

Neck movements in ankylosing spondylitis and their responses to physiotherapy

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SUMMARY Cervical spine movements were compared in 35 patients with ankylosing spondylitis (AS) and matched controls. In AS there were limitations of all movements and particularly of lateral flexion. These limitations could not be correlated with any particular features of AS except radiological involvement of the lower apophyseal joints. In 25 patients there were significant improvements in all measurements after 3 weeks of intensive inpatient physiotherapy. After discharge the patients were encouraged to perform unsupervised physiotherapy and in 11 patients seen at 3 months the improvements in neck movements were either maintained or increased further. In contrast no changes in movements were found in 9 patients assessed 3 weeks and immediately before starting physiotherapy.

Limitation of cervical movements is a characteristic feature of ankylosing spondylitis (AS). However, we can find little objective data quantifying this. Although it is generally accepted that physiotherapy exercises aimed at improving spinal movements form an essential part of treatment, their value has not been adequately shown by clinical trials. In this study the ranges of cervical spine movements in patients with AS were compared with those of controls matched for age and sex. We used these measurements to evaluate the responses of AS necks to active physiotherapy.

Clinical material

We studied 35 consecutive patients with AS (criteria of Bennett and Wood, 1968), without selection according to cervical involvement. There were 25 males and 10 females aged between 24 and 59 years. They were all admitted for inpatient physiotherapy at the Royal National Hospital for Rheumatic Diseases, Bath, where it is the practice to treat ankylosing spondylitics for 3 weeks in classes, and give them intensive group physiotherapy with active mobilising exercises graded according to their degrees of disability. Patients were instructed to continue physiotherapy after discharge. The controls were healthy individuals without history of neck

symptoms and were matched for age and sex with the spondylitics.

In 25 patients we performed measurements immediately before and after 3 weeks of physiotherapy treatment without alteration of the drug regimen. In 9 we obtained a further set of measurements 3 weeks before physiotherapy to provide a comparison with the effects of treatment. Finally we repeated the readings in 11 patients 3 months after discharge from hospital.

Methods

Each patient was assessed with a detailed clinical history and physical examination with particular attention to the neck and the central nervous system. We used a spirit inclinometer (Back Pain Association) to measure cervical spine movements. The instrument was placed vertically and sagittally on the crown of the head with the subject in the neutral position. The subject was asked to flex and extend the neck and the degrees of flexion and extension were measured by the movements of the pointer. By rotating the inclinometer 90°, lateral flexion to the right and left were measured. The subject was then asked to lie flat and, with the inclinometer on the forehead, rotation to the right and left was measured. These measurements were all made by the same observer.

To give a measure of the reliability of the measurements in all directions three replications were obtained on successive days on each of 10 controls.

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The standard deviations and coefficient of variation between the replications were computed, and the distributions of these over the 10 patients examined.

We obtained radiographs of the cervical spine including lateral views in flexion and extension.

Results

Of the 35 patients, 23 were free of complications of AS, 10 had recurrent iritis, 1 aortic incompetence, and 1 Crohn's disease. No neurological abnormalities were found in any of the patients.

Table 1 shows the standard deviation and coefficient of variation for the replicated measurements and Table 2 gives the 95% limits for the values within which any replication would lie. The results show acceptable reproducibility of measurements performed by one observer. Movements of the cervical spine in all directions were compared with those of the matched controls (Fig.) We found that all measurements in the AS group were significantly diminished. In particular lateral flexion was most markedly reduced.

At some time during the course of their disease 33 of the 35 AS patients had symptoms referable to the neck. We could not correlate limitation of cervical movements with the length of history of AS, severity of neck symptoms, or the radiological findings except that the 5 patients with affected lower apophyseal joints had the most severe restriction of lateral flexion.

We compared neck movements in 25 patients before and after 3 weeks of physiotherapy using paired Student's *t* tests. Table 3 summarises the results which show significant improvements in all directions. In contrast there was little change in flexion/extension, lateral flexion, and rotation in the 9 patients assessed 3 weeks before and immediately before starting inpatient physiotherapy (Table 4).

To determine whether the improvements with intensive inpatient physiotherapy would be maintained after discharge, we repeated measurements in 11 patients 3 months after leaving hospital, again using paired Student's *t* tests (Table 5). No change was found in flexion/extension but lateral flexion and rotation continued to improve.

Table 1 Replicated measurements with inclinometer

Movement	Standard deviation in degrees		Coefficient of variation (%)	
	Mean	SE	Mean	SE
Lateral flexion	1.69	1.06	3.45	2.25
Rotation	1.61	0.90	3.52	2.30
Flexion	1.67	0.98	3.56	2.04
Extension	1.41	0.95	2.79	2.36

Table 2 Confidence limits

Movement	95% limits about the mean in degrees
Lateral flexion	±5.39
Rotation	±4.91
Flexion	±5.19
Extension	±4.62

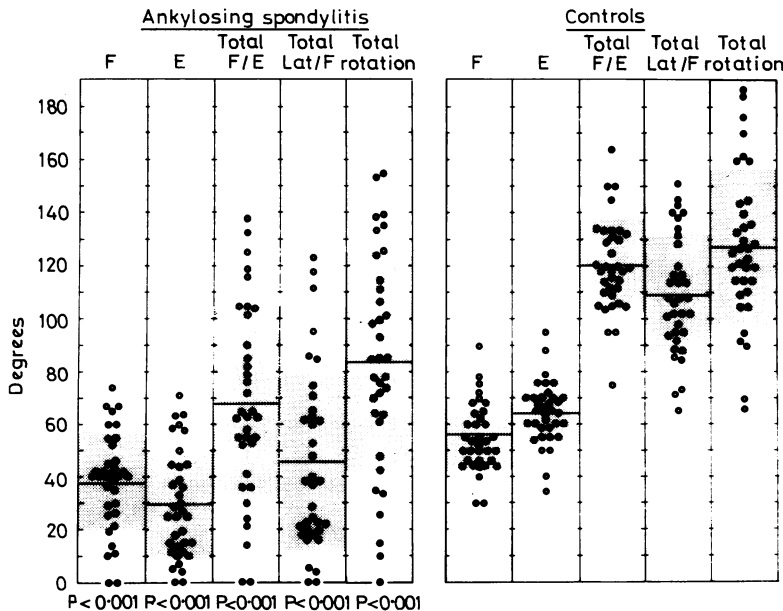


Fig. Movement of cervical spine in patients with ankylosing spondylitis compared with controls. P values indicate the significance of the difference between the 2 groups. F=flexion; E=extension; Shaded area indicates ±SD.

Table 3 *Cervical spine movements in ankylosing spondylitis before and after physiotherapy*

Movement (degrees)	Mean	SEM	P
Flexion			
Before physio	28.20	2.35	
After physio	39.28	2.78	<0.001
Extension			
Before physio	23.16	2.58	
After physio	30.72	3.50	<0.001
Flexion/extension			
Before physio	51.16	4.21	
After physio	70.32	5.59	<0.001
Total lateral flexion			
Before physio	26.44	3.41	
After physio	40.48	4.59	<0.001
Total rotation			
Before physio	54.48	6.45	
After physio	82.20	7.75	<0.001

Table 4 *Cervical spine movements in ankylosing spondylitis 3 weeks before and immediately before physiotherapy*

Movement (degrees)	Mean	SEM	P
Flexion/extension			
3 weeks before physio	75.7	10.6	
Immediately before physio	81.4	8.3	>0.10
Total lateral flexion			
3 weeks before physio	47.22	28.08	
Immediately before physio	48.11	26.56	>0.10
Total rotation			
3 weeks before physio	87.67	14.90	
Immediately before physio	103.22	14.39	<0.01

Table 5 *Cervical spine movements in ankylosing spondylitis on finishing physiotherapy and 3 months later*

Movement (degrees)	Mean	SEM	P
Flexion/extension			
End of physio	97.45	10.70	
3 months later	102.54	10.83	>0.10
Total lateral flexion			
End of physio	63.36	9.65	
3 months later	76.82	8.74	<0.01
Total rotation			
End of physio	106.64	17.17	
3 months later	136.91	11.94	<0.001

Discussion

The repeated measurements show that when performed by the same observer this technique for documenting cervical movements will provide acceptable reproducible results. Therefore it can be used to compare cervical movement between patients and controls and before and after treatment.

The ranges of neck movements in the controls were of a similar order to those found by Newell and Nicholls (1965) using a different measuring technique. Flexion and extension principally occur at the atlanto-occipital joints and rotation at the atlanto-axial joint. Lateral movements occur from C2-7.

Because of this, the limitation of movements of the neck provides some guide to the area of the cervical spine that is affected (Beetham *et al.*, 1966).

As lateral flexion was most markedly reduced in AS it is likely that the principal changes affected the mid and lower rather than the upper cervical spine. The patients with most restriction of lateral flexion showed most lower apophyseal joint changes. However, in the remaining patients all movements of the cervical spine were reduced with no correlation with symptoms or other radiological findings.

Both flexion and extension were reduced in AS. The latter loss was more marked but this may have been due to a dorsal kyphosis tilting the neck forwards, so altering the neutral position. For this reason flexion and extension were considered both separately and together. However, greater loss of cervical extension and flexion agrees with the observations of Sturrock *et al.* (1973), who examined the whole spine in AS.

The intensive inpatient physiotherapy regimen consisted of graduated exercises directed at the whole spine, and sporting activities. This improved all movements of the neck and these improvements were maintained for at least 3 months. Indeed, lateral flexion and extension continued to improve after the patient returned home to do unsupervised physiotherapy. The improvements during physiotherapy were in marked contrast to the lack of change in the 3 weeks immediately preceding admission.

In addition to the objective benefits many patients described subjective improvements in, for example, looking forwards, reversing cars, etc. All patients were encouraged to continue physiotherapy at home after discharge and their willingness to do so together with continued objective improvements of some parameters testify to its value.

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