Gentle thawing of the frozen shoulder: A prospective study of supervised neglect versus intensive physical therapy in seventy-seven patients with frozen shoulder syndrome followed up for two years

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Seventy-seven patients with idiopathic frozen shoulder syndrome were included in a prospective study to compare the effect of intensive physical rehabilitation treatment, including passive stretching and manual mobilization (stretching group) versus supportive therapy and exercises within the pain limits (supervised neglect group). There were no significant differences in age, sex, time elapsed since onset, and disease severity at inclusion. All patients were followed up for 24 months after the start of treatment. In the patients treated with supervised neglect, 89% had normal or near-normal painless shoulder function (Constant score ≥80) at the end of the observation period. This end result was reached by 64% within 12 months. In contrast, of the group receiving intensive physical therapy treatment, only 63% reached a Constant score of 80 or higher after 24 months. Both the level of the Constant score at the end of the study and the moment a Constant score of 80 or higher was reached confirm that supervised neglect yields better outcomes than intensive physical therapy and passive stretching in patients with frozen shoulder. (J Shoulder Elbow Surg 2004;13:499–502.)

The natural history of idiopathic frozen shoulder syndrome is considered benign, but the long period of pain and disability has been the reason for many interventions. Mobilization and stretching, intraarticular injections, manipulation under anesthesia, and surgical or arthroscopic release are performed with good results reported by the authors.

In contrast, the study by Stenvers[29] reported on the good results of gentle exercises within the painless range of motion without any form of passive stretching. To establish the effect of supervised neglect on frozen shoulder compared with an intensive physical therapy regimen that includes passive stretching and exercises that supersede the pain thresholds, a prospective study was designed in patients with well-defined idiopathic frozen shoulder syndrome. The study hypothesis was that, by treating patients with supervised neglect, a painless and better range of motion can be attained within a shorter time span than by means of intensive physical therapy with passive stretching and mobilization.

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MATERIALS AND METHODS

All 77 patients with idiopathic frozen shoulder syndrome diagnosed between January 1997 and January 2001 were included. The diagnosis was established as defined by Lundberg[14]: more than 50% motion restriction of the glenohumeral joint in all directions for a period of 3 months or more. Glenohumeral joint movement was measured with the scapula stabilized by the researcher, by use of an inclinometer (Cybex).

Patients with significant injury to the ipsilateral shoulder or arm; with surgical procedures on the shoulder, arm, cervical spine, thorax, or breast within the previous 2 years; or with intraarticular deformities, degenerative arthritis, or inflammatory arthritis were not included. Diabetic patients were excluded because of the different natural course of the disease in patients with diabetes mellitus.[8,14,21]

We chose a quasiexperimental design with a successive cohort as a control group.[17] Patients were treated with supportive therapy and supervised neglect for 2 years and with passive mobilization and stretching for the next 2 years. The patients were divided into two random groups[17]: 45 patients (19 men and 26 women) were included in one group between January 1997 and January 1999, were provided an explanation of the natural course of the disease, were instructed not to exercise in excess of their pain threshold, and were instructed to do pendulum exercises and active exercises within this painless range and to resume all activities that were tolerated. The second group, comprising 32 patients (21 women and 11 men), was included between January 1999 and January 2001 and was prescribed a standardized treatment protocol executed by a physical therapist of active exercises up to and beyond the pain threshold, passive stretching and

Table I Characteristics of patient groups

	Supervised neglect group	Physical therapy group
No.	45	32
Men/women	19/26	11/21
Age (yrs)	50 ± 6	51 ± 7
Duration of symptoms (mo)	5 (3–12)	5 (3–10)

Table II Mean range of motion of both groups at inclusion

	Supervised neglect group [Mean (SD) at inclusion]	Physical therapy group [Mean (SD) at inclusion]	Significance
Forward elevation	33° (6°)	33° (6°)	NS
Lateral elevation	40° (6°)	38° (7°)	NS
External rotation	9° (10°)	10° (9°)	NS
Internal rotation	Dorsum of hand to buttock	Dorsum of hand to buttock	NS

NS, Not significant.

manipulation of the glenohumeral joint, and home exercises aimed at stretching and maximal reaching. Whenever necessary, anti-inflammatory medication (nonsteroidal anti-inflammatory drugs) or analgesics were prescribed to patients in both groups. No patient received corticosteroid medication, local or systemic, and no manipulation or mobilization under anesthesia, general or regional, was performed.

No patient was lost to follow-up. All were reexamined at 3-month intervals up to 24 months after inclusion. The Constant score,[4] which is a validated measure of shoulder disability incorporating subjective (40%) and objective (60%) results by combining pain, range of motion, and functional status, all parameters typical of frozen shoulder syndrome, was used for outcome analysis.[6,31] A score of 80 points or higher was considered to indicate a normally functioning shoulder.

The data were analyzed with SPSS 10.0 (SPSS Inc, Chicago, IL). Descriptive statistics were used to describe the main characteristics of the study sample. To investigate the effectiveness of the supervised neglect group versus the group receiving physical therapy, a repeated measurement analysis of variance was conducted to determine how the Constant score changed during the 24-month period. In this analysis of variance conducted over nine data points, the Constant score was the dependent variable, time of measurement the within-subject factor, and treatment (supervised neglect/physical therapy) the between-subject factor. $P < .05$ was considered to indicate statistical significance.

RESULTS

The main characteristics of the subjects are summarized in Table I. No significant differences in age, sex, or duration of disease before inclusion were found between the thawing and stretching groups.

At baseline, the supervised neglect and physical therapy group did not differ significantly with respect to the Constant score. The mean range of motion of both groups at inclusion (Table II) , as well as the details related to motion and pain in the Constant score (Table III) , shows that the total score in both groups was comparable. During the follow-up measurements, significant differences were found between the two groups at all eight points of measurement (Figure 1,Table IV) .

Table V shows that, within 2 years, 89% in the supervised neglect group reached a Constant score of 80 or higher—that is, they were totally pain-free and had regained almost complete glenohumeral joint motion. In this group, 64% of the patients reached this level within 12 months. This is in contrast to the physical therapy group, in which only 63% reached a score of 80 or higher after 24 months. Both the height and the moment a Constant score of 80 or higher was reached are in line with our hypothesis that a supervised neglect approach yields better outcomes.

DISCUSSION

As frozen shoulder syndrome has been divided into different stages—inflammation, proliferation, fibrosis, and remodeling—we believe that the effect of intensive passive stretching, as was done in our physical therapy group, probably has an adverse effect on the natural course of the disease process in the active phase. This would be the case especially in the stages of inflammation and proliferation and perhaps also in the early fibrotic stage by activating the inflammatory reaction. This may explain the difference in outcome between these two groups.

Although several types of pathogenesis have been postulated,[1–3] the origin of frozen shoulder syndrome still remains unclear. In many studies the definition of the term frozen shoulder is unclear, as are the indication for and timing of interventions. As a starting point for most published studies, the time of intervention is mentioned and not the duration of the disease before this intervention and the development of the motion restriction in time. In addition, posttraumatic stiff shoulders, secondary frozen shoulder in diabetic patients, and motion impairment on the basis of other joint pathology (ie, subacromial pathology) are often not distinguished from the primary idiopathic frozen shoulder.

A quasiexperimental design with a successive cohort as the control group was used in this study. Although a time effect cannot be completely ruled out in this kind of design, it can be considered acceptable, as both groups were randomly drawn from the same population.[17] This study confirms again that idiopathic primary frozen shoulder is a self-limiting disease with a predictable good to excellent outcome in about 90% of cases.[16] Most noninvasive therapeutic strategies are based on stretching or rupturing the capsule[14–16,18,19,23] and manipulative physical therapy.[30] The lack of clarity in the definition and the severity of the disease, as well as the timing of the

Table III Mean range of motion of both groups (part of Constant score)

	Supervised neglect group		Physical therapy group	
	Median Constant score value at inclusion	**Median Constant score value at final follow-up**	**Median Constant score value at inclusion**	**Median Constant score value at final follow-up**
Forward elevation	2 (31°–60°)	10 (151°–180°)	2 (31°–60°)	10 (151°–180°)
Lateral elevation	2 (31°–60°)	8 (121°–150°)	2 (31°–60°)	8 (121°–150°)
External rotation	2*	10‡	2*	8‖
Internal rotation	2†	8§	2†	8§

*Back of head/elbow forward; †dorsum of hand to buttock; ‡full elevation; §dorsum of hand to DV 12; ‖top of head/elbow back.

therapy, can explain the very different results, which range from 100% good to average/fair.[14,15,23] The result of therapy with intraarticular corticosteroid injections,[10,25,28] with or without hydraulic distension,[7,9,13,26,27,32] is not evident from the published studies either; good results are published for 44% to 80% of the patients, again with no validated outcome score and no clear description of the timing and indication of therapy. More aggressive interventions, such as manipulation under anesthesia[5] and arthroscopic[12,13,20,24,27,30] or open release,[11,22] are a popular form of therapy for frozen shoulder, with acclaimed results of 69% to 97% in patients with resistant frozen shoulder performed after a period of intensive passive stretching and mobilization. If these aggressive or invasive treatments, with their attendant risks, are performed after a year of intensive physical therapy, with a reported good result 3 months after surgery, the total duration of the disease does not differ from this study's patients in the supervised neglect group. The mean time for the patient group to heal (ie, reaching a Constant score ≥80) is 15 months. The enigma of the disease is perhaps not only the pathogenesis but the predictable effect of any therapy on the impatient patient and the doctor willing to give him or her fast relief.

In this study and in this population, it is indicated that supervised neglect of idiopathic frozen shoulder syndrome is superior to passive stretching and mobilization with regard to the functional end result and

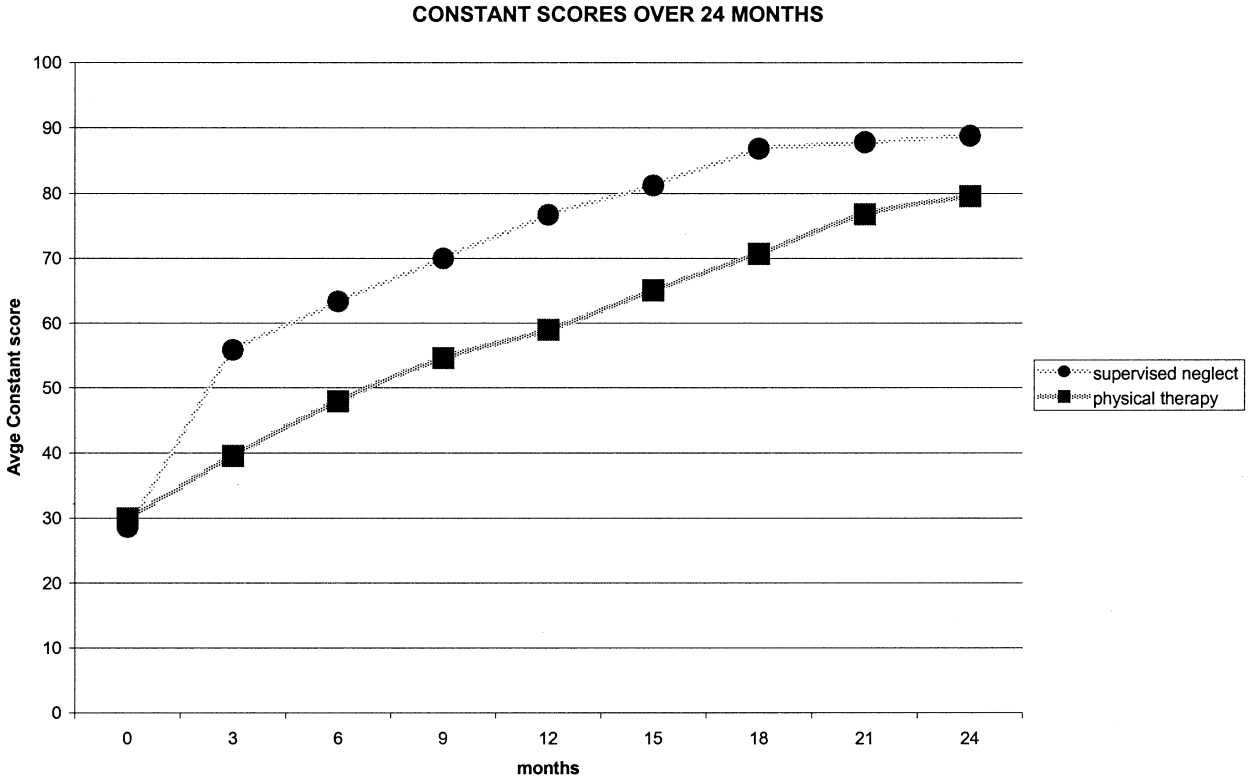

Figure 1 Results of both groups.

Table IV Comparison of treatment: Supervised neglect and physical therapy across 24 months

	Constant score [Mean (SD)]		
Time (mo)	Supervised neglect group (n = 45)	Physical therapy group (n = 32)	Significance
0	28.60 (8.64)	29.97 (8.46)	.492
3	55.87 (14.26)	39.50 (8.45)	.000*
6	63.31 (15.00)	47.91 (7.51)	.000*
9	69.96 (15.44)	54.59 (7.89)	.000*
12	76.71 (13.60)	58.97 (8.79)	.000*
15	81.20 (13.45)	65.06 (11.12)	.000*
18	86.82 (14.41)	70.69 (12.47)	.000*
21	87.80 (12.80)	76.75 (14.41)	.001†
24	88.78 (11.26)	79.56 (16.09)	.004†

*$P < .001$.
†$P < .01$.

Table V Percent of patients reaching a Constant score of 80 or higher in both groups

	Patients with Constant score ≥ 80 (%)	
Time (mo)	Supervised neglect group (n = 45)	Physical therapy group (n = 32)
0	0	0
3	2	0
6	16	0
9	22	0
12	64	0
15	78	16
18	78	31
21	84	50
24	89	63

the speed of recovery. As a 12-month period of disability is a sensitive issue for most social security systems and the persons who are dependent on it, further research for treatments to reach a predictable result within a shorter time span should be performed.

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