Peripheral Manipulation for Shoulder Joint Dysfunction in Cerebrovascular Stroke Patients

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ABSTRACT

Background and Purpose: *Shoulder pain is known to retard rehabilitation after cerebrovascular stroke (CVS) having uncertain causes and prognosis.* ***The Aim of our work*** *is to depict the problem of shoulder joint dysfunction in CVS patients and to demonstrate how the application of peripheral manipulation of shoulder joint can be helpful in solving such problem.* ***Subjects and Methods:*** *30 males stroke patients with shoulder pain were screened and subdivided into two equal groups: the first group (study group)(G1) received peripheral manipulation of the soft tissues of shoulder joint in grades: 1,2,3 and 4 in addition to Proprioceptive Neuromuscular Facilitation (PNF) pattern of shoulder flexion, abduction and external rotation. The second group (control group) (G2)) received PNF as the (study group (G1)) only. The sessions were for one month-three times per week-for thirty minutes each session. To measure the outcome of the study; pre and post treatment assessment was done through: the Modified Ashworth Tone (MAT) scale for tone evaluation, Visual Analogue Scale (VAS) for pain assessment and Quality of Life Index (QOLI) scale for scoring of activity of daily living and patient satisfaction. Three Dimensional Motion Analysis System (3DMAS) was applied in both groups pre and post treatment to analyze the Range of Motion (ROM) alteration of the shoulder joint.* ***Results:*** *There was a strong association between ipsilateral sensory abnormalities and abnormal shoulder joint examination and arm weakness. A highly statistically significant difference was present between pre and post treatment assessment of mean of (ROM) as tested by 3DMAS in all planes tested in the study group (G1). This was reflected on clinical evaluation by the presence of statistically significant difference between pre and post treatment assessment of MAT scale, VAS and QOLI scale in the study group (G1) with much patient satisfaction and pain relief.* ***Conclusion:*** *Peripheral manipulation of the shoulder joint in stroke patients can be considered as a promising hope in tailoring stroke rehabilitation as it is well correlated with patient satisfaction.* ***(Egypt J. Neurol. Psychiat. Neurosurg., 2006, 43(1): 1-14)***

INTRODUCTION

Shoulder dysfunction is probably one of the most frequent complications of cerebrovascular stroke (CVS). It has repercussions on motor rehabilitation and psychological equilibrium of the patient, so different strategies for prevention and treatment are presented[1].

Scapular movement is thought to influence spinal alignment and over all shoulder girdle function. The basis for this relationship has been attributed to two factors: First, the numerous muscular connections between the spine, scapula, clavicle and humerus and secondly due to the integrated movement at the glenohumeral and scapulothoracic joints during arm elevation movement commonly called scapulohumeral rhythm[2,3,4].

Alteration in the alignment of the skeletal components of the shoulder complex have been ascribed in both flaccid and spastic stages of paralysis after cerebrovascular accidents and are believed to contribute to the development of shoulder disorders in the hemiplegic patient[5].

The true incidence of post stroke shoulder pain is unknown but was documented as a "stroke complication" in 4%[6]. The causes are heterogeneous but can be classified into peripheral, central and mixed[7]. The peripheral or regional causes are those related to the joint; can be solitary (e.g. lesion of the rotator cuff tendons, biceps tendinitis, traction neuropathy of the brachial plexus and nerve stretch injury or exacerbation of arthritis) and complex regional pain syndrome as (Frozen shoulder, Glenohumeral subluxation, Impingement syndrome and Muscle trigger point). Others are related to the central neurological lesions such as central post-stroke pain (CPSP), lack of sensibility, unilateral neglect, reflex sympathetic dystrophy (RSD) with shoulder-hand syndrome and spasticity. Poor handling of hemiplegic limb may exacerbate a pre-existing condition such as osteoarthritis. Thus, pre-morbid disease of the shoulder may predispose to post stroke shoulder pain[6,8].

The etiology of the majority of these pathologies may be linked to disturbances caused by or resulting in abnormal joint kinematics. The exact mechanism of development of shoulder pain in hemiplegics is not known. In the normal shoulder during abduction of the arm, the rotator cuff rotates the humerus externally so that the greater tuberosity can slide under the acromion. This prevents soft tissue impingement between the acromion and greater tuberosity. There is a lack of external rotation in the hemiplegic arm because of either weakness of external rotators or increased tone in the internal rotators. This results in soft tissue damage and shoulder pain[9].

There are two major approaches for physical therapy in this field: those that focus on the problem as a localized mechanical one; and those that view the problem as a neurological one. Local treatments used have included heat and cold therapy. Slings and shoulder supports have also been used[8]. Until recently, the evidence for the effectiveness of these methods of physiotherapy has been poor. Rehabilitation after stroke remains a challenge. Therapeutic exercises are commonly used to help stroke survivors to recover from physiologic impairments from the primary cause of dysfunction that is upper motor neuron injury[9]. Randomized controlled studies have shown that intensive treatment may help to improve spontaneous recovery of motor function in spastic stroke patients. Joint mobilizations and muscle stretching are considered an important part of the patient's daily management [10].

The principles of Proprioceptive Neuromuscular Facilitation (PNF) are based on sound neurophysiological and kinesiologic principles. It depends on the idea of central excitation. The strength of a muscle contraction is directly proportional to the number of activated motor units, which obey the 'all or none' rule. The functioning of these is dependent on the degree of excitation of the motor neurons[11]. The basic aim of this method is to stimulate the maximum number of motor units into activity and to stimulate all the remaining muscle fibers. The importance of the proprioceptors; in particular the muscle spindles; was recognized as a key factor in facilitating the contraction of muscles. It was also recognized that to increase the power of muscles it is necessary to make them work maximally in accordance with the basic principles of progressive resistance exercises[12,]

Peripheral Manipulation of articulations of the human body has been practiced since the days of Hippocrates and by various cultures from ancient times to the present. Presently, the use of manipulative therapy is being debated and is enjoying increased acceptance among physicians and physical therapists throughout the international community. Application of painful restricted soft tissues manipulations around joints by oscillatory passive movements that provide a neurophysiologic and mechanical therapeutic effect, help to improve the whole range of motion (ROM) of a selected joint[13].

The Aim of our work is to study the problem of shoulder joint dysfunction in CVS patients prospectively, in an unselected stroke population in the first 6 months after stroke and to screen the effect of applying non-traditional method for stroke rehabilitation through peripheral manipulation of shoulder joint.

PATIENTS AND METHODS

Patients:

Inclusion criteria:

1. 30 male stroke patients will be screened from the Neurology Outpatient Clinic, Kasr El-Aini hospital and the Neurology Outpatient Clinic of Faculty of Physical Therapy, Cairo University.
2. All having shoulder joint dysfunction.
3. Age of the patients should be above 45 years.
4. The duration of treatment will be for one month with three sessions per week, each is for thirty minutes.
5. Patients will be subdivided into two equal groups:
   A. Study group (G1): would be receiving peripheral manipulation of the soft tissues of the shoulder joint in grades: 1,2,3 and 4 in addition to Proprioceptive Neuromuscular Facilitation (PNF) pattern of shoulder flexion, abduction and external rotation.
   B. Control group (G2): would be receiving PNF as (study group) only.

The results of this study will be limited by:

1. The patient's cooperation in performing home exercises program.
2. The patient's psychological status.
3. The sample is small in size.
4. The error percent in the motion analysis system used to measure shoulder joint motion.

Methods:

All the patients were subjected to the following assessment protocol:

I. Thorough Clinical assessment:
Medical History and Neurological Examination: Using the standard cerebrovascular stroke assessment sheet[14].

II. Pre and post treatment assessment was done through:

1. **Modified Ashworth Tone (MAT) scale[15]:** for tone assessment.
2. **Power assessment by "The Medical Research Council"[16].**
3. **Visual Analogue scale[17,18] (VAS):** for pain assessment.
4. **Quality of Life Index scale[19,20] (QOLI scale):** to evaluate score of limb function with activity of daily living and patient satisfaction.
5. **Three Dimensional Motion Analysis System (3DMAS) [21]**: to analyze the change in the range of movement (ROM) objectively. Quantitative analysis of motion typically involves a sophisticated computerized video camera apparatus, referred to as an optoelectronic motion analysis system, this system measures the three dimensional location of an individual marker in a manner similar to that in cinematography, but with greater ease and speed. The system automatically triangulates the information to provide a three dimensional position of each marker at each frame. The optoelectronic system can detect the true three dimensional positions of markers within few millimeters in each of the three axes. Marker position is typically determined at every 1/50, 1/100 or 1/200 of a second, depending on the speed of the camera used. Multiple markers are fixed to ensure consistent application as well as to reduce skin movement artifact .The camera typically detects the minute changes of ROM before and after testing.

III. Proprioceptive Neuromuscular Facilitation (PNF):

It is based on the principles of normal human development (i.e., mass movements precede individual movements, reflexive movements precede volitional movements, developments occur cephalically to caudally, control is gained proximally prior to distally, the timing of normal movements is distal to proximal). It involves repeated muscle activation of the limbs by quick

stretching, traction, approximation and maximal manual resistance in functional directions (i.e., spiral and diagonal patterns) to assist with motor relearning and increasing sensory input. In an attempt to relax spastic antagonist muscle groups, rhythmic stabilization can be used, which involves alternating voluntary contractions of agonist and antagonist muscles. The test is done essentially in 3 planes: flexion, abduction and 3 dimensional planes of all directions: x,y and z. The ROM is measured in these planes.

IV. Peripheral manipulation of the soft tissues:

Peripheral manipulation of the soft tissues is a type of treatment employing painful restricted oscillatory passive soft tissue movement around joints that provide a neurophysiologic and mechanical therapeutic effect. It is composed of a graded system of four grades differing in amplitude and excursion for applying passive movements throughout the extent of the joint range. However, therapeutic ROM exercises done by the patient at home can involve passive abduction of the arm. The amplitude of such passive movements should be kept within the pain- free range. The pain will subside in patients with the hemiparetic shoulder pain when the amplitude of passive ROM is reduced. Exercise is the most important therapy in the restoration of physical independence in hemiplegia. Active and active-assistive exercises are added to the program when the patient starts to regain voluntary control.

Statistical Analysis:

The statistical analysis was done using an IBM compatible computer .Data were included in a database and analyzed by means of statistical software package namely SPSS Windows V.8. Descriptive statistics were presented as means ± standard deviations and number percentage (frequency distributions), mode and range. Analytical tests used included unpaired student t test (two sided) for comparing two groups. Post hoc test was used for comparing each group. Non parametric testing was also used to confirm significance. Paired t test was used for comparing values before and after treatment. Correlation and regression analysis were also performed whenever appropriate.

RESULTS

A. Results of The Clinical Study:

Ages of the study group (G1) ranged from 45 to 59 years with mean age+ SD of 51.4±4.36 years. The ages of the control group (G2) ranged from 45 to 61 years with mean age+ SD of 53.1±4.87 years. Table (1).

Among different risk factors incriminated for a stroke, we tested our patients for the presence of hypertension, diabetes, previous stroke and heart disease. Hypertension and diabetes were mostly afflicting the study group (G1) 66.7% and 60% respectively (Table 2).

We examined our patients for the presence of shoulder subluxation, hand swelling or pain, tenderness on shoulder palpation, grade of muscle tone by applying the Modified Ashworth Tone scale (MAT scale) and grade of muscle power (Table 3).

1. **Shoulder Subluxation:**
   Shoulder Subluxation was present in 9 patients (60%) pre-testing, and decreased to 4 patients (26.7%) post-test in the study group (G1). On the other hand, in the control group (G2), shoulder subluxation was present in 12 patients (80 %) pre-test and decreased to 8 patients (53.3 %) post-test (Fig. 1).
2. **Hand Swelling or Pain:**
   In the study group (G1) hand swelling or pain was present in 8 patients (53.3%) pre-test, yet this percent decreased post- test to 3 patients (20 %) only; while, in the control group (G2) hand swelling or pain was present in 10 patients (66.7 %) pre-test and decreased to 9 patients (60 %) post-test (Fig. 2).
3. **Tenderness on Shoulder Palpation:**
   Tenderness on shoulder palpation was present in 11 patients (73.3%) pre-testing in the study group (G1) and decreased to 2

patients only (13.3%) post-testing. Similar results but less marked were found in the control group (G2) where tenderness on shoulder palpation was found in 12 patients (80%) pre-test and decreased to 5 patients (33.3%) post-test (Fig. 3).

4. **Grade of Muscle Tone:**
   According to the Modified Ashworth Tone (MAT) scale; spasticity was reduced from 13 (86.76%) patients that were affected with grade [2] pre-test, to be 3 (20%) patients only in such score post-test representing improvement in 10 patients (66.7%) who became affected with grade I, in the study group (G1). However such an improvement was not the same in the control group (G2); where, 46.7% of patients were spastic of which only 6.7% improved (Fig. 4).
5. **Grade of Muscle Power:**
   Thirteen patients (86.7%) were having [grade 3] muscle power pre-testing in study group (G1) that demonstrated an excellent improvement post-testing: 6 patients (40%) became [grade 3+] and 8 patients (53.3%) were having [grade 4] of muscle power with one patient (6.7%) having [grade 5] muscle power. On the other hand, out of 14 patients(93.3%) were [grade 3] in control group (G2); 5 patients remained at the same grade (33.3%) and only 7 patients (46.7%)had improved their strength to be [grade 3+] and only 3 patients (20%) became [grade 4] (Fig. 5).

Shoulder Pain Characteristics:

Among different shoulder pain characteristics we assessed our patients for course and severity of pain using the Visual Analogue Scale (VAS) and finally the Quality Of Life Index (QOLI) scale that measures the activity of daily living limb function and patient satisfaction.

The mean±SD of the VAS score was [7.6±1.18] pre-test, and decreased to be [4±1.88] post-test, while the mode (the frequently encountered) score was [7] pre-test and was reduced to [4] post-test in the study group (G1); indicating improvement. As regards the control group, mean±SD of the VAS score was [6.6±1.39] pre-test, and decreased to be [5.1±1.76] post-test, while the mode (the frequently encountered) score was [6] pre-test and was reduced to [5] post-test (Table 4).

Moreover, we appraised patients` satisfaction and activity of daily living or score of limb function via the Quality of Life Index {QOLI} scale. The mean +SD of QOLI scale score was [4.2±1.09] pre-test to be increased post-test to be [7.2±1.53], while the frequently encountered QOLI score (the mode) was [4] pre-test, and became [8] post-test in the study group (G1). On the other side, in the control group, the mean±SD of QOLI scale score was [5.06±2.05] pre-test to be increased post-test to be [6.4±1.68], while the frequently encountered QOLI score (the mode) was [4] pre-test as the study group, it became [5] only post-testing. All of this point to more and more patient satisfaction in the study group (G1) (Table 5).

A highly statistically significant difference was found on correlating the results of clinical examination of the shoulder joint in CVS patients pre and post treatment; in the study group (G1); ($P<0.05$) in all the items elected for clinical assessment. On the other hand, although an obvious difference in improvement of the clinical examination was recognized in the control group (G2), it did not reach the statistically significant level, except for tenderness on shoulder palpation and power grade only ($P<0.05$) (Table 6).

B. Results of the Three Dimensional Motion Analysis System (3DMAS):

We used (3DMAS) to measure the outcome of shoulder joint Range of Motion (ROM) before and after treatment in both groups as regard flexion movement, abduction movement and 3 dimension planes of all three directions: x, y, and z. A highly statistically significant improvement in the mean±SD of ROM of shoulder joint was spot in all planes in the study group (G1), as well seen

in table (7): (P<0.001). On the other side, a highly statistically significant improvement in the mean±SD ROM of flexion and abduction movement only was encountered in the control group (G2). What is more important, is the difference in the means of ROM of the shoulder joint between pre and post treatment, that was prominent in the study group (G1) essentially; indicating the impact of exploiting peripheral manipulation of soft tissues on the shoulder joint ROM in CVS patients (Fig. 6).

Table 1. Mean ages±SD of CVS patients of both groups.

Age	Mean	SD
Study Group (G1)	51.4	4.36
Control Group (G2)	53.11	4.87

Table 2. Risk Factors incriminated among patients of the present study.

Risk Factors	**Study Group (G1)**		**Control Group (G2)**	
	N.	**%**	**N.**	**%**
Hypertension	10	66.7	14	93.3
Diabetes	9	60	7	46.7
Heart Disease	6	40	6	40
Previous stroke	3	20	1	6.7

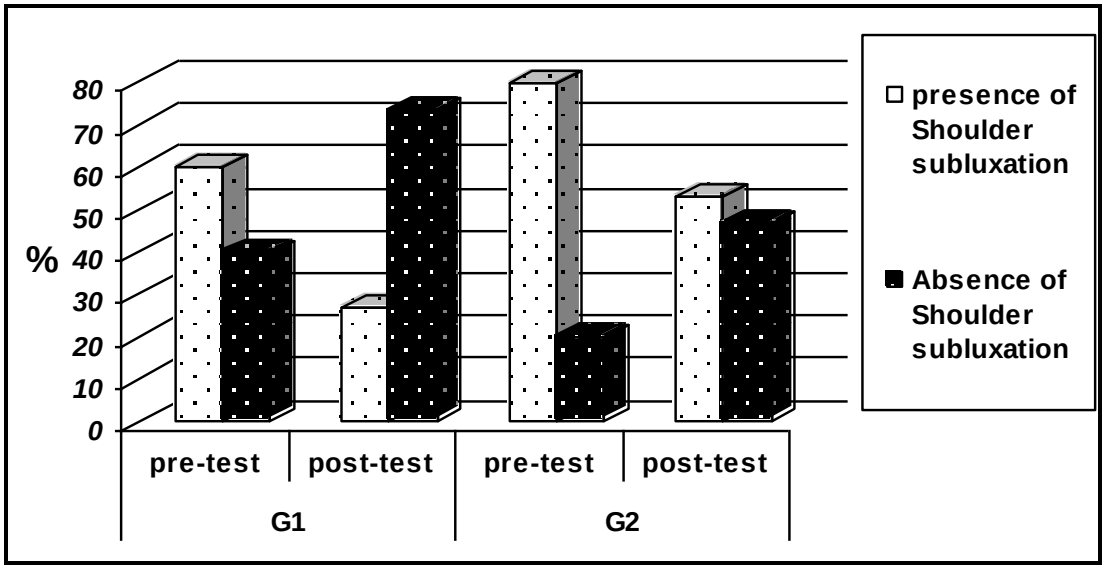

Fig. (1): Shoulder subluxation among our patients.

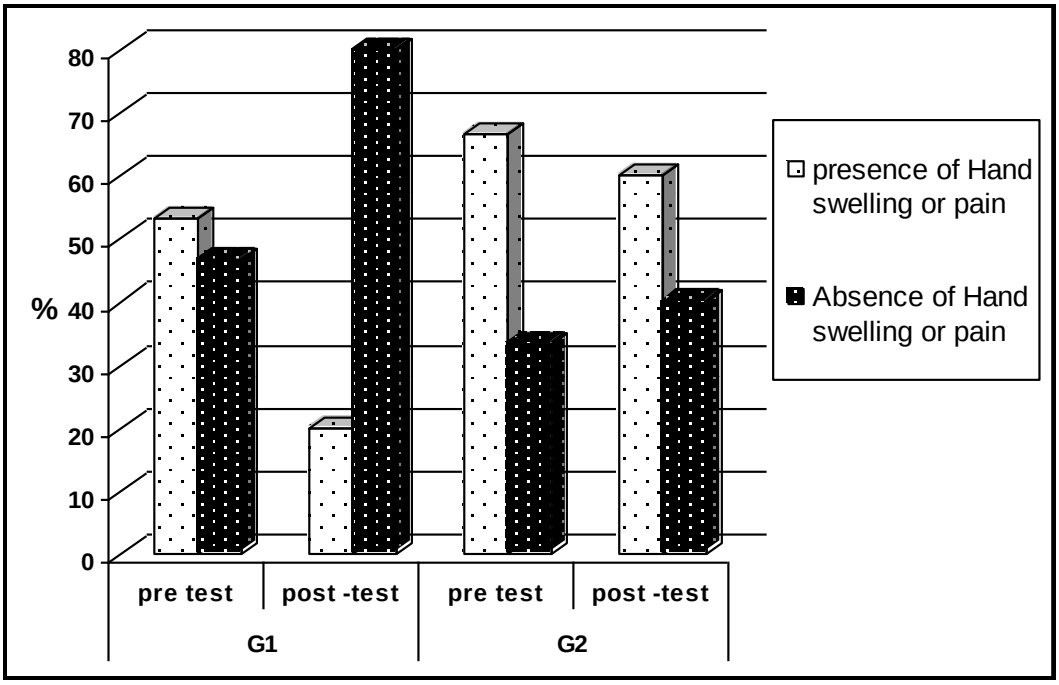

Fig. (2): Hand swelling or pain among our patients.

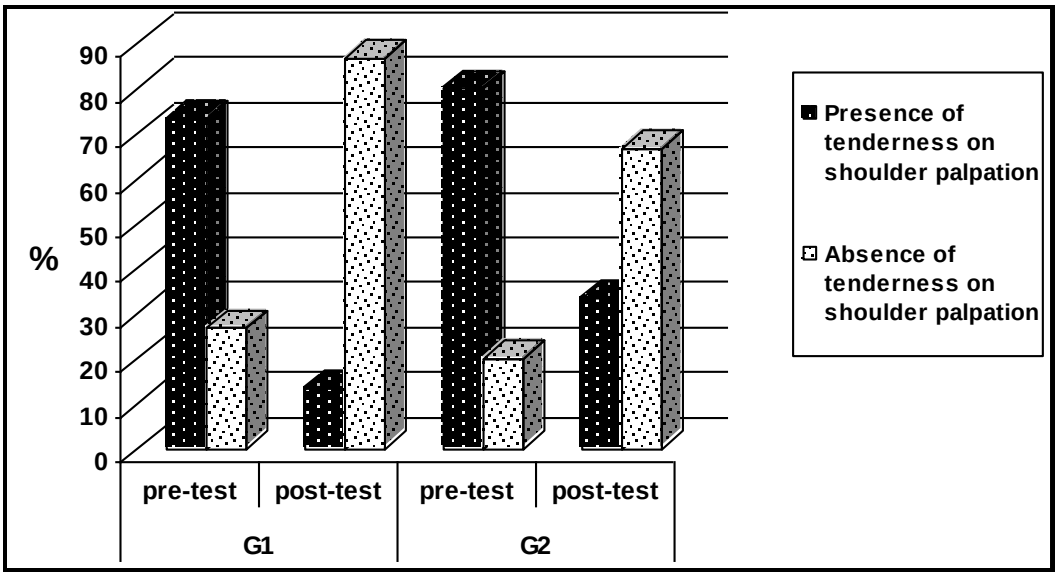

Fig. (3): Tenderness on shoulder palpation among our patients.

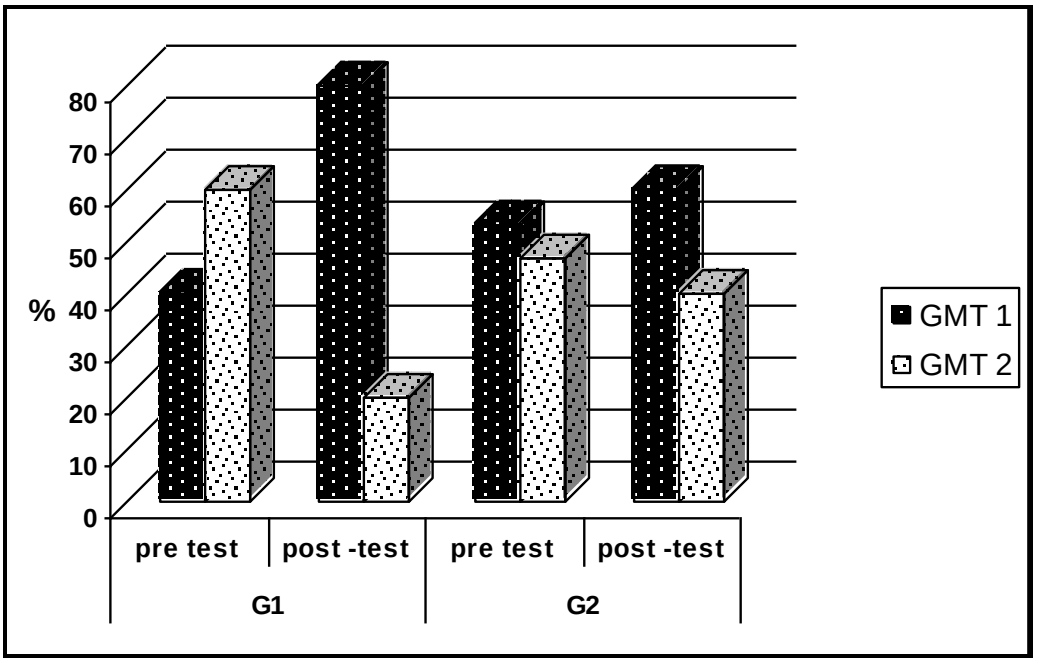

Fig. (4): MAT scale results among our patients.

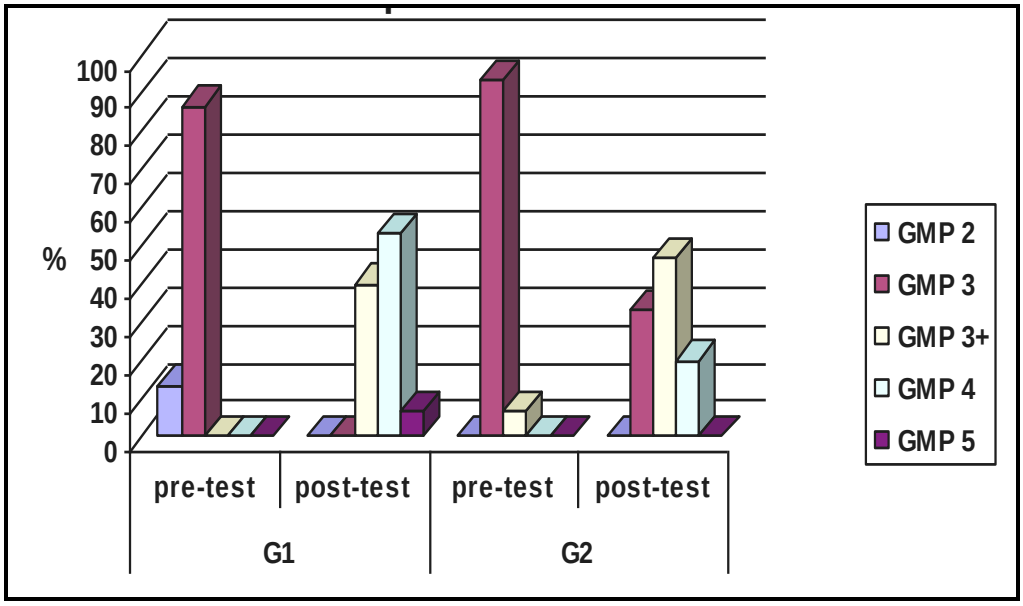

Fig. (5): Grade of muscle power among our patients.

Table 3. Clinical Examination of the Shoulder joint among our patients.

Clinical Examination of the Shoulder joint		Study Group (G1)				Control Group (G2)			
		Pretest		Posttest		Pretest		Posttest	
		N.	%	N.	%	N.	%	N.	%
Shoulder subluxation	+	9	60	4	26.7	12	80	8	53.3
	-	6	40	11	73.3	3	20	7	46.7
Hand swelling or pain	+	8	53.3	3	20	10	66.7	9	60
	-	7	46.7	12	80	5	33.3	6	40
Tenderness on shoulder palpation	+	11	73.3	2	13.3	12	80	5	33.3
	-	4	26.7	13	86.7	3	20	10	66.7
GMT	1	2	13.3	12	80	8	53.3	9	60
	2	13	86.7	3	20	7	46.7	6	40
GMP	2	2	13.3	0	0	0	0	0	0
	3	13	86.7	0	0	14	93.3	5	33.3
	3+	0	0	6	40	1	6.7	7	46.7
	4	0	0	8	53.3	0	0	3	20
	5	0	0	1	6.7	0	0	0	0

Table 4. Visual Analogue Scale (VAS) results among patients of the present study.

Descriptive Statistics	VAS			
	G1		G2	
	Pre-test	Post-test	Pre-test	Post-test
Mean	7.6	4	6.6	5.1
Median	8	4	7	5
Mode	7	4	6	5
Standard Deviation	1.18	1.88	1.39	1.76
Range	4	8	5	7
Minimum	5	0	4	1
Maximum	9	8	9	8

Table 5. Quality of Life Index (QOLI) scale among our patients.

Descriptive results	QOLI scale			
	G1		G2	
	Pre-test	Post-test	Pre-test	Post-test
Mean	4.26	7.26	5.06	6.4
Median	4	8	5	6
Mode	4	8	4	5
Standard Deviation	1.09	1.53	2.05	1.68
Minimum	3	5	2	5
Maximum	6	9	9	10

Table 6. Correlation of results of clinical examination of the shoulder joint in CVS patients in both groups pre and post treatment.

Clinical Examination of the shoulder joint in CVS patients	Study Group (G1)		Control Group (G2)	
	Z	P	Z	P
Shoulder subluxation	-2.23	.02*	-1.00	.31
Hand swelling	-2.23	.02*	-1.00	.31
Tenderness on shoulder palpation	-3.00	.00**	-2.23	.02*
Modified Ashworth Tone scale (MAT scale)	-2.11	.00*	-1.00	.32
Grade of muscle power (GMP)	-3.13	.00**	-2.00	.05*
Visual Analogue scale (VAS)	-3.15	.00**	-1.97	.41
Quality of Life Index scale (QOLI) scale	-3.32	.00**	-1.56	.06

*: significant **: highly significant

Table 7. Correlations of Means±SD of ROM of the shoulder joint in CVS patients pre and post test; in the study and control groups; as tested by the 3DMAS.

3DMAS	STUDY GROUP (G1)						CONTROL GROUP (G2)					
	PRE TEST		POST TEST		Z	P	PRE TEST		POST TEST		Z	P
	mean	SD	mean	SD			mean	SD	mean	SD		
3D Plane of all directions	28.4	11.2	62.6	14.3	-3.40	**.001****	22.2	8.3	31.5	12.3	-2.7	.006
Flexion	91.4	8.7	108.5	10.9	-3.35	**.001****	90.3	7.7	99.6	4.4	-3.4	**.001****
Abduction	84.4	6.6	111.9	9.75	-3.40	**.001****	83.1	6.7	93.84	9.0	-3.2	**.001****

*: significant **: highly significant

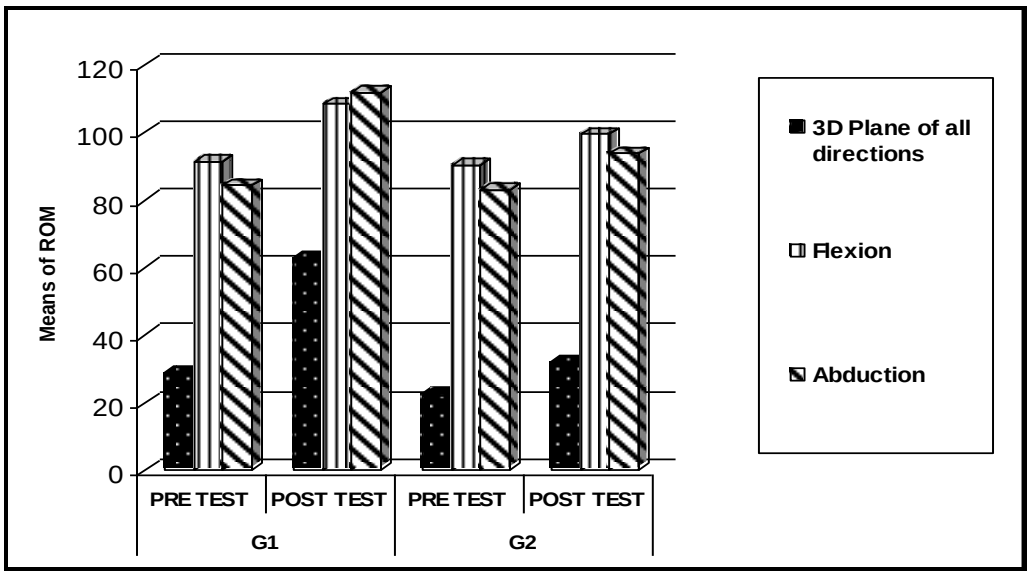

Fig. (6): Means of ROM of shoulder joint as measured by 3DMAS among our patients.

DISCUSSION

The dream of lessening the burden of CVS on patient and community is starting to become true with the use of new rehabilitation programs. As CVS is still the third leading cause of death in the world and remains to be the most common serious neurological problem in the world because of its impact on person and community; physiotherapy is the major component of rehabilitation for stroke patients, as it has been shown to have statistically positive impact on outcome[22,23].

Different methods of rehabilitation programs are advocated for CVS patients; as traditional exercise therapy[8,11] and Proprioceptive Neuromuscular Facilitation Techniques (PNF)[24,25]. Moreover, a recent scope of applying peripheral manipulation technique of soft tissues in CVS is now budding[26]. This study is the first one in Egypt in testing peripheral manipulation technique as a new treatment modality for shoulder joint dysfunction in stroke patients.

Ginn[23] specifically evaluated the effectiveness of peripheral manipulation in the treatment of shoulder pain in CVS as usually the lower limb improves before the upper limb that takes extra time, money and effort on patient and family. He found that peripheral manipulation program of shoulder joint was equally as effective as to cortisone injection and combination of physiotherapy interventions for shoulder joint dysfunction in CVS patients.

In our study all the patients had one or more of the risk factors for CVS as diabetes, hypertension, cardiac troubles and previous CVS. This was supported by the results of Khalifa[25], who studied the epidemiology of CVS in Upper Egypt. The study was carried on 25.000 persons and resulted in total incidence of 1.8 per 1000 populations and total prevalence of 5.08 per 1000 population. Furthermore, he found that aging, male sex, diabetes, hypertension and cardiac troubles increase the incidence and prevalence of ischaemic CVS.

In the present work we attempted to validate the rehabilitative approaches used in the management of shoulder dysfunction in CVS patients, using clinical data as shoulder physical characters and shoulder pain assessment together with the use of an objective smart way to prove such improvement that is 3DMAS.

The results of our study showed a statistically significant decrease in the Visual Analogue Scale (VAS) scores used to validate pain deterioration, which were well seen after treatment in the study group (G1):($P<0.05$). On the other hand, although a decrease in (VAS) scores was present in the control group (G2), it did not reach a statistically significant level ($P>0.05$). These results were in line with those reported by Walsh[8], McDowell & Newell[17] and Bang & Deyle[26], who insisted on the validity and reliability of the VAS in pain assessment. Furthermore, Bohannon et al.[27], and Kumar et al.[28], have reported a relationship between the amount of pain and loss of shoulder motion. Yet, the conclusion that pain is the result of loss of ROM does not necessarily follow. The mere association could be related to subjective factors that fail to explain the genuine limitation of shoulder movement that can be analyzed by several methods. These results were parallel to the results of the present study, as we succeeded to determine real limitation of ROM of the shoulder joint via 3DMAS that is the cause of shoulder joint dysfunction and not pure pain existence.

Our study revealed a high statistically significant decrease in tone scores post treatment, as measured by MAT scale that was noted in the study group (G1) only. Such results seem to principally support the close association of spasticity with shoulder pain (e.g. spasticity leads to limitation of ROM that may end in frozen shoulder with more pain and more limitation). The results are in parallel with many reports who found that spasticity may be an important contributing factor in pain development and in turn affect strength and function of shoulder joint[29,30].

More crucial, the present work demonstrated a statistically significant post-treatment improvement of upper extremity related activity of daily living and limb function associated with more satisfaction, by using the Quality Of Life Index (QOLI) scale, inspite of the long duration of

stroke in the study group (G1). This was analogous to Ferrans and Powers[19], who validated (QOLI) scale reliability with Internal Consistency of 0.93 in evaluating patient satisfaction. However, this was in controversy with the report of Nakayama et al.[31], who concluded that further functional recovery should not be expected later than 11 weeks after stroke. However, this can be related to the type of physiotherapy used in their work that is different than the modalities used here in our study.

One of the results of this study, using PNF as a strengthening technique was improved muscle strength in the control group (G2) post-treatment, which was statistically significant. On the other side, a high statistically significant difference in improving muscle power post-treatment was well seen in the study group (G1). This reflects the impact of peripheral manipulation of soft tissues on shoulder dysfunction in CVS patients. These findings were in accordance to those reported by Weiss et al.[24], who found that progressive resistance training improved muscle strength in CVS individuals at least one year after stroke onset.

The weight of improvement of ROM of shoulder movement in CVS patients was well illustrated in our study by operating 3DMAS. Such new meticulous proficient device was capable to measure precisely the improvement of the patients` active ROM of shoulder flexion, abduction and 3 dimension planes of all three directions of movement. The results of 3DMAS showed that combination of peripheral manipulation with PNF was significantly effective in improving the shoulder joint ROM in the all tested planes of movement, with much striking difference in the mean post/pre-treatment scope of improvement of ROM of shoulder joint of motion. On the contrary, the PNF technique alone improved shoulder flexion and abduction only and failed to improve the shoulder ROM in the 3 dimension planes of all three directions. This is in line with the work of Bang and Deyle[26], who validated the effectiveness of peripheral manipulation on shoulder dysfunction in CVS patients and demonstrated significantly greater improvement in shoulder function, when manipulation was used. This can be interpreted in the light of the neurophysiological background of each technique as PNF is mainly directed firstly toward improving the strength and coordination of the upper limb and secondly the improvement in ROM may come[32], while the peripheral manipulation technique is purely directed to improve the ROM of any part treated and this come to reality by directly dealing with the contractures and adhesions around any joint and releasing these constraints to obtain smooth ROM of the joints[33].

Our results are incompatible with those postulated by Nicholson[34] and Conroy & Hayes[35], who had specifically evaluated the effectiveness of shoulder region joint mobilization in the treatment of shoulder dysfunction. Neither study was able to demonstrate any short term improvement in shoulder function or range of movement. However, both of these trials may lack the statistical power to detect potential differences between treatment groups due to small sample sizes or the measuring devices of ROM were not highly developed to determine minute changes in ROM as the 3DMAS used in our study. Another factor can be due to the type of disease afflicting the shoulder joint in their study, as they include peripheral and central causes, while the latter need extra types of rehabilitative programs.

Brox et al.[36], also found sustained significant benefit of peripheral manipulation over placebo with respect to improved shoulder function in patients with shoulder pain. They also indicated that peripheral manipulation was as effective as surgery plus exercise in the treatment of shoulder pain following strokes.

So, we conclude from our study that peripheral manipulation of soft tissues of the shoulder joint can be considered as one of the forthcoming lines in tailoring management of shoulder dysfunction in CVS patients, standing on its competency on increasing patient satisfaction, diminishing pain and expanding ROM in such a case.

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الملخص العربي

تأثير التحريك العلاجي اليدوي الطرفي لمفصل الكتف المصاب في مرضى السكتة الدماغية

تعتبر مشاكل مفصل الكتف من أكثر المشاكل المصاحبة لمرضى السكتة الدماغية والتي تؤثر بشكل كبير على أداء وظيفة هذا المفصل وعلى وظائف الذراع بشكل عام. كما أن فقدان وظائف الكتف له دور فعال ومؤثر على مختلف أنشطة المريض وخصوصا الأنشطة اليومية الأساسية التي يتمني أي إنسان أن يقوم بها بنفسه مثل الأكل والشرب وارتداء الملابس وغيرها من مختلف أنشطة الحياة اليومية ومن ثم ينعكس هذا بالسلب على حالته النفسية. ولذلك هدفت هذه الدراسة الى بيان أثر التحريك العلاجي اليدوي الطرفي على مشاكل الكتف في مرضى السكتة الدماغية ومحاولة مساعدة هؤلاء المرضى في التغلب على مشاكل الكتف واستعادة وظائفه.

تم تقسيم المرضى عشوائيا إلى مجموعتين متساويتين (مجموعة الدراسة والمجموعة الضابطة) وقد تلقت المجموعتان برنامجا يحتوي على نموذج من التسهيل العضلي العصبي ذاتي التحفيز لمفصل الكتف (PNF) وهو عبارة عن (ثني ،فتح للجانب ودوران للخارج مع فرد مفصل الكوع). وقد تلقت مجموعة الدراسة بالإضافة لذلك نوعا من العلاج اليدوي الطرفي لمفصل الكتف . وقد إستمّر علاج كلتا المجموعتين لمدة ثلاثون دقيقة فى كل مرة بمعدل ثلاث مرات أسبوعيا.

تم تقييم المرضى قبل وبعد العلاج عن طريق تقييم إكلينيكي ويشمل اختبار التشنج العضلي (MAT)، واختبار القوة العضلية (GMP) واختبار الأنشطة الوظيفية (QOLI) مع استخدام مقياس مدى الألم المرئى (VAS). كل ذلك بالإضافة إلى تقييم المدى الحركي لمفصل الكتف أثناء أداء نموذج التسهيل العضلي العصبي ذاتي التحفيز (ثني, فتح للجانب ودوران للخارج) والعلاج اليدوي الطرفي لمفصل الكتف وذلك باستخدام جهاز التحليل الحركي ثلاثي الأبعاد (3DMAS).

وقد أوضحت نتائج الدراسة وجود فارق دّال إحصائيا فى تحسّن مدى الحركة(ROM) فى مفصل الكتف بعد الاختبار باستخدام جهاز التحليل الحركي ثلاثي الأبعاد (3DMAS) فى مجموعة الدراسة عنها فى المجموعة الضابطة حيث كان فى جميع المحاور محل الاختبار كما كان واسع المدى بالإضافة إلى أنه كان مقترنا بتحسن إكلينيكي وحركي ملحوظ فى مجموعة الدراسة فقط عنها فى المجموعة الضابطة فى تقليل التشنج العضلي (MATS)، وزيادة القوة العضلية (GMP) وزيادة رضا المريض بتحسن وظيفة مفصل الكتف (QOLI) مع انخفاض حدة الألم (VAS). من هنا نستنتج أن استخدام التحريك العلاجي اليدوي الطرفي يفيد في صياغة علاج مشاكل مفصل الكتف في مرضى السكتة الدماغية.