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PHYSIOTHERAPY AFTER FRACTURE OF THE PROXIMAL END OF THE HUMERUS

Comparison between Two Methods

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ABSTRACT. Two methods of physiotherapy after fracture of the proximal end of the humerus were compared. The study was designed as a randomized, controlled and single-blind trial. Twenty patients were assigned to two groups 10–12 days after the injury. One group was treated conventionally, the other received instructions in self-training with follow-up control of results. Objective examination and subjective assessment were made at five intervals, up to one year after the injury. The greatest improvement in function was shown in both groups between 3 and 8 weeks. The patients deemed their daily life functions to be normal 8 weeks after the injury. The objective assessment was normal at later stages. No significant differences were found between the two groups in any of the tests. Instruction in self-training with control of results including objective assessments are therefore an adequate method in the rehabilitation of these patients.

Key words: Physical therapy, shoulder fracture, activities of daily living, muscle strength

Fracture of the surgical neck of the humerus occurs commonly in the elderly (7, 8, 11, 13). As there is a marked tendency for the capsule to contract and for the deltoid muscle to atrophy (8), early mobilization of these patients is therefore important.

Physiotherapy has played an important role in the rehabilitation of these patients. In an open study it has previously been shown that self-training by the patients after careful instruction leads to the same result and thereby saves time for the physiotherapist (11). We therefore carried out a randomized, controlled and single-blind (6) study to compare self-training with conventional physiotherapy.

MATERIAL AND METHODS

The material consisted of 20 patients 50–75 years old. Their mean age was 64 years, 66 years in the instruction group and 62 years in the conventional treatment group. All had non-displaced or slightly displaced fracture of the proximal end of the humerus. Seven patients had a fracture of the greater tubercle. Of these belonged 3 to the instruction group and 4 to the conventional treatment group. There were 17 female and 3 male patients in the material. The patients were referred to the physiotherapist from the Department of Orthopedics when the fixation sling was removed 10–12 days after the injury. In the instruction group, 5 patients had right arm and 5 left arm fractures. In the treatment group, 3 patients had right arm and 5 left arm fractures. Two patients in the instruction group, both male, were excluded from the study.

One died, the other had to undergo an operation. In the instruction group, one patient could not take part in the 16-week control, and 3 patients in the one-year control. In the treatment group, 2 patients could not take part in the 24-week control and in the one-year control.

Randomization procedure

Twenty patients were randomly assigned to two groups 10–12 days after the injury. They were informed of the aim of the study when they first met the physiotherapist in charge of the treatment and the instruction. All agreed to take part in the study. A second physiotherapist examined the patients. She did not know to which group the patient belonged, and the patients were instructed not to tell her. A third person was responsible for the randomization procedure and kept the key to the permutation table. The patients were examined with regard to passive joint movements, functional movements, their own assessment of pain and activities of daily living (ADL), and isometric muscle strength at 3, 8, 16 and 24 weeks and at about one year after the injury.

Instruction to patients in the instruction group

The patients in this group saw the physiotherapist the day the sling was removed, 3 weeks and 8 weeks after the injury. They were instructed as follows.

First visit: With the arm supported on a table, to perform flexion–extension and abduction exercises of the shoulder and extension exercises of the elbow. With the help of the other arm to lift the injured arm in the sagittal plane. They were encouraged to use the hand in the ADL. Advice was given regarding relaxation and resting positions.

Second visit: To continue the above program, to lift the elbow from the table without lifting the shoulder, to place the hand on the neck and on the lumbar region. To use the arm in ADL.

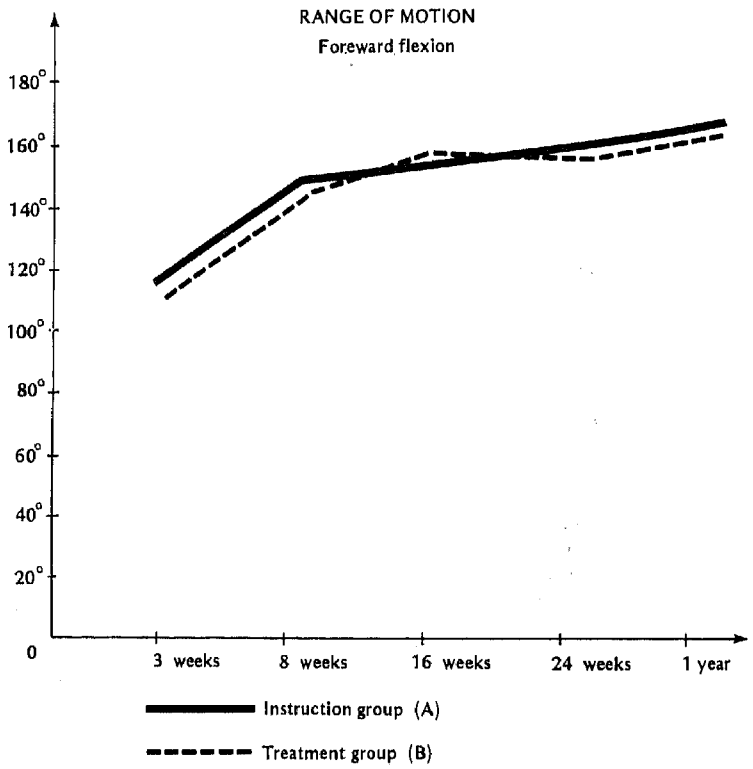

Fig. 1. Range of motion in forward flexion of the shoulder at five different time intervals after the injury.

Third visit: To maintain the position of maximum range of motion in all directions for 10 seconds. At each visit, emphasis was placed on ensuring that the patients were able to carry out the given instructions. They were told to do the exercises for 5–10 minutes, 4–5 times daily (11).

Treatment of patients in the conventional treatment group

These patients had nine treatments during 10–12 weeks, 1–2 times each week. Each treatment lasted for 20–30 minutes. The treatment followed the regime in conventional physiotherapy departments in Sweden (11). Careful mobilization of the caput humeri in the dorsal direction was done after 4 weeks (9). Soft tissue treatment was carried out to some extent. No thermoelectrotherapy was given.

Method of assessment

All patients were examined as follows.

Joint motion. Range of motion was measured with a goniometer in standard positions (1). The movements were carried out to the pain threshold.

Functional movements. Four functional movements were designed, of which two are reported in the study: placing the hand on the neck and on the lumbar region. The movements were graded 0–5, 0=impossible, 5=normal function, 1–4 showing degrees of compensatory movement.

Pain. The assessment of pain was made in connection with the functional movements and rated according to a scale modified from Borg (3): 0=no pain and 8=maximum pain.

Subjective assessment of daily living (ADL). Four daily activities were chosen. To comb the hair is reported in the study. The ability was graded 1–5, 1=uncertain, 2=impossible, 5=normal function.

Isometric muscle test. The patient performed isometric muscle tests three times. The tests were made in four directions, of which two are reported in the study. They were made in standard positions, and with both arms.

RESULTS

The patients in the instruction group (Group A) were on average 7 years older than those in the treatment group (Group B). In the treatment group there were 2 more patients with right arm fractures, and 2 more patients with fractures of the greater tubercle than in the instruction group. However, no significant difference was found between the two groups regarding age, sex, side of fracture and type of fracture.

Range of motion (Fig. 1)

No significant difference was shown at any stage between the two groups. In forward flexion, chosen

Table I. *Mean values and standard deviations of two functional movements with patient assessment of pain during the movement at different time intervals after the injury*

Time lapse after injury	N	Functional movements: Hand on neck M	Hand on neck SD	Pain M	Pain SD	Hand in back M	Hand in back SD	Pain M	Pain SD
A. *Instruction group*									
3 weeks	10	1.4	1.7	3.4	1.5	2.4	1.7	4.2	1.3
8 weeks	10	3.2	1.6	2.2	1.8	3.4	1.1	3.2	1.9
16 weeks	9	4.0	1.2	1.0	1.6	4.0	1.1	3.0	2.0
24 weeks	10	4.5	0.5	0.7	1.3	4.2	1.0	2.0	2.5
>1 year	7	4.6	0.5	0.6	1.0	5.0	0	0.7	1.5
B. *Treatment group*									
3 weeks	8	0.9	1.6	4.1	1.6	1.4	1.2	5.5	1.1
8 weeks	8	3.8	0.9	1.9	1.2	3.0	1.4	4.3	1.5
16 weeks	8	4.3	1.0	1.3	1.7	3.3	1.7	3.4	1.9
24 weeks	6	4.3	1.2	1.0	1.5	4.0	1.7	1.7	1.9
>1 year	6	4.3	1.2	1.0	1.7	4.0	1.5	1.5	2.0

as a representative movement (Fig. 1), there was a significant increase in range of motion in both groups between 3 and 8 weeks after the injury (Group A, $p<0.05$; group B, <0.01). From 8 to 16 weeks and from 16 to 24 weeks no significant increase was found in any of the groups. From 8 to 24 weeks however, there was a significant increase (both groups $p<0.001$). From 24 weeks to approximately one year after the injury no further increase was evident. Both groups showed the greatest increase in range of motion for all tested movements between 3 and 8 weeks after the injury in all measured directions. At the assessment one year after the injury, group A showed in abduction and forward flexion a significant difference from normal range of motion ($p<0.05$). Internal and external rotation showed no significant difference compared with normal range of motion. Group B showed at the same stage no significant difference from normal range of motion in any of the movements.

Functional movements (Table I)

No significant difference was found in any of the functional movements at any stage between the two groups. In the functional movements of placing the hand on the neck, (Table I) chosen as a representative movement, there was a significant increase during the first interval of 3 to 8 weeks (both groups $p<0.005$). From 8 to 16 weeks and from 16 to 24 weeks no significant increase was found in any of the groups. From 8 to 24 weeks there was a significant improvement in function in group B ($P<0.05$); group A showed no significant increase. From 24 weeks to approximately one year after the injury, no further increase was found. From 8 weeks to one year after the injury there was a significant increase in the functional movement 'placing hand on neck', in both groups ($p<0.05$). The greatest improvement was found during the first interval of 3 to 8 weeks. The same pattern was shown in all the assessed functional movements.

After 24 weeks the range of movement did not differ from full movement for the group in any of the tested movements.

Assessment of pain (Table I)

No significant difference was found between the two groups at any stage. Both groups assessed their average pain level to be neither slight nor severe, 3 weeks after the injury with regard to the movement 'placing hand on neck'. This was chosen as the most representative movement. From 3 to 8 weeks after the injury, group A showed no significant decrease in pain, whereas group B showed a significant decrease ($p<0.05$). From 8 to 16 weeks and from 16 to 24 weeks, no significant decrease in pain was found in any of the groups.

From 8 to 24 weeks there was a significant decrease in pain (both groups $p<0.01$), but from 24 weeks to approximately one year, no further decrease was found. From 8 weeks to one year after the injury, group A showed a significant decrease

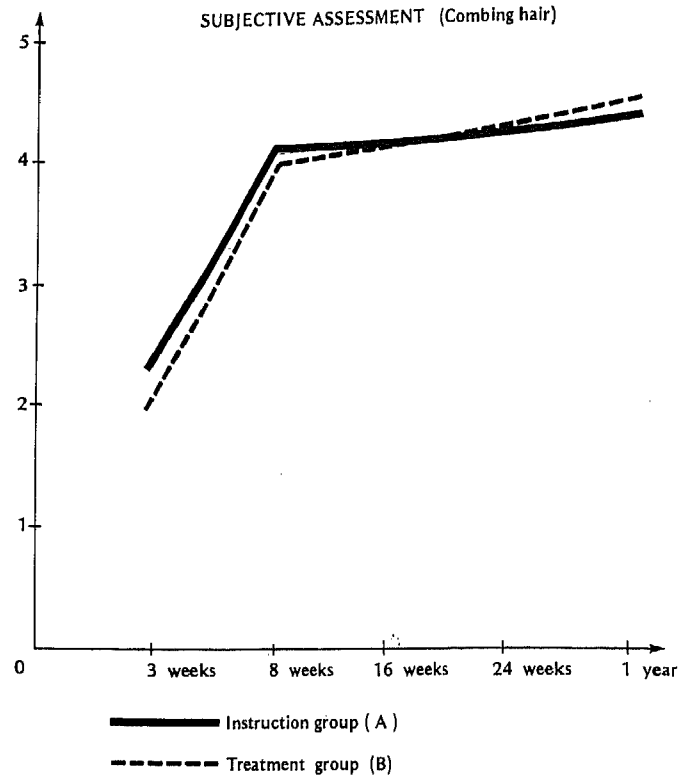

Fig. 2. Subjective assessment (combing hair) at five different time intervals after the injury.

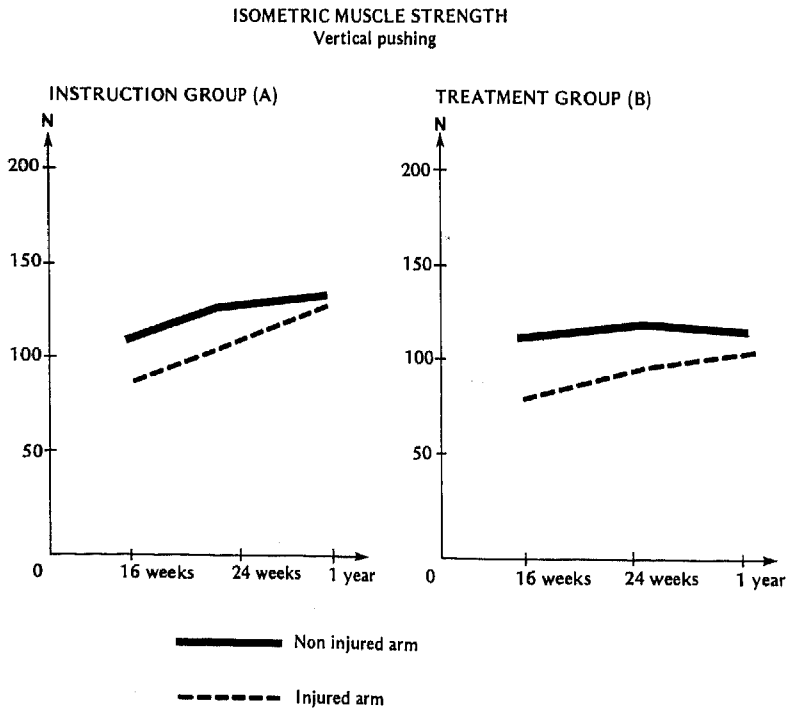

Fig. 3. Isometric muscle strength in vertical pushing. Instruction group (*left*) and treatment group (*right*) at three different time intervals. Tests were made with both arms at each stage.

($p<0.05$) and group B no decrease in pain in connection with the functional movement 'hand on neck'. The same pattern was found in connection with the other functional movements.

Assessment of activities of daily living (ADL) (Fig. 2)

No significant difference was shown between the groups at any of the intervals when the patients were assessed. In the activity of combing the hair (Fig. 2) there was a significant difference ($p<0.01$ in both groups) between 3 and 8 weeks after the injury. Between 8 and 16 weeks after the injury, no significant increase was found in any of the groups. The same pattern was shown in the remaining three activities. Already after 8 weeks the patient assessed their activities as near to normal, and they were in fact not significantly different from normal.

Isometric muscle strength (Fig. 3)

All tests were performed with both the injured and the non-injured arm. There was no significant difference between the two groups at any of the time intervals or in any direction.

In vertical pushing by the injured arm (Fig. 3), chosen as a representative movement, both groups showed a significant increase in muscle strength between 16 and 24 weeks (both groups $p<0.05$). Between 16 weeks and approximately one year after the injury there was a significant increase in muscle strength in both groups (Group A, $p<0.02$ and group B, $p<0.025$). Between 24 weeks and one year, group A showed a significant increase ($p<0.01$), but group B no significant increase in muscle strength.

In vertical pushing there was a significant difference between the injured and non-injured arms in group A at 16 weeks ($p<0.05$) and 24 weeks ($p<0.01$). After one year there was no significant difference in muscle strength between the injured and the non-injured arms in this group. In group B there was a significant difference in vertical pushing between the injured and the non-injured arms at 16 weeks after the injury ($p<0.01$). After 24 weeks and one year after the injury the same significant difference was found ($p<0.05$).

In horizontal pushing, both groups showed a significant difference between the injured and the non-injured arms at 16 weeks ($p<0.05$), but no significant difference at 24 weeks or one year after the injury. The non-injured arm showed no significant increase in muscle strength in any of the groups between 16 and 24 weeks, nor between 24 weeks and approximately one year. Between 16 weeks and one year after the injury, group A showed a significant increase in muscle strength ($p<0.05$) in vertical pushing. Group B showed no significant increase during the same period.

DISCUSSION

Physiotherapy is accepted as a treatment for patients with proximal humeral fractures (5, 7, 8, 11, 12, 13), and methods have been presented for the treatment (5, 7, 8, 11). Few studies have shown the effect of the treatment (8, 11). Assessment of the results of treatment depends on an objective interpretation of functional recovery (2, 4, 7, 8, 12) and on a subjective assessment of pain and ability to carry out various daily activities (3, 4, 7, 8). The purpose of the study was to ascertain whether instruction in self-training with regular checks on the results could give the same recovery as does conventional treatment. The advantage of this approach seems evident, both for the patient and for the physiotherapist. This category of patient is mostly the elderly, who may find it difficult to visit the physiotherapist. With adequate instruction and checking of the results, the training can be carried out in the patient's own home. Psychologically, it might be an advantage for the patients to take responsibility for their own rehabilitation. In support of this proposal is the fact that during the study 3 of the patients in the instruction group spontaneously expressed satisfaction with the arrangement. Two of the patients in the treatment group wanted to break off the treatment before the set time, and suggested they could manage on their own. One person in the instruction group was disappointed at not getting any treatment (massage). Time can be saved for the physiotherapist, thus making it possible to economize with medical resources without any deleterious effect on the patient's condition (11).

However, it seems important for the patient's motivation that an appointment be made, for checking of the results, at a definite interval up to 16 weeks after the injury. This approach emphasizes the pedagogic role of the physiotherapist. The physiotherapist should be aware of the communication process: give a small amount of information

and instruction each time, and consider the general principles for giving instruction.

The study shows that the greatest improvement in function was made in both groups between 3 and 8 weeks after the injury. The rehabilitation proceeded at a slower rate until 24 weeks and in some cases up to one year after the injury.

It was found that the range of motion in forward flexion and abduction was not restored to full range in either group one year after the injury. However, in both groups the range of internal and external rotation were restored to normal or next to normal after 16 to 24 weeks. The rotation movements seem to be the most important ones for the normal function of the shoulder girdle. In both groups the patients assessed themselves their ADL functions to be normal at 8 weeks after the injury. This observation may be explained by the fact that they were mostly elderly and might be satisfied with a restricted movement. It has previously been shown a lack of correlation between the anatomic and the functional results, the amount of pain, and the patient's satisfaction with the result (10). The discrepancy between the subjective and the objective evaluation in this study, shows that subjective assessment gives a limited picture of recovery. It is therefore necessary to assess more objective variables such as for instance range of motion, functional movements and muscle strength.

As no patient were treated more than 12 weeks after the injury, it may be questioned whether physiotherapy, including mobilization of the joints, training of muscular coordination and strength, would improve the function further and more quickly after this period. In a material of 152 patients (8) 22 patients had treatments for a period between 12 weeks and more than 6 months after the injury. Only 3 of these patients obtained good function of the arm. The type of physiotherapy given was not described.

CONCLUSIONS

1) Instruction in self-training compared with conventional physiotherapy gave the same results in patients with none-displaced or slightly displaced fractures of the proximal end of the humerus. 2) The greatest improvement occurred between 3 and 8 weeks after the injury, but in most cases continued up to one year. 3) The patients assessed activities of daily living as normal already after 8 weeks, although the objective assessment showed a continued improvement up to 24 weeks and one year after the injury. Checking of the results and objective assessment is therefore of great importance.

Our results with exact figures in tables can be obtained from the authors upon request.

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