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Comparative Study between Multiple Cervical Discectomy and Cervical Corpectomy in Cervical Spondylotic Myelopathy

Thesis
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in Neurosurgery

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CONTENTS

Keywords :spine-cervical-degenerative-myelopathy –corpectomy -discectomy

Discussion

Brain demonstrated in 1952 that cervical spondylosis, which had previously been known to produce various signs and symptoms of facet joint and cervical root disorders, also was responsible for spinal cord compression and thus myelopathy **(*Matthew et al 2002)***.

Cervical spondylotic myelopathy is the leading cause of spinal cord dysfunction in older patients. Anterior and posterior surgical approaches have a role in the treatment of cervical spondylotic myelopathy depending on the number of levels involved, diameter of canal and the alignment of the spine. Anterior decompression and fusion is useful in patients who have disease at three or fewer levels or in patients with kyphotic alignment. In more extensive disease, a posterior decompression and fusion is usually best. Canal expansive laminoplasty is useful in the treatment of myelopathy without radiculopathy in a patient with lordotic alignment. With the exception of laminoplasty, nonfusion procedures have little role in the treatment of cervical spondylotic myelopathy ***(Orr-et al., 1999).***

In our work, 40 patients of CSM were managed surgically, by one of two methods, in a random way without any selection data for each of the two methods.

1. Multiple level discectomy with bone graft with and without fixation.

2. Single or multiple level corpectomy with bone graft and fixation.

In our work, there were 31 males (77.5%) and 9 females (22.5%). Males out number females by 3.4: 1:

Thirty one males (77.5%): nineteen patients showed excellent outcome, ten patients showed good outcome. Two patient as preoperative or worse, nine females (22.5%) three patients showed excellent outcome, four patients showed good outcome, two patients fair outcome, this difference in outcome is statistically insignificant the prognosis was not correlated with gender. Our study goes nearly with the result of ***ISU, et al. (1996)*** series there were 27 male and 14 females (male predominant) and ***(Bennie et al 1999)*** who reported (62%) men and (38%) women, while ***(Josef T. Klmg et al 2003)*** who conduct that predominantly male (91%), while disagree with ***(Saunders et al.1991)*** series there were 22 males and 18 females (the female approaching the number of males) we can explain this with aggressive strain of cervical spine in our community especially manual workers with predominant of males in this jobs.

In our work the age of the patients ranged from 40 – over 60 years, mean age was 55.3 years old, 45% of patients presented with age 50 – 60 years old. This goes with ***(Bennie et al 1999)*** who reported the mean age **of** the patients in this series was 56 years and ***(Josef T.King et al 2003)*** who mentioned that the mean (± standard deviation) patient age was 56.8 ± 11.2 years, and older than mean age of ***Azuma et al. (2002)*** the mean age was 45 years old and less than mean age of ***Yap et al. Series (1993)*** the mean age was 63.6 years old. Over 60 years patients in our work represent (15%) while in ***Saunders et al. (1991)*** 25% of his patients were above 70 years old.

The age of the patient at the time of presentation with cervical spinal cord compression may affect the decision-making process because

of 1) the effect of age on the spine, its ligaments, and on intrinsic spinal stability; 2) the effect of age on the spinal cord and its vasculature; and 3) the effect of age on bone density. ***(Sait Naderi et al 1996)***

Vascular changes associated with spondylosis may be more severe in the older patient group and may result in ischemia of the nerve roots or spinal cord. This phenomenon can affect the tolerance of the spinal cord to compression. On the other hand, the spinal cord may be atrophic in older patients, thus minimizing the compressive effect of spinal stenosis & bone density can affect surgical strategies. A 50% decrease in the mass of osseous tissue results in a reduction of strength to 25% of the original strength. Age-related osteoporosis (Type 2 osteoporosis) can complicate a patient's postoperative course. In cases of corpectomy and grafting, and in the presence of soft bone, an aggressive bracing management strategy may be necessary ***(Sait Naderi et al 1996).***

This figures denoted that CSMR was earlier in our community against older age in developed countries, may be due to bad handling of our spine especially in farmers and manual workers.

In our work, the results were as follow:

Between 40 – 50 years, there were 16 patients (40%) showed outcome as follows: 14 patients excellent recovery (87.5%), 2 patients good recovery (12.5%). Between 50 – 60 years 18 patients (45%): showed ten patients excellent recovery (55.5%), 5 patients' good recovery (27.8%), three patients fair recovery (16.7%). Between 60-70 years, there were 6patients (18%) showed three patients good recovery (50%), three patient as preoperative (50%).

- We found that the prognosis was well correlated with age, as excellent and good recovery occurred in younger ages and fair and poor results were in old ages. So young age has a good prognostic factor, although, the difference between different age groups was statistically weakly significant ($P < 0.05$).This appeared as in all other papers, ***Born, (2000)***: in his series showed severity of myelopathy and age are significant predictors in outcome and ***George et al. (1999)*** in his series: better results were observed in younger patients of CSM & also appeared in ***Montogomery and Brower (1992)***: young age is a good prognostic factor in CSM. But disagree with ***Fessler et al. (1998)***: age was not a good predictor factor of clinical outcome of CSM.

Duration of symptoms:

In our work the duration of symptoms ranged from 9 months to 4 years with the mean 2 years. The delayed diagnosis as the symptom may be masked by weakness of old ages. In our study the duration of symptoms more than ***(Brain et al. 1956)***: nearly half of their patients had symptoms for one year at time of presentation and ***(Bennie et al 1999)*** reported mean duration 16.9 months. On the other hand ***(Josef T.King et al 2003)*** mentioned that the median duration of CSM symptoms was 5 years while goes with ***Sadasivan et al. (1993)***: were the mean duration of symptoms was 6months-3years.

As less than 1 year there were 9 patients (22.5%) 6 patients showed excellent recovery, and 3 patients had good recovery, between 1 to 2 years there were 21 patients (52.5%) There were 16 patients showed excellent recovery, 5 patients showed good recovery, between 2-3 year, there were 6 patients (15%) 3 patients showed good recovery, 3 patients

had fair recovery , between 3 – 4 years, there were 4 patients (10%), 2 patients showed good recovery, 2 patients had poor recovery.

The post operative improvement was strongly correlated with duration of symptoms, as excellent recovery was found in patients having duration of symptoms less than a year while fair and poor results were found in patient having duration of symptoms more than three year. The difference in outcome between different duration of symptoms is statistically highly significant which also mentioned by ***Saunders et al. (1991)***\ who said that the duration of symptoms prior to treatment was the single most predictive factor for outcome ***Fougas et al. (2002)*** compared study between early and delayed decompressive surgery showed that early decompression gives better results and ***(McCormick et al, 2003)*** wrote that Early surgery can improve prognosis. Montgomery and Brower2 found that the prognosis after surgery was better for patients with less than 1 year of symptoms, young age, fewer levels of involvement, and unilateral motor deficit.Phillips24 examined 65 patients treated surgically and found that symptoms of less than 1 year's duration significantly correlated with benefit from treatment. Similarly, Ebersold et al25 evaluated several possible predictors of outcome in 84 patients treated surgically. Using the Nurick's functional grade, they found that the only significant variable predictive of outcome was how long the symptoms had lasted before surgery., but disagree with ***George et al***. in their series ***(1999)*** who mentioned that no relation between results and duration of symptoms could be established. We can explain that by the long duration of symptoms preoperative concomitant with advanced grades of Nurick's and JOA due to initial delay in diagnosis.

Nurick's gait disability scale:

There was one patient with grade I as the gait is nearly normal, as mentioned by ***(Fessler et al, 1998)*** which may be explained by permanent minor vascular impairment and not mechanical alone .

Grade II preoperatively 9 patients (22.5%) all became grade I (100%). Grade III preoperatively 14 patients (35%), Nine patients (64.2%) became grade I. Two patients (14.2%) became grade II. Two patients (14.2%) became grade III & One patient (7.1%) became grade IV…Total (21.3%).

Grade IV preoperatively 18 patients (45%) Four patients (22.2%) became grade I. 8 patients (44.4%) became grade II. Two patients (11.1%) became grade III. Three patients (16.7%) remain as preoperative& one patient (5.5%) became grade V….Total (22.2%). Grade V there were no patients.

This difference in outcome between different Nurick's grades was statistically highly significant and inversely proportional to the degree of post operative improvement. This goes with other series results, as ***Kumar et al. Series, (1999)*** concluded that patients with better neurological status at the time of surgery are more likely to improve postoperatively also with ***Fouyas et al. (2002)*** mentioned that the Patient characteristics such as age disability at presentation, and the duration of symptoms, could influence outcome and ***Emery et al. (1998)*** Mentioned that the strongest predictive factor for recovery from mylopathy was the severity of the myelopathy before operative intervention, as the better preoperative neurological function was associated with better neurological outcome. That also concluded by ***Born, (2000)*** who

mentioned that clinical myelopathy severity and age are significant predictors of two outcomes.

There was postoperative discrepancy between improvement in UL and LL due to persistent spasticity in LL postoperatively. This was correlated with finding of ***Childes et al. (1999)*** in their series.

Hand disability scale according to modified JOA scale:

Preoperative JOA grade II, there were 6 patients (15%) all recovered to grade I (100%) postoperatively, JOA grade III there were 8 patients (20%) preoperative, all recovered to grade I (100%). JOA grade IV preoperatively there 17 patients (42.5%), eleven patients (64.7%) became JOA grade I. Four patients (23.5%) became JOA grade II. Two patients (11.7%) remained as pre operative, two patients (7%) became JOA V. JOA Grade V preoperatively 9 patients (22.5%). Two patients (22.2%) became JOG I, five patients (66.6%) became JOA II. One patients (11.1%) became JOA IV. This difference in JOA grade outcome is statistically highly significant.

In our work, the most common levels to be affected were C4-C5, C5-C6 followed by C6-C7 and C3-C4 and this against that concluded by ***Montgomery and Brower (1992)*** who found the most common levels were C5-C6 followed by C6-C7 and C4-5 while ***Richard G. et al (1998):*** The commonest levels were C5-C6 followed by C3-C4.

In our work we found that two levels cord compression (22 patients 55%), ten patients were treated by two levels discectomy and one level corpectomy at one year follow up, six patients had excellent recovery, three patients had good recovery One patient fair recovery while, there were 12 patients treated by two level discectomy with bone

graft one year follow up became Six patients became excellent recovery. Four patients became good recovery. One patient had fair recovery and one patient had poor recovery.

Three level cord compression (16 patients 40%). 7 patients were treated by three level discectomy with bone graft one year follow up, Two patients showed excellent recovery. Four patients had good recovery. One patient had fair recovery.

The other 9 patients were operated upon by three levels discectomy and two level corpectomy and bone graft and fixation often. One year follow, three patients showed excellent recovery. Five patients showed good recovery. One patient had fair recovery.

Four levels compression two patients (5%): one patient was operated upon by four levels discectomy and 3 levels Corpectomy, after one year follow up he had poor recovery. While the other was operated upon by four levels discectomy and had good recovery.

The excellent and good outcome were more common with one or two levels compression than three and four levels cord compression although it was statistically insignificant as we know the multiple factors contributing in cervical spondylotic myelopathy (not only mechanical compression but mainly vascular so in some cases and in spite of good decompression there is mild improvement so there is weak relation between the number of level decompressed and the prognosis . This goes with ***George et al. (1999)*** found that there was correlative relation between results and number of levels of cord compression, but disagree with ***Fesseler et al. (1998)*** who mentioned that the postoperative myelopathy outcome was not significantly correlated with number of

levels compression, also ***Emery (2001)*** anterior decompression. Frequently requires corpectomy at one or more levels number of levels was not significant.

In our work, 23 patients (57.5%) showed preoperative cord changes on T2 weight image. At one year follow up, Six patients had excellent recovery. Eleven patients had good recovery. Three patients fair recovery. Three patients showed poor recovery. There were 6 patients had fair and poor result in patients with cord malacia. The difference in outcome between the 2 groups of patients with cord malacia and without is statistically highly significant which agree with ***Wada et al. (1999):*** presence of high signal intensity areas on T2-weighted magnetic resonance images correlated poorly with recovery rate and ***Naderi et al. (1998)*** who conducted that the presence of preoperative high signal intensity within spinal cord reflect less neurological improvement wit my explanation as there were definite vascular compromised who responsible of bad prognosis with cord malacia when compared with cases without cord malacia .

In our study we found some prognostic factors as age, duration of symptoms, severity of myelopathy, and signs of cord changes which determine the improvement post operative .

In the first group of this work which was treated by corpectomy and bone graft and fixation it showed: Excellent and good outcome in 85%, Failure in 15% .In second group treated by multilevel discectomy and bone graft in showed: Excellent and good outcome in 85%. Failure in 15% which pointed to insignificant of the anterior approaches when combined with adequate decompression. As mentioned by ***Saunderd,***

(1998): No unique morbidity is associated with extremes of sub axial decompression when compared with surgery of lesser extent but thre is one factor is important after decompression which is stabilization as conducted by ***Seifert, (1995):*** Adequate decompression of the spinal cord and correction of hyper mobility should be achieved by surgery in one stage.

Table (34): Out come in other series with different surgical technique:

Procedure	No. of Patients	Results (%)		
		Improved	Unchanged	Worsened
a. Laminectomy	1219	59.5	29	11.5
b. Anterior discectomy with fusion	922	75	20	5
c. Anterior discectomy without fusion	94	77	18	5
d. Anterior corporectomy with fusion	293	88	12	0
e. Anterolateral decompression	41	93	7	0
f. Multilevel oblique corpectomy	66	79	13.5	7.5

a) Arnasson 1987, Bohlman 1993, Brigham 1995, Carol 1988.
b) Jeffeys 1986, Kadoya 1985, Moussa 1983, Zhang 1983.
c) Arrnasson 1987, Bertalanffy 1988, Bollati 1983, Kadoya, 1984.
d) Barnard 1987, Boni 1984, Hanai 1986, Jamjon 1991,
e) Hakuba 1976, Verbiest 1970, Verbiest 1966.
f) George et al. 1999.

Analysis of failure results and complications:

Failure group was 6 patients (15%); all of cases were presented at old age, with long duration of symptoms and advanced preoperative Nurick's and JOA scale, there were MRI signs of cord changes.

Between these cases. One patient was operated upon by 4 level discectomy and 3 level corpectomy deteriorated immediately postoperative. The second patient was operated upon by 2 level discectomy and deteriorated few days post operatively. Nothing was

found abnormal by radiological examination, so treated conservatively and on follow up, the patients showed mild improvement.

Graft complications:

Pseudoarthrosis: was seen in 9 cases because the graft was small and not impacted in the disc space especially cases with bone graft and without cages or plating, among them there was three cases showed protrusion which made patients complained of dysphagia but pass conservatively while two case showed complete dislodgement one of them reoperated upon with good height bone graft and plating while the other case passed conservatively with Philadelphia neck collar.

Donor site haematoma: discovered immediately post operative. This patient was managed by evacuation and good homeostasis & closure with drain.

Donor site pain: in two cases the pain persisted at the donor site of bone graft plain X-ray was done which showed fissure fracture in hip bone. The patient was treated conservatively. Our study showed more cases with Pseudoarthrosis than ***Shapiro et al. (2001)***: Showing five cases with graft collapse, pseudoarthrosis and in one case kyphosis occurred which may be to necessity of learning curve.

Plate complications (3cases):

In two cases loosening of lower screws occurred, with no dislodgment of plate and graft, the clinical condition did not worse and was treated conservatively by Philadelphia neck collar. Dislodgment of plate and screws: in one case, at 8 weeks follow up complete dislodgment of the plate and screws occurred. Removal of plate and screws was done and no need for fixation again. All these cases occurred in long segment