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Effect of Scalene and Pectoralis Minor Stretching Exercises in Patients with Carpal Tunnel Syndrome: A Case Series

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ABSTRACT

Introduction- Carpal tunnel syndrome (CTS) is considered the most common peripheral entrapment neuropathy, which manifests as unpleasant symptoms, such as burning, tingling, or numbness in the palm that extends to the fingers. As the disease progresses, individuals also report decreased grip strength accompanied by hand weakness and atrophy of thenar muscles and hence affects the activities of daily living of the patients. There are both surgical and conservative treatments available for relieving strain on the median nerve.
Purpose- To find out the effect of scalene and pectoralis minor muscles stretching exercises on pain intensity, symptoms severity and functional status in patients with CTS
Methodology- In this case series 5 diagnosed cases of CTS had undergone scalene and pectoralis minor muscles stretching exercises along with conventional treatment which included median nerve mobilization, flexor tendon gliding exercises. Treatment was given 3 times in a week for 4 weeks. Outcome measures were pain intensity, symptoms severity and functional status of hand.
Result & conclusion- There was significant reduction in pain, symptoms severity and also significant improvement in functional status of the hand in all 5 patients.

Keywords- Carpal Tunnel Syndrome, Tendon Gliding exercises, Splinting, Pain, Median Nerve Gliding exercises.

INTRODUCTION

Carpal tunnel syndrome is well known and most frequent form of entrapment mono neuropathy of upper limb which accounts for 90% of all neuropathies. It is estimated that 4-5% of the general population suffers from it. CTS affects women three times more than men and occurs between the ages of 40-60 years.[1-2]

Carpal tunnel syndrome associated with compression of median nerve at carpal tunnel which is located at wrist in between the transverse carpal ligament and carpal bones. It is characterised by sensory and motor symptoms which includes pain, numbness, tingling sensation and paraesthesia of the first three fingers and lateral part of the ring finger, which may cause nocturnal awakening and in severe cases atrophy of

thenar muscle found. this multitude of symptoms affects basic and instrumental activities of daily living and hence reduces the overall functional ability of hand.[3-4]

CTS can occur due to combination of various pathophysiologic mechanisms including increased pressure in the tunnel, median nerve microcirculation injury, median nerve connective tissue compression and synovial tissue hypertrophy.[5]

Most cases of carpal tunnel syndrome are idiopathic but several risk factors contribute in the occurrence of this syndrome such as gender, age, pregnancy, obesity, diabetes, hypothyroidism, use of oral contraceptives, hypertension, rheumatoid arthritis. Repetitive work and hand operated vibratory tool also contribute in it.[6-7]

The median nerve being a branch of the brachial plexus, travels from intervertebral foramina, scalene triangle and retro pectoralis space before entering into arms, hands and fingers. The intervertebral foramina, scalene triangle and the area beneath the pectoralis minor muscle are anatomical spaces that have been identified as sensitive places where nerve fibre compression may occur and might decreases the axoplasmic flow and results in micro-circulatory damage. Therefore, compression of the median nerve fibres at these places might result from tightness in these muscles. Stretching exercises of these two muscles added to conservative therapy may help in reducing CTS symptoms more effectively.[8-9]

Therefore, this case series aims to find out effect of scalene and pectoralis minor muscle stretching exercises along with conventional treatment on pain intensity, symptoms severity and functional status in patients with carpal tunnel syndrome.

MATERIAL AND METHODS

Type of study

Case series.

Sample and setting.

Patients were recruited from the outpatient unit of Neurology Department of post graduate institute of medical sciences Rohtak. Patients electro-diagnostically diagnosed with carpal tunnel syndrome were included in this case series. The nerve conduction studies were performed in an independent neuro laboratory. Only participants who had diminished nerve conduction velocity <50m/s and/ or increased motor latency >5m/s based on the nerve conduction study were included. Patients who had history of trauma to upper limb in last 6 months, had received steroid injection in past 3 months and patients having diabetes, neoplasms, hypothyroidism, kidney problems, cardiac ailments, pregnancy were excluded from this case series.

Methods and Methodology:

All patient were assessed for pain intensity using numeric pain rating scale (NPRS), symptoms severity using symptoms severity scale (SSS) and functional status with functional status scale (FSS) at baseline, after intervention protocol at 4 weeks and 4 weeks of follow up period:

Intervention protocol:

Intervention protocol includes stretching exercises for anterior and middle scalene muscle and pectoralis minor muscle stretching exercises along with conventional treatment which includes cervical manual traction, median nerve mobilization and hand flexor muscle tendon gliding exercises.

Anterior scalene stretch was given in sitting position and therapist applied a stretch to the patient's lateral head in the lateral and posterior direction, while also stabilising the patient's shoulder by applying pressure with the other hand. For middle scalene, patient was sitting comfortably and therapist passively bend the neck laterally in opposite direction as far as and stabilizes shoulder with another hand till the patient experienced a comfortable stretch. The stretch was maintained for 30 sec followed by 30 sec rest in between the stretches and 5 repetition was given 3 times a week for 4 weeks. For Pectoralis minor muscle stretch: Patient was standing with shoulder 90˚ abducted, elbow

90̊ flexed and palm placed on a flat planar surface. The subject then rotated the trunk away from the elevated arm, increasing the horizontal abduction at the shoulder and maximizing the stretch across the chest. Stretch was maintained for 30 sec followed by 30 sec rest in between the stretches and 5 repetitions was given 3 times a week for 4 weeks.[10--11]

Cervical manual traction was given in supine position with 25 degree of neck flexion for 10 second pull followed by 5 second rest. 10 repetition was given on alternate days for 4 weeks

Median nerve mobilization was given as described by Butler in 1991. The therapist sequentially performed the nerve mobilization as shoulder depression, shoulder abduction, forearm supination, shoulder external rotation, wrist and fingers extension and elbow extension at the end. 10 repetition was given on alternate days for 4 weeks.

For hand flexor muscle tendon gliding exercises the patient were comfortably sitting on a chair with shoulder and elbow was in 90 degrees of flexion and forearm in supination the fingers were held in five different positions - straight, hook, fist, table top, and straight fist and will hold each position for 5 sec. 10 repetition was given, 2 times in a day on alternate days for 4 weeks.

Data analysis:

Descriptive statistics was used to calculate the percentage improvement in pain, symptoms severity and functional status in patients with CTS.

RESULTS

The demographic data are shown in Table 1. The case series included 3 females and 2 males. Mean age of the patients was 52.2years. Among them 3 were non-smoker and 2 were smoker. 4 patient had symptoms in dominant hand but 1 had in non-dominant. Mean duration of symptoms were 8.6 months. The descriptive results for percentage improvement in reducing pain intensity was found ≥60% effective in all patients with CTS. The result reflected for symptoms severity found to be ≥ 50% and functional status was found to be ≥60% effective in all patients with CTS are shown in Table 2. Data reflected significant percentage improvement in pain intensity and symptoms severity and functional status of the patients with CTS.

Table 1: Demographic data of Subjects

S. No.	Subjects	Gender	Age	Hand dominance	Smoking	Duration of symptoms
1	P1	F	47	YES (R)	No	10 months
2	P2	M	52	YES (R)	Yes	8 months
3	P3	F	43	YES (R)	No	3 months
4	P4	M	72	YES (R)	Yes	12 months
5	P5	F	47	No (R)	No	10 months

Table 2: Descriptive results for pain intensity, symptoms severity and functional status

SUBJECTS	PAIN INTENSITY			SYMPTOMS SEVERITY SCORE			FUNCTIONAL STATUS SCORE		
	PRE	POST	%IMP	PRE	POST	%IMP	PRE	POST	%IMP
P1	7	1	85.71%	34	15	55.88%	22	8	63.63%
P2	8	2	75%	43	18	58.13%	21	6	71.42%
P3	6	1	83.33%	36	14	61.11%	16	5	68.75%
P4	5	2	60%	35	12	65.71%	18	4	77.77%
P5	8	2	75%	38	10	73.68%	20	3	85%

DISCUSSION

Carpal tunnel syndrome is most common entrapment mononeuropathy affecting wider population. It is characterised by sensory and motor symptoms which includes pain, numbness, tingling sensation and paraesthesia of the first three fingers and lateral part of the ring finger, which may cause nocturnal awakening and in severe cases atrophy of thenar muscle found. This multitude of symptoms affects basic and instrumental activities of daily living and

reduces the overall functional ability of hand. Authors reported that stretching exercises increases the flexibility and length of scalene muscle and pectoralis minor muscle and increase the volume of scalene triangle and retro pectoral minor space. Yong Wook Kim et al. (2016) concluded that ultrasound guided steroid injection or stretching exercises of scalene muscle might have led to reduced upper extremity paresthesia in patients with thoracic outlet syndrome. Several studies have showed that flexor tendon gliding exercises and median nerve mobilization might be a beneficial nonsurgical treatment for persons with CTS when performed in a slow and controlled manner as these gliding exercises will reduce mechanical irritation, teno-synovial edema, pressure of carpal tunnel adhesions to surrounding tissue, maintain the nerve homeostasis and improve nerve mobility, venous return and axoplasmic flow by the milking action of the exercises. Hayat Hamzah et al. (2019) also reported that median nerve mobilization was more effective than conventional treatment includes tendon gliding exercises, wrist and hand strengthening exercises, stretching and active range of motion (AROM) exercise in decreasing pain intensity and improving function Cervical manual traction enlarges the intervertebral foramina and hence relieves any compression of the cervical nerve root, improving nutrient supply and restoring the normal length and mobility of the nervous tissue at intervertebral foramina level.[12] Young ho yun et al. (2020) concluded that cervical manual traction along with median nerve mobilization was more effective than cervical manual traction alone in reducing pain and disability in patients with cervical radiculopathy.[13]

CONCLUSION

This case series concluded that scalene and pectoralis minor muscle stretching exercise along with conventional treatment significantly improves pain, symptom severity and functional status of the patient with CTS.

Declaration by Authors

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