

CERVICAL TRACTION AS A THERAPEUTIC TOOL

A Clinical Analysis Based on 212 Patients

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ABSTRACT. A series of 212 patients suffering from the symptoms of the cervical syndrome was divided into six groups according to the main symptom of the disease: 1) pain and tingling radiating down to the hand and digits, 2) pain radiating to the anterior wall of the chest, 3) pain radiating to other regions (i.e. occiput, neck, shoulders, arms, interscapular region), 4) headache over the frontal or temporal region, 5) vertigo, and 6) a clear neurological finding (i.e. weakness and/or atrophy of the muscles) in addition to the symptoms of group 1. The total sum of the symptoms amounted to 267. All the patients were treated by cervical traction. In the whole series there was complete cure in 19%, marked improvement in 42%, slight improvement in 23% and no improvement in 16%. The highest percentage (68%) of patients who were completely cured or obtained marked improvement was in group 1 and the lowest percentage (47%) was in group 4. The causes of failure of treatment (44 cases) could not be explained with the data collected in this investigation. Thirty-one per cent of the patients had been earlier treated with cervical traction. These figures show well the need of repeated courses of treatment required by the patients suffering from the cervical syndrome.

Pain in the neck, around the shoulder girdle, and in the arm and hand is due more often to a lesion of the cervical spine than to any other cause, and a diagnosis of cervical syndrome is one of the most common in orthopaedic practice (18). The term cervical syndrome is used to signify a group of symptoms and clinical findings that occur as a result of irritation or compression of the cervical nerve roots in or about the intervertebral foramina, before they divide into anterior and posterior primary rami. The other structures within the intervertebral foramina may also be involved. These include the recurrent spinal meningeal nerves, the spinal branches of the vertebral arteries and their accompanying veins, and the nearby vertebral arteries themselves (7, 8, 13).

The pathology of the cervical syndrome is complex. The following features may be present: narrowing and protrusion of the intervertebral discs, new bone formation (osteophytes) occurring at the margins of adjacent vertebral bodies, osteoarthritis and peri-arthritis of the posterior intervertebral joints, inflammation and fibrosis of the meningeal sleeve investing the nerve roots, and local interference with the blood supply of the nerve roots caused by osteophytes (18).

A large proportion of patients with symptoms of the cervical syndrome respond satisfactorily to conservative treatment; therefore deep heating and massage of the neck muscles and traction of the cervical spine have been a common treatment of cervical spine lesions for many years (1, 4-6). The essential effect of cervical traction is that it straightens the cervical spine and enlarges the intervertebral foramina to relieve compressive or irritative forces upon the nerve roots.

Because the symptoms of the cervical syndrome are relatively manifold and, on the other hand, treatment with heat, massage and cervical traction must be considered to have always the same effecting mechanism, it is of benefit to know the efficacy of this kind of treatment in relieving each separate symptom of the cervical syndrome. For this purpose the following series of patients suffering from various symptoms of the cervical syndrome was exhaustively analyzed.

SERIES

The study is based on 212 consecutive patients (77 males and 135 females) who were treated with cervical traction in the Department of Physical

Table I. Number, sex and mean age of the patients and percentage distribution of the duration of the symptoms in the six subgroups of the cervical syndrome

| Subgroup | No. of cases | | Age | | Duration of symptoms | | |
|--|---------------------------|-------------|-------|--|--------------------------|-----------------------|--------------------------|
| | Total Males Females | Mean age | Range | | Under 4 months (%) | 4-12 months (%) | Over 12 months (%) |
| | | | | | | | |
| Group 1 | 88 | 55 | 34-79 | | 38 | 17 | 45 |
| Pain and tingling radiating down to the hand and digits | m 25 | 53 | 39-79 | | | | |
| | f 63 | 56 | 34-74 | | | | |
| Group 2 | 22 | 53 | 38-65 | | 30 | 35 | 35 |
| Pain radiating to the anterior wall of the chest | m 10 | 54 | 39-65 | | | | |
| | f 12 | 53 | 38-65 | | | | |
| Group 3 | 55 | 57 | 21-80 | | 42 | 39 | 19 |
| Pain radiating to the other regions (i.e. occiput, neck, shoulders, arms, interscapular region) | m 19 | 59 | 34-69 | | | | |
| | f 27 | 56 | 21-80 | | | | |
| Group 4 | 42 | 55 | 32-70 | | 38 | 16 | 46 |
| Headache over the frontal and/or temporal region | m 13 | 56 | 36-70 | | | | |
| | f 29 | 54 | 32-70 | | | | |
| Group 5 | 44 | 55 | 26-75 | | 34 | 21 | 45 |
| Vertigo | m 19 | 54 | 26-75 | | | | |
| | f 25 | 56 | 44-66 | | | | |
| Group 6 | 16 | 54 | 42-68 | | 12 | 25 | 63 |
| Clear neurological finding (i.e. weakness and/or atrophy of the muscles) in addition to the symptoms of group 1. | m 10 | 53 | 42-68 | | | | |
| | f 6 | 55 | 53-60 | | | | |
| Whole series | 212 | 55 | 21-80 | | | | |
| | m 77 | 55 | 26-79 | | | | |
| | f 135 | 55 | 21-80 | | | | |
| Total no. of symptoms | 267 | | | | 35 | 24 | 41 |

Medicine because of some symptom or symptoms of the cervical syndrome. The patients were divided into six groups according to the main symptom of the disease. Since about 25% of the patients had two or more main symptoms, the total sum of the symptoms of the 212 patients amounted to 267. Most patients suffered from pain, numbness and tingling radiating down to the hand and digits (88 cases). Other groups and data concerning the patients are presented in Table I. It is to be emphasized that the diagnosis of the patients was based on mere simple clinical (neurology, internal medicine, surgery) examination (e.g. no arteriographies etc.).

The patients were divided into six groups according to the following principles. The first group, "pain and tingling radiating down to the hand and digits", comprised the patients who complained of distinct pain or tingling radiating to the region of the hand and digits. Patients with pain in the region of the forearm were placed in

the third group. The second group, "pain radiating to the anterior wall of the chest", consisted of patients having aches mainly in this region. Because it was sometimes impossible to determine whether the pain in the chest was restricted only to the wall of the chest or whether it was caused by a spasm in the coronary arteries, these group was planned to cover both possibilities (2, 11, 12). The third group, "pain radiating to other regions", consisted of all cases where the pain radiated to occiput, neck, shoulders, upper arms, forearms, region of scapulae, etc.; in other words, it was comprised of cases where the pain did not radiate down to the hands and digits and/or to the anterior wall of the chest. In the fourth group, "headache over the frontal or temporal region", were the patients suffering from headache restricted to the temporal region and/or the region of the forehead; patients suffering from pain radiating to the occiput were placed in the third group. The fifth group, "vertigo", consisted of

Table II. Incidence of roentgenological findings in the subgroups of the cervical syndrome

| Group | No. of cases | Roentgenological finding | | | | |
|--|--------------|--------------------------|----------------------------|-------------------------|--|------------------------|
| | | Fully normal (%) | Narrowing of the discs (%) | Foraminal narrowing (%) | Anomalies, block vertebrae, old fractures, marked postural changes (%) | Clear osteoporosis (%) |
| Group 1 Pain radiating to the hand and digits | 88 | 3 | 94 | 86 | 11 | 10 |
| Group 2 Pain radiating to the chest | 22 | 0 | 86 | 86 | 14 | 14 |
| Group 3 Pain radiating to other regions | 55 | 4 | 85 | 78 | 16 | 5 |
| Group 4 Headache | 42 | 10 | 86 | 76 | 21 | 12 |
| Group 5 Vertigo | 44 | 5 | 88 | 88 | 11 | 7 |
| Group 6 Clear neurological finding | 16 | 0 | 100 | 100 | 44 | 0 |
| Whole series | 212 | 4 | 90 | 86 | 20 | 8 |

patients who complained mainly of this symptom. The sixth group, "clear neurological finding", consisted of patients who, in addition to the pain and tingling radiating down to the hand and digits, also had wasting and weakness of the small muscles of the hand.

RESULTS

Duration of symptoms

The percentage distribution of the duration of symptoms in the whole series and in the six symptom groups is presented in Table I. It can be seen that 41% of the patients had suffered from their symptoms for over 12 months. On the other hand, one third of the patients had had symptoms for less than 4 months. In the group of patients having clear neurological findings the duration of the symptoms was, of course, the longest. In the whole series there was a tendency of the symptoms to fall mainly into two categories: those lasting less than 4 months and those lasting over 12 months, i.e. symptoms of relatively short and, on the other hand, of relatively long duration.

Roentgenological findings

Although the symptoms of the cervical syndrome cannot be fully explained by X-ray findings, be-

cause gross degenerative disease may be shown radiologically in patients who have no symptoms and vice versa, radiographs in antero-posterior, lateral and oblique directions were taken in order to obtain information about the extent of the degenerative processes of the cervical spine and to detect possible anomalies, neoplasms, etc.

The roentgenological findings observed in this series are presented in Table II. As can be seen, there were roentgenological changes in most cases; only 4% of cases presented a fully normal roentgenological finding. Narrowed disc spaces and narrowed intervertebral canals were found in about 90% of the cases. The percentage distributions of the narrowed disc spaces and narrowed intervertebral canals were "normal" (3, 7, 10, 13). Both of these changes were found most frequently in the interspace C₅₋₆, next in the interspace C₆₋₇, and in the third rank in the interspace C₄₋₅. There were no significant differences between males and females.

The occurrence of block vertebrae, anomalies and defects such as hemi-vertebrae, etc., healed fractures and marked postural changes was smaller. These changes were registered in a total of 20% of all cases; the significantly greater occurrence (44%) of changes of this kind in the group of patients having a clear neurological find-

Table III. Treatment of the patients in the six subgroups of the cervical syndrome

| Group | No. of cases | No. of cases pretreated with | | | | | | Average no. of treatments (tractions) |
|--|--------------|------------------------------|-------------|------------|-------------|---------------------|------------|---------------------------------------|
| | | Short wave diathermy | Infra-red | Micro-wave | Ultra sound | Long wave diathermy | Cold (ice) | |
| Group 1 Pain radiating to the hand and digits | 88 | 66 | 10 | 8 | 2 | 1 | 1 | 11 |
| Group 2 Pain radiating to the chest | 22 | 14 | 3 | 4 | 1 | | | 9 |
| Group 3 Pain radiating to other regions | 55 | 36 | 12 | 6 | | | 1 | 10 |
| Group 4 Headache | 42 | 26 | 11 | 4 | 1 | | | 10 |
| Group 5 Vertigo | 44 | 30 | 13 | 1 | | | | 11 |
| Group 6 Clear neurological finding | 16 | 14 | 2 | | | | | 12 |
| Total series (total no. of symptoms) | 267 | 186 (69%) | 51 (19%) | 24 (9%) | 4 (1.5%) | 1 (0.5%) | 2 (1%) | 11 |

ing was striking. Definite osteoporosis was observed in only 8% of the total series; the distribution of this change into the six groups was relatively even.

Treatment

All the patients were treated according to the same principles. Because heat relieves tenderness and muscle spasm, all (except two) patients were given some kind of heat on the posterior area of the neck and shoulders. Short wave diathermy was used in most cases, next in frequency was infrared radiation, and some patients were treated with microwave, ultrasound or long wave diathermy (Table III). In two cases heating appeared to be unsuitable and therefore cold therapy (ice) was used.

After the application of heat, manual massage also was applied in every case to the site of the muscles of the posterior area of the neck. The massage was given for about 10–15 min. In addition, the patients were often given exercises that relaxed the tight muscles of the neck and shoulder girdle. The main effect of heating and manual massage of the neck muscles was to overcome spasm of the neck muscles occurring in almost every patient suffering from the symptoms of the cervical syndrome.

Cervical traction was applied in most cases, using continuous traction in the supine position with a simple collar, rope, pulley and weight system. In some cases we used intermittent motorized traction ("Tru Trac", manufactured by Tru-Eze manufacturing Co., Inc., Burbank, Calif.) or continuous traction with the patient seated. The direction of pull was usually chosen so as to cause a slight flexion of the cervical spine. The traction force used was 3 to 13 kg according to the weight and position of the patient and the stage of the treatment course; at the beginning of the treatment the traction forces were much smaller than at the end. The therapy was usually given every other day, i.e. three times weekly. The average number of treatments was eleven (Table III), and thus the whole treatment period lasted about 4 weeks.

Results

The results of the therapy were classified as follows: slight improvement involved a clear decrease of the patient's subjective distress, marked improvement involved a nearly complete disappearance of the main symptom of the patient and the disturbances associated with it, and complete cure involved the complete disappearance of the main symptom in question.

Table IV. The quota of patients treated earlier with cervical traction and the results of treatment in the six subgroups of the cervical syndrome

| Subgroup | Patients treated earlier | | Results, all patients (No.-%) | | | | |
|---|--------------------------|-----------------------------|-------------------------------|-----------|--------------------|--------------------|---------------|
| | No. and percentage | Months since last treatment | No. of cases | No effect | Slight improvement | Marked improvement | Complete cure |
| Group 1 Pain radiating to the hands and digits | 28/88 = 32 % | 13 | 88 | 10 = 11 % | 18 = 21 % | 38 = 43 % | 22 = 25 % |
| Group 2 Pain radiating to the chest | 8/22 = 36 % | 5 | 22 | 3 = 14 % | 7 = 32 % | 9 = 41 % | 3 = 14 % |
| Group 3 Pain radiating to other regions | 14/55 = 25 % | 9 | 55 | 4 = 8 % | 15 = 27 % | 21 = 38 % | 15 = 27 % |
| Group 4 Headache | 15/42 = 36 % | 5 | 42 | 10 = 29 % | 12 = 24 % | 17 = 40 % | 3 = 7 % |
| Group 5 Vertigo | 12/44 = 27 % | 9 | 44 | 14 = 32 % | 6 = 13 % | 17 = 39 % | 7 = 16 % |
| Group 6 Clear neurological finding | 7/16 = 44 % | 4 | 16 | 3 = 19 % | 3 = 19 % | 10 = 62 % | 0 |
| Total series | 84/267 = 31 % | 9 | 267 | 44 = 16 % | 61 = 23 % | 112 = 42 % | 50 = 19 % |

The results of treatment obtained in this series are presented in Table IV. In the whole series there was complete cure in 19 % (50 cases), marked improvement in 42 % (112 cases), slight improvement in 23 % (61 cases) and no improvement in 16 % (44 cases).

The results obtained in each of the six groups were compared with those in the other groups by adding together the percentage of completely cured patients and the percentage of those who were markedly improved in each group and by comparing the figures obtained. The percentage of patients completely cured or markedly improved in the whole series was 61 % (42 + 19). The highest percentage, 68 % (43 + 25), was in the first group and the lowest percentage, 47 % (40 + 7), in the fourth group. As can be seen in Table IV, patients having "pain and tingling radiating down to the hand and digits" (group 1) and "pain radiating to other regions" (group 3) reacted most favourably to the cervical traction, whereas patients with "headache over the frontal or temporal region" (group 4) and "vertigo" (group 5) reacted somewhat less favourably. The percentage of patients who obtained no improvement after the course of treatment was also highest in the same groups 4 and 5.

Patients treated earlier

In this series 31 % of the patients had been treated earlier with cervical traction (Table IV). The distribution of these patients between the six groups was relatively even (range 25–44 %). The highest percentage, 44 %, was in group 6 ("clear neurological finding").

The average time since the last treatment was 9 months. The longest time, 13 months, was found in group 1 ("pain and tingling radiating down to the hand and digits") and the shortest time, 4 months, in the group 6 ("clear neurological finding"). It is seen that both the percentage of patients treated earlier with cervical traction and the shortest time since the last treatment are to be found in group 6.

Analysis of causes of failure of the treatment

In 16 % of the cases (44 patients: 16 males and 28 females) cervical traction brought no improvement. When this group of patients was analyzed it appeared that the mean age of these patients was 56 years (55 years in the whole series) and the percentage of cases of treatment failure varied from 11 % (group 1) to 32 % (group 5) (Table IV). The roentgenological findings are presented in Table V, and as can be seen the percentages

Table V. *The percentage occurrence of roentgenological findings in the cases of failed treatment*

| Group | No. of cases | No. of cases with failure | Roentgenological finding | | | | |
|--|--------------|---------------------------|--------------------------|----------------------------|-------------------------|--|------------------------|
| | | | Fully normal (%) | Narrowing of the discs (%) | Foraminal narrowing (%) | Anomalies, block vertebrae, old fractures, marked postural changes (%) | Clear osteoporosis (%) |
| Group 1 Pain radiating to the hand and digits | 88 | 10 | 10 | 80 | 70 | 20 | 10 |
| Group 2 Pain radiating to the chest | 22 | 3 | — | 66 | 34 | — | — |
| Group 3 Pain radiating to the other regions | 55 | 4 | — | 75 | 75 | 50 | — |
| Group 4 Headache | 42 | 10 | 20 | 80 | 60 | 20 | — |
| Group 5 Vertigo | 44 | 14 | 7 | 93 | 79 | 7 | 14 |
| Group 6 Clear neurological finding | 16 | 3 | — | 100 | 100 | 100 | — |
| Whole series | 267 | 44 | 9 | 84 | 71 | 23 | 7 |

in the failure group are almost the same as those in the whole series (Table II). The treatment used in the failure group was also nearly similar to that in the whole series; short wave diathermy was used in 73% (whole series 70%), infrared radiation in 14% (19%), and microwave in 11% (9%). The average number of treatments in this group was 9 (11 in the whole series). The percentage distribution of the duration of symptoms also resembles very closely that in the whole series (in parenthesis): under 4 months 36% (35%), 4–12 months 23% (24%), and over 12 months 41% (41%).

As can be seen from the figures presented above, the group of cases in which the treatment failed was in every relation similar to the whole series, and therefore this study can throw no light on the possible causes of failure of the treatment.

DISCUSSION

The clinical manifestations of the cervical syndrome are manifold. The symptoms and physical signs vary according to the level and the precise anatomical relationships of the pathological lesions and the mechanisms caused by them. Sym-

toms due to involvement of cervical nerve roots or the spinal cord are very common, as well as pains in the neck, headache or symptoms of vertebro-basilar ischaemia. The symptoms may occur singly or a combination of them may be present (7, 15, 16).

There continues to exist a certain doubt concerning the mechanisms and possibilities of relieving the symptoms of the cervical syndrome. However, it can be stated that symptoms which occur as a result of irritation or compression of the cervical nerve roots as well as of the recurrent spinal meningeal nerves, the spinal branches of the vertebral arteries and veins, and the near-by vertebral arteries themselves can theoretically be relieved by the cervical traction (7, 13). Compression of the spinal medulla and obstruction of the vertebral artery leading to vertebro-basilar ischaemia are, on the other hand, changes which logically cannot be relieved by traction of the cervical spine.

The main purpose of the present study was to examine the efficacy of cervical traction in relieving the separate symptoms of the cervical syndrome. The results obtained showed that cervical traction is as a rule a relatively good means of

relieving the symptoms, since 61 % of the total number of symptoms were completely cured or received marked improvement. With respect to the results in each of the six subgroups of symptoms, it seems evident that those symptoms which are based on mere compression of the cervical nerve roots (groups 1-3) can be relieved most efficiently (in 68 %). Pains radiating to the anterior wall of the chest (possibly due in part to the mechanism of sympathetic nervous system irritation) and headaches over the frontal or temporal region can be relieved to a somewhat lesser extent (in 55 %). The most resistant symptom to cervical traction appeared to be vertigo, which could be relieved effectively in 47 % only.

The results presented above are in accordance with the theoretical possibilities of cervical traction to relieve the various symptoms of the cervical syndrome. On the other hand, the relatively good results in relieving for instance vertigo are somewhat surprising, because obstruction of the vertebral artery is usually not caused by cervical spondylosis (14). Perhaps the effect of cervical traction on the sympathetic vertebral nerve explains partly this favourable result (7).

Most authors rate the interspaces between C_{5-6} and C_{6-7} as the most frequent sites of the earliest and most significant degeneration of the cervical discs. This represents the apex of flexion and extension strains (10). The roentgenological findings observed in the present study agree with these observations, because the narrowing of the intervertebral discs and intervertebral foramina occurred in the following succession: C_{5-6} , C_{6-7} and C_{4-5} . The well-known poor correlation between the symptoms of the patient and the roentgenological finding is also confirmed in this study by the similarity of the incidences of roentgenological changes in the hole series and in the group resistant to treatment.

A long previous duration of the symptoms has been shown to be the most obvious reason for the failure of treatment in patients suffering from the tension neck syndrome (16). In the present study, however, there was no correlation between the duration of the symptoms and the results of the treatment.

For patients treated earlier with cervical traction the time since the last treatment is a good measure of the efficacy of this method in relieving the separate symptoms of the cervical syn-

drome. The time since the previous treatment, together with the percentage of these patients, is a clear indication of the continuous need of repeated courses of treatment required by the patients suffering from the cervical syndrome.

The causes of failure of treatment could not be explained with the data collected in this investigation. It is, however, evident that the cases of failure suffered from some other diseases than the cervical syndrome and, in addition to this, they often also probably had psychogenic disturbances caused by the postmenopausal age (9).

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