.[12-15]

The aim of this study is to find out the clinical risk factors that can affect the surgical out-

come of the CDD at King Adulaziz University Hospital.

MATERIAL AND METHOD

This study was done at King Abdulaziz University Hospital in Jeddah-Saudi Arabia. This was a retrospective study. The research ethics committee at King Abdulaziz University approved the research project without a need for obtaining a patient consent.

The medical files were reviewed between January 2005 till December 2010. 120 patients had a proven degenerative cervical spine disease by MRI study and complaining of neck pain. The medical files of patients visited the neurosurgery service were reviewed for demographic data, medical history (including neck pain, radiation, numbness and weakness) and physical examination (including motor power changes, abnormal sensory examination and abnormal reflexes). The MRI cervical spine was performed with GE1.5T machine, the MRI was reported by a neuroradiologist at KAUH. All patients had surgical intervention either through anterior cervical discectomy and fusion[16] or through posterior decompressive laminectomy.

The outcome result was divided into two categories (favorable and unfavorable) based on follow up record postoperatively in the outpatient visits. The favorable result was defined as uncomplicated postoperative course for at least 12 months. The unfavorable outcome was defined as either any complication in the postoperative course for at least 12 months or un-improved patients' condition.

STATISTICAL ANALYSIS

The odd ratio (OR) with 95% confidence interval (CI) was used to assess the effect of bivariate data on the outcome (table 1). The logistic regression analysis was used to assess the effect of the multivariate data (table 2).

The results were presented with the *P* value significance and the 95% confidence interval. A *P* value of < 0.05 was considered significant.

All the statistical analysis was performed using IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.

RESULTS

Total of 120 patients were enrolled. 63 (52.5%) were females and 57 (47.5%) were males. The mean follow up period was 12±10 months.

Factor	OD	95% *CI*	*P*
Pain radiation	3.1	1.12,8.3	0.001
History of numbness	1.7	0.9, 3.2	0.04
History of weakness	1.7	1.75, 2.96	0.01
Hypertension	3.1	1.6, 6.22	0.001
DM	0.57	0.19, 1.66	0.26
smoking	0.6	0.3, 1.55	0.24
Abnormal motor examination	0.7	0.26, 1.8	0.47
Abnormal sensory examination	1.4	1.06, 1.84	0.04
Type of surgery	2	0.77, 5.15	0.06

Table-1: the odd ratio with 95% confidence interval for bivariate factors

Factor	R^2	F	*P*
Age	0.025	1.92	0.17
Level	0.062	2.86	0.09
Duration of symptoms	0.026	2.86	0.16
Hypertension + DM	0.259	12.58	0.001
Hypertension + DM + smoking	0.305	10.92	0.001
Abnormal reflexes examination	0.016	1.16	0.28
Multiplicity	0.27	28	0.001

Table-2: The regression analysis of different multivariate factors

Age

The mean age was 55.2 +/- 12.8 years the minimum age was 29 years and the maximum age was 83 years. Age was not affecting the outcome R^2 = .025, $F(1, 76)$ = 1.92.64, p =0.17.

The cervical level involved (figure1)

The most common degenerative cervical spine changes were found at C5-6 levels (figure1) followed by the C6-7 level. . The level was not affecting the outcome R^2 = 0.062., $F(1, 43)$ = 2.86, p =0.09.

Duration of symptoms

The mean duration of symptoms prior to the presentation to the medical facility was 41 +/- 45.6 months (minimum 5 months and maximum 180 months). The duration of symptoms was not affecting the outcome R^2 = 0.026., $F(1, 73)$ = 2.86, p =0.16.

The outcome

There were 83 (69.16%) patients who had favorable

outcome. The number patients who had unfavorable outcome was 37 (30.83%).

The history predictors

Pain radiation

There were 84 patient complained of radiation to the upper extremities detecting the degenerative cervical diseases. Patients with radiation had a better outcome of surgery than other patients OR 3.1, 95% CI [1.15, 8.3],*p*=0.001.

History of numbness

There were 57 patients complained of numbness in the upper extremities with neck pain. Patients with history of numbness had a better outcome of surgery than other patients OR 1.7, 95% CI [0.9, 3.2], *p*=0.04.

History of weakness

There were 48 patient complained of weakness in the upper extremities. Patients with history of weakness had a better outcome of surgery than other patients OR 1.7, 95% CI [1.75, 2.96], *p*=0.01.

Co morbidities

History of hypertension (figure2)

45 (37.2%) patients gave history of hypertension. The analysis showed that hypertensive patients had worse outcome than normal patients OR 3.1, 95% CI [1.6, 6.22], *p*=0.001.

History of diabetes mellitus (DM)

30 (24.8%) of patients had DM . These patients had the same outcome as non-diabetic patients OR 0.57, 95% CI [0.19, 1.66], *p*=0.26, however, when DM was combined with hypertension they resulted in unfavorable outcome $R^2 = 0.259.$, $F(2, 72) = 12.58$, $p = 0.0.001$

Smoking effect on outcome

Only 9 (7.4%) patients were smokers. They have the same outcome as non smokers OR 0.6, 95% CI [0.3, 1.55], *p*=0.24, however, when smoking was combined with hypertension and DM they resulted in unfavorable outcome $R^2 = 0.305.$, $F(3, 65) = 10.92$, $p = 0.0.001$

Physical examination of abnormal motor power

There were 36 patient found to have weakness in the extremities . weakness was not a predictor for outcome OR 0.7, 95% CI [0.26, 1.8], *p*=0.47.

Physical examination of abnormal sensation

There were 30 patient found to have of abnormal sensation in the upper extremities. Patients with abnormal sensory examination had a better outcome of surgery than other patients OR 1.4, 95% CI [1.06, 1.84], *p*=0.04.

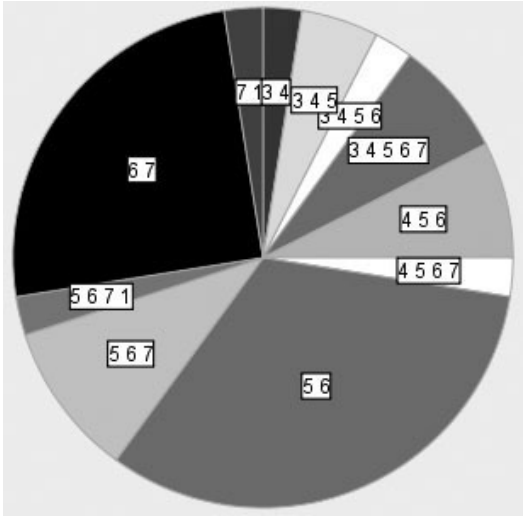

Figure-1: Pie chart showing the distribution of the cervical level involved with the degenerative cervical disease.

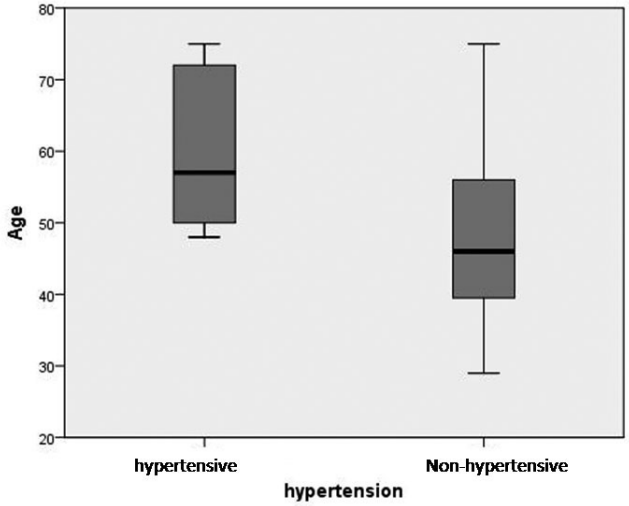

Figure-2: The hypertension distribution in relation to the patients' age

Physical examination of abnormal reflexes

There were 57 patient found to have of abnormal reflexes in the upper extremities. The abnormal reflexes examination was not affecting the outcome $R^2 = 0.016.$, $F(1, 73) = 1.16$, $p = 0.28$.

Multiplicity

Multiple levels involved with degenerative disease had worse outcome than single level $R^2 = 0.27.$, $F(1, 76) = 28.84$, $p = 0.001$.

Type of surgery

104 (86.6%) had anterior cervical decompression and

fusion, 16 (13.4%) posterior decompression. The type of surgery had no effect on the outcome OR 2.0, 95% CI [0.77, 5.15], p=0.06.

DISCUSSION

Cervical spondylosis is the most common progressive disorder in the aging cervical spine. It results from the process of degeneration of the intervertebral discs and facet joints of the cervical spine. From the Biomechanical point of view, both the disc and the facet joint are acting as a connecting bridge between the vertebrae to absorb the external loads. They help in the mobility of the cervical spine. Development of symptoms usually depends on osteophytes formation that can lead to either myelopathy and radiculopathy,secondary to spinal canal compromise. Congenital spinal stenosis can be a participating factor as well. The developmental process, together with the degenerative process, may cause mechanical pressure on the spinal cord at one or multiple levels. This pressure may produce direct neurological damage or ischemic changes and, thus, lead to spinal cord disturbances.[17] Most patients with symptomatic degenerative cervical radiculopathy can be managed conservatively. Surgical intervention for radiculopathy is considered only if the conservative treatment has failed or if the neurological deficits are significant. In myelopathy, surgical intervention can be considered earlier.On the other hand, in cases of mild myelopathy, careful observation and conservative treatment can be offered.[18] In this article age and duration of symptoms are not significantly affecting the outcome. This finding is in line with previous article.[19] However, another study shows age is a significant prognostic factor.[20] The third trend of studies shows the duration of symptoms is a significant prognostic factor.[21-24] This contradiction may be related to the presence of other confounders that are affecting both factors that need to be considered carefully.

Some studies show no correlation between the multiplicity and outcome[24,25], the current article shows that multiple level involvement is a significant factor that affecting the outcome proportionally. This has been demonstrated before[26] and now patients at KAUH shows the same trend.

History of hypertension is a significant factor that is affecting the outcome negatively and need to be considered preoperatively and included in the discussion with the patient. Only few studies mentioned the significant effect of high blood pressure on the surgical outcome of the patients with CDD.[27,28] The relationship between the hypertension and CDD is poorly understood, although, one article suggests that, the stimulation of sympathetic nerve fibers in pathologically degenerative disc could produce sympathetic excitation, and induce a sympathetic reflex to cause cervical vertigo and hypertension.[29]

In spite that DM and smoking are not affecting the outcome individually, but when combined together with the hypertension, the added value do affect the outcome negatively, so, patient with CDD going for surgery need to quit smoking, having their blood sugar well controlled as well as their blood pressure prior to proceeding for cervical spine surgery to avoid unfavorable outcome. The main complication reported before is pseudoarthrosis.[30]

Patients present with cervical pain radiation, history of numbness and feeling of weakness have better outcome especially if the clinical examination showed altered sensation. This can be related to the diagnosis accuracy or agreement of the patients for the surgical option as they find the situation is getting worse and the surgery is indicated. Radiological and electrophysiological factors need to be considered to have a better view of the patient's prognosis. This article is retrospective, single centered with relatively small number of patients. To have a better evidenced prognostic factors, a multicenter and prospective study need to be conducted.

CONCLUSION

Clinical factors affecting the outcome of surgical cervical degenerative disease outcome are multiplicity, hypertension, history of pain radiation, numbness, weakness and finding abnormal sensation. The radiological images with the electrophysiological factors need to be considered before reaching final outcome prediction.

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