

OUTCOME OF PATIENTS WITH CERVICAL SPONDYLOTIC MYELOPATHY SEEN AT A REHABILITATION CENTRE

K B Yap, P K Lieu, H P Chia, E B Menon, E S Tan

ABSTRACT

A retrospective study was conducted on 21 patients with cervical spondylotic myelopathy to study the clinical characteristics of these patients and the influence of surgery and rehabilitation on their outcome. All the patients were 50 years and above, with a mean age of 63.6 years. The most common presenting feature was weakness of all the limbs. Neckache was not a prominent finding. Although only 2 patients complained of bladder disturbance, 6 other patients were found to have bladder dysfunction after urodynamic assessment. Clinical outcome after surgery was 50% improved, 28% unchanged and 22% worsened. Fifty percent of the patients with voiding problems recovered after bladder training.

Rehabilitation was significant in assisting in the recovery of patients after surgery. One patient had a disabling stroke 4 days after cervical surgery while another died of urinary tract infection while undergoing rehabilitation.

Keywords: cervical spondylotic myelopathy, surgical outcome, neurogenic bladder, rehabilitation

SINGAPORE MED J 1993; Vol 34: 237-240

INTRODUCTION

It has become an accepted practice to perform surgery on the cervical spine for patients with myelopathy of cervical spondylosis. However, the reported improvement rates vary widely and it has not been proven conclusively that the outcome after surgery is better than the natural history of the disease or with conservative management. The surgical treatment is not only costly in terms of the operation itself but patients often undergo expensive radiological investigations and stay for prolonged periods in hospital to recuperate. This paper reports on a review of local patients seen at a rehabilitation centre after their surgery.

The aims of the study were to examine the clinical profile of local patients with cervical spondylotic myelopathy and the influence of surgery and rehabilitation on the outcome of these patients.

METHODS

A retrospective analysis of the inpatient records of all patients with cervical myelopathy admitted to the Department of Re-

habilitation Medicine, Tan Tock Seng Hospital was made over a 4-year period from 1988 to 1991. The department is a referral centre for rehabilitation serving all the government and restructured hospitals in Singapore. All the patients referred for rehabilitation would have been previously admitted to a surgical unit (either orthopaedic or neurosurgical) prior to their transfer. However, it is likely that only patients with significant functional neurological deficits were referred for rehabilitation.

All the patients studied satisfied the following criteria:

- (a) clinical evidence of cervical myelopathy on clinical examination,
- (b) disabled by the problem and had previous surgical intervention in the same hospital or from the referring hospital,
- (c) radiological evidence of accompanying cervical spondylosis.

Patients with hyperextension injuries of the cervical spine, transverse myelitis of the cord, fractures of the cervical spine and space-occupying tumours of the cervical cord were excluded.

At the point of admission and discharge from the rehabilitation centre, the patients were individually assessed by the rehabilitation team comprising the rehabilitation physician, the physiotherapist and the occupational therapist, to determine their degree of disabilities. A consensus was reached for each patient regarding their disabilities and a scoring system was used to code the outcome. The scoring system used was a modification of the Rehabilitation Profile and Disability Profile derived from Millard and Moskowitz respectively. The details of this scoring system are spelled out in Appendix I.

As the referring surgical unit only charted the muscle power in terms of the Medical Research Council (MRC) grading, functional recovery was assessed as "improved" if there was a gain of muscle power in the upper or lower limb of at least one grade, "unchanged" if the improvement was less than one grade, and "worsened" if there was a decline in the power charting.

RESULTS

A total of 21 patients were available for the study. There were 13 males and 8 females. One male patient died from complications of *Klebsiella* urinary tract infection after 2 weeks in the rehabilitation centre. The duration of stay and functional scores of this patient were not included in the analysis. The clinical characteristics of the patients were as follows:

Department of Geriatric Medicine
Tan Tock Seng Hospital
Moulmein Road
Singapore 1130

K B Yap, MBBS, MRCP(UK), M Med(Int Med)
Registrar

P K Lieu, MBBS, M Med(Int Med)
Registrar

Department of Rehabilitation Medicine
Tan Tock Seng Hospital

E B Menon, MBBS, MRCP(UK)
Registrar

E S Tan, MBBS, FACRM(Aust), FAFRM(Aust.), FAMS
Head

Department of Community, Occupational & Family Medicine
National University of Singapore
Lower Kent Ridge Road
Singapore 0511

H P Chia, MBBS
Senior Tutor

Correspondence to: Dr E S Tan

Appendix I

PROFILE SYSTEM OF DISABILITY CLASSIFICATION

Adapted from:

1. Moskowitz E, McCann CB. Classification of disability in the chronically ill and aging. *J Chronic Dis* 1957;5:342-6.
2. Millard JB, Director, Passmore Edwards Medical Centre, Clacton-On-Sea, UK.

Upper and lower extremities

- 0: Normal or no gross abnormality considering the age of the individual.
- 1: Minimal abnormality - Major joint range of motion not less than 75% (active) of the full range of motion or average motor power not less than grade IV (MRC scale), or reduced coordination or sensation evident only on specific clinical tests.
 - 2: Moderate abnormality - Major joint range of motion 50% - 75% (active) or average motor power grade III (MRC scale) or further reduced coordination or sensation evident only on specific clinical tests.
 - 3: Severe abnormality - Major joint range of motion 25% - 50% (active) or average motor grade I-II (MRC scale) or further reduced coordination or sensation evident on inspection.
 - 4: Complete motor paralysis/complete sensory loss/gross incoordination/joint range of motion 0% - 25% (passive).

Excretory function

- 0: Normal spontaneous micturition or no gross abnormality considering the age of the patient.
- 1: Occasional stress incontinence or nocturia, or complete control after bladder/bowel training.
 - 2: Has sensation to void but no voluntary control, voids by tapping and/or compression/straining.
 - 3: Periodic incontinence or retention alternating with control.
 - 4: Total incontinence or complete loss of bladder/bowel performance due to any cause.

Independence in self-care activities

- 0: Normal
- 1: Complete independence without aids or appliances. Supervision only.
 - 2: Complete independence with the use of aids/appliances or requiring occasional help of another person with minimal assistance in one or two activities of daily living.
 - 3: Moderate assistance in the performance of more than two activities of daily living.
 - 4: Maximal assistance in the performance of all activities of daily living.
 - 5: Complete dependence.

Mobility status

- 0: Normal
- 1: With the use of aids/appliances, can ambulate and manage steps without hand rail and public transport.
 - 2: With the use of aids/appliances, can ambulate and manage steps with hand rail, slopes and uneven ground but not public transport.
 - 3: Independent ambulation on one level and can manage steps with hand rails.
 - 4: Ambulant on one level but requires minimal personal assistance.
 - 5: Ambulant with maximal assistance
 - 6: Independent in wheelchair mobility
 - 7: Independent in wheelchair mobility but requires assistance in certain areas eg in and out of cars and on and off kerbs.
 - 8: Complete dependence in wheelchair mobility or bedridden

1. Age

The ages of the patients ranged from 53 years to 72 years for males and 50 to 74 years for females. The mean ages for males and females were 64 years and 63 years respectively. Twelve (57.1%) of the patients were aged 65 years and above.

2. Race

All the patients were Chinese except for one Malay male patient.

3. Modes of presentation

The modes of presentation were as follows:

- | | |
|--|-------------|
| a. weakness of all 4 limbs | - 8 (38.1%) |
| b. weakness and numbness of all 4 limbs | - 4 (19.0%) |
| c. lower limb weakness | - 4 (19.0%) |
| d. upper limb numbness | - 3 (14.3%) |
| e. clumsiness of 4 limbs | - 1 (4.8%) |
| f. lower limb weakness and clumsiness of hands | - 1 (4.8%) |

One male patient had a preceding fall before the onset of his weakness. In addition, 4 of the 21 (19.0%) patients also complained of neckache while 2 gave history suggesting disturbance of micturition.

4. Duration of complaints

The duration of complaints ranged from one day to five years. The majority (75%) had complaints of 6 months or less.

5. Type of neurological deficits

The typical clinical findings were that of cervical myelopathy with the degree of weakness being variable.

6. Bladder involvement

While only 2 (9.5%) patients gave a history suggesting bladder involvement, there were 6 (28.6%) other patients who were subsequently found to have problems with their bladder upon transfer to the rehabilitation department. These individuals had difficulty in passing urine and urodynamic assessment at the rehabilitation department demonstrated the presence of spastic hyperreflexic bladders in 3 and hypocontractile bladders in 5. One patient with hypocontractile bladder was also found to have evidence of bladder neck obstruction on cystoscopy.

7. Surgical intervention

From the surgical records, 7 of the patients underwent cervical laminectomy, 3 had the Cloward's operation, while the rest had cervical laminoplasty⁽³⁾, cervical fusion⁽³⁾, anterior decompression and fusion⁽²⁾, anterior discectomy and fusion⁽¹⁾, laminectomy and laminoplasty⁽¹⁾, and anterior decompression⁽¹⁾.

8. Length of hospital stay

The average length of stay in the surgical ward before transfer for rehabilitation was 38.1 days with a range of 14 to 102 days.

9. Length of stay in the rehabilitation department

The average length of stay in the rehabilitation department was 60.4 days with a range of 14 days to 137 days.

10. Functional recovery after surgery

A total of 21 patients were subjected to surgery. Of these, the pre-operative muscle power grading of 2 patients were not available. One died while undergoing rehabilitation. Of the remaining 18 patients, 9 (50.0%) improved, 5 (27.8%) remained unchanged while 4 (22.2%) worsened.

11. Functional recovery before and after rehabilitation

Functional recovery was assessed separately for upper limb

Table I - Extent of recovery after rehabilitation

	Mean (n=20)	SD (n=20)	2-tail probability
upper limb	0.62	0.59	<0.0001
lower limb	0.43	0.60	0.004
ADL status	1.00	1.05	<0.0001
mobility	2.24	2.39	<0.0001

Table II - ADL status on discharge

ADL Status	Number	%
Complete independence, supervision only	2	10
Complete independence with use of aids/appliances	10	50
Moderate assistance in performance of more than 2 ADL activities	5	25
Maximal assistance in performance of all ADL activities	1	5
Complete dependence	2	10
	20 *	100

* = one patient died while undergoing rehabilitation

recovery, lower limb recovery, improvement of independence, activities of daily living (ADL), status and mobility status. There was significant recovery after rehabilitation for all the above categories after analysis of results using the paired-t test method. The results are as shown in Tables I - III.

12. Recovery of bladder function

All the patients with evidence of bladder involvement underwent bladder training at the rehabilitation department. During the initial period of urinary retention, intermittent catheterisation was carried out. Assisted bladder tapping or compression was added when there was sign of spontaneous micturition occurring. A check on the volume of residual urine (RU) was made after each spontaneous voiding. When the RU was below 100 ml, catheterisation was stopped and the patient was assessed as having recovered sufficiently to void on his own.

Using this criteria, 4 out of 8 (50%) with bladder dysfunction experienced sufficient recovery to void spontaneously on their own. Of the 4 who did not recover, 3 had poor neurological recovery with complete dependence in wheelchair mobility.

13. Complications

One male patient died of *Klebsiella* urinary tract infection 2 weeks after admission to the rehabilitation department. One female patient sustained a stroke 4 days after her cervical spine surgery and this left her severely incapacitated and wheel-chair bound.

DISCUSSION

In our study population, all the patients came to medical attention either as a result of progressive or sudden neurological deficit. Males outnumbered females by a ratio of 1.6 to 1. All the patients were 50 years and above. In the series by Clarke and Robinson⁽¹⁾, the mean age of presentation was 53 years

Table III - Mobility status on discharge

Mobility Status	Number	%
Normal	3	15
Can manage public transport with use of aids/appliances	1	5
Independent on one level and can manage steps with hand rails	5	25
Ambulant on one level but needs minimal personal assistance	5	25
Complete dependence in wheelchair mobility or bed-ridden	6	30
	20	100

with a male preponderance of 2.4:1. The most common complaint was weakness of all 4 limbs. Neckache was an uncommon feature (19%) and this is also in agreement with Clarke and Robinson⁽¹⁾. Radicular pain was not a prominent feature in our series and Lees and Aldren Turner⁽²⁾ have stated that no patient who was first seen for a radicular pain later develop a myelopathy. Myelopathy and radiculopathy appear to be two totally different syndromes⁽³⁾. It has been suggested that only 2 syndromes increase the likelihood of spondylotic myelopathy - the syndrome of numb and clumsy hands⁽⁴⁾, and the syndrome of sudden quadriplegia or paraplegia after a minor fall in the elderly⁽⁵⁾.

As there are no reliable laboratory tests to confirm the diagnosis of cervical myelopathy, the diagnosis often depends on finding the presence of spastic paraparesis⁽¹⁾. Ferguson and Caplan⁽⁶⁾ have cautioned that both motor and sensory symptoms and signs should be present before making the diagnosis but this is not universally accepted. The problem of diagnosis is compounded by the fact that cervical spondylosis is almost a universal feature of the ageing process. Plain X-rays survey by Irvine⁽⁷⁾ has shown that 70% of women and 85% of men have this feature by the age of 59 years. Pallis⁽⁸⁾ has reported the presence of neurological signs in 50% of asymptomatic people with cervical spondylosis.

The pattern of bladder involvement in our study showed a mixture of hyperreflexic and hypocontractile (combined motor and sensory impairment) bladders. It is important to note that a significant proportion of patients actually had bladder dysfunction on urodynamic assessment although they had not complained of it. Bladder training resulted in the recovery of bladder function in 50% of our patients. Perhaps it would be worthwhile in future to assess all cervical myelopathy patients urodynamically before sending them for surgery. In the study by Ando⁽⁹⁾ where urodynamic assessment was conducted in 62 patients with cervical cord compression disorders, cystometry revealed preoperative neurogenic bladder in 22 patients (35%) including overactive detrusor in 10 patients and underactive detrusor in 6. He observed that bladder and urethral dysfunctions appeared to be associated with myelopathy of the pyramidal and spinothalamic tracts of the cervical cord because of the high incidence of neurogenic bladder associated with positive Babinski's sign and sensory disturbance at the perineal and lower extremities. Also, those with underactive detrusor had deep sensory disturbance in the lower extremities. It is probable that the underactive detrusor was accompanied by myelopathy involving the posterior funiculus of the cervical cord which mediates bladder proprioceptive sensation. In the same Japanese study, post-operative evaluation on patients

showed that over half had recovery of their bladder function. Hattori et al⁽¹⁰⁾ who performed urodynamic assessment on 37 patients with cervical spondylotic myelopathy found that 14 had detrusor hyperreflexia, 17 had increased residual urine volume and 6 had detrusor sphincter dyssynergia.

The choice of radiological investigation depended very much on the surgeon and the availability of radiological services. By far, the most common mode of investigation used locally was the CT-myelogram. With the availability of the MRI, this new but expensive mode of imaging may prove more popular because of its non-invasiveness and accuracy. However, it should be noted that the MRI is not infallible. In an MRI study by Teresi et al⁽¹¹⁾ on asymptomatic patients, he found that 24% of subjects had osteophytes, cord impingement was present in 20% and the cord was compressed in 7% of these asymptomatic patients. Among 42 asymptomatic patients over the age of 64 years, 57% had evidence of disc protrusion and 25% had cord impingement.

The role of surgery in spondylotic myelopathy still remains a controversy. Those who advocate it report very favourable results in their series, as much as two-thirds of patients^(12,13). Others who are more pessimistic in their reports give only 50:50 chance of improvement after surgery⁽¹⁴⁾. What proportion of patients would improve with conservative treatment and physiotherapy remains unanswered. There has been no large and proper therapeutic trial to date that can answer all the questions⁽¹⁵⁾.

CONCLUSION

In our series of patients, 50% had improvement, 28% remained the same and 22% worsened after their surgery. After rehabilitation, two-thirds achieved complete independence with or without the use of aids or appliances. Half were independent in their mobility without any assistance. Rehabilitation also made a further significant improvement in the functional status of the patients who had undergone surgery. Although the current accepted mode of therapy in cervical spondylotic myelopathy is surgery, the clinical outcome remains rather uncertain. Due

to the small number of patients in our series, it is not possible to draw definite conclusion regarding the efficacy of surgery on local patients. Furthermore, some patients might not have been referred to our rehabilitation centre after surgery. A local multi-centre collaborative study using standardised methods of assessment and evaluation of outcome, including measures of functional independence and quality of life would be very useful to evaluate the usefulness of cervical surgery. However, at this present point it would still be difficult to withhold surgery for a patient who is deteriorating despite adequate conservative measures.

REFERENCES

1. Clarke K, Robinson PK. Cervical myelopathy: a complication of cervical spondylosis. *Brain* 1956;79:483-510.
2. Lees F, Aldren Turner JW. Natural history & prognosis of cervical sypondylosis. *Br Med J* 1963;2:1607-10.
3. Phillips DG. Upper limb involvement in cervical spondylosis. *J Neurol Neurosurg Psychiatry* 1975;38:386-90.
4. Good DC, Cruch JR, Wacasar L. "Numb, clumsy hands" and high cervical spondylosis. *Surg Neurol* 1984;22:285-91.
5. Voskuhl RR, Hinton RC. Sensory impairment in the hands secondary to spondylotic compression of the cervical spinal cord. *Arch Neurol* 1990;47:309-11.
6. Ferguson RFL, Caplan LR. Cervical spondylotic myelopathy. *Neurol Clin* 1985;3:373-82.
7. Irvine DH, Foster JB, Newell DJ, Klukvin RN. Prevalence of cervical spondylosis in a general practice. *Lancet* 1965;ii:1089-92.
8. Pallis C, Jones AM, Spillane JD. Cervical spondylosis. Incidence & implications. *Brain* 1954;77:274-89.
9. Ando M. Neurogenic bladder in patients with cervical cord compression disorders. *Nippon-Hinyokika-Gakkai-Zasshi* 1990;81(2):243-50.
10. Hattori T, Sakakibara R, Yasuda K, Murayama N, Hirayama K. Micturitional disturbance in cervical spondylotic myelopathy. *Spinal Disord* 1990;3(1):16-8.
11. Teresi LM, Lufkin RB, Reicher MA, et al. Asymptomatic degenerative disk disease & spondylosis of the cervical spine: MR imaging. *Radiology* 1987;164:83-8.
12. Epstein JA, Epstein NE. The surgical management of cervical spinal stenosis, spondylosis, and myeloradiculopathy by means of the posterior approach. In: *Cervical Spine Research Society*. ed. *The Cervical Spine*. Philadelphia: Lippincott, 1989;625:69.
13. Lehman LB. Cervical spondylotic myelopathy. A diagnostic challenge in ageing patients. *Postgrad Med* 1990;88(3):240-3.
14. Nurick S. Natural history and results of surgical treatment of the spinal cord disorder associated with cervical spondylosis. *Brain* 1972;95:101-8.
15. Rowland LP. Surgical treatment of cervical spondylotic myelopathy: Time for a controlled trial. *Neurology* 1992;42:5-13.