

**MUTIFIDUS MUSCLE CROSS SECTIONAL AREA MEASURED BY MRI IN FEMALES WITH CHRONIC IDIOPATHIC NECK PAIN**Wael Gabr<sup>a,b\*</sup>, Mohamed Kamal<sup>c,d</sup>, Osama Abdel Salam<sup>e</sup>, Monzer Mustafa<sup>e</sup>, Moustafa E.M. Radwan<sup>f,g</sup><sup>a</sup> Associate professor of neurology, Neurology department, Mansoura University, Mansoura, Egypt.<sup>b</sup> Associate professor of neurology, Internal medicine department, Tiabah University, Madina, KSA.<sup>c</sup> Lecturer of Rheumatology, Rheumatology department, Alazhar University, Egypt.<sup>d</sup> Lecturer of Rheumatology, Internal medicine department, Tiabah University, Madina, KSA.<sup>e</sup> Lecturer of neurology, Neurology department, Mansoura University, Mansoura, Egypt.<sup>f</sup> Associate professor of Radiology, Radiology department, Assiut University, Assiut, Egypt.<sup>g</sup> Associate professor of Radiology, Radiology department, Taibah University, Saudi Arabia.**\*Corresponding Author: Wael Gabr**

Associate professor of neurology, Neurology department, Mansoura University, Mansoura, Egypt.

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**ABSTRACT**

Multifidus muscles asymmetry and atrophy was found to be associated with chronic idiopathic spine pain<sup>[1]</sup>, OBJECTIVE: This study tries to find a relation between chronic idiopathic neck pain and structural abnormality in multifidus muscle using MRI study Methods: 32 patients with chronic idiopathic neck pain (CINP) and 20 healthy subjects were recruited in this study. The multifidus muscle cross sectional area measured by MRI was compared in patients and control groups. P associa Results: The mean cross sectional area (CSA) in cm<sup>2</sup> of the multifidus muscle measured by MRI at the level C3, C4, C5 and C6 vertebrae were significantly reduced only in patients with severe CINP as compared to control group, while it was comparable to control group in patients with mild, and moderat CINP. There was no significant asymmetry between left and right sides in patient with CINP. Conclusion: severe CINP associated with structural changes in the neck muscles and can be detected by MRI studies. The CINP must be managed properly before development of paraspinal muscles atrophy

**KEY WORDS:** Multifidus muscles, CINP.**INTRODUCTION**

Chronic neck pain is a common complaint in outpatient clinic<sup>[2]</sup>, the relationship between clinical finding, pain intensity and the pathological finding on diagnostic imaging are usually poor.<sup>[3]</sup> In most cases the etiology can't be detected and referred to as idiopathic chronic neck pain (ICNP)<sup>[4]</sup>, which has a great impact on the patient productivity, daily activity and affects his social life.<sup>[2]</sup>

Many studies find that chronic spine pain associated with paraspinal muscle atrophy<sup>[1]</sup>, and muscle asymmetry especially in multifidus muscles<sup>[5]</sup>, which acts as extensor of the spine also it stabilizes the spine during rotation.<sup>[6]</sup> Many studies was done to explore the normal shape and size of multifidus muscle, these studies concluded that among normal population the multifidus muscles are symmetrical bilaterally, it increases in size as descend down; the muscles are small in cervical region and enlarge in thoracic and lumbar regions<sup>[7]</sup>, also it is larger in males compared to female, and its size not affected by aging.<sup>[8]</sup>

MRI studies of patient with back pain showed that the paraspinal muscles are atrophied and shorter on the affected side.<sup>[5]</sup> These finding were not observed in patients with acute back pain.<sup>[9]</sup> Study of the cross sectional area (CSA) of the muscle may be not accurate due to paraspinal muscle fatty infiltration (MFI) and subsequently the muscle CSA may not changed.<sup>[1]</sup>

The aim of this study was to compare both the size (CSAs) and the symmetry of the multifidus muscle at cervical region in subjects with chronic idiopathic neck pain using magnetic resonance imaging.

**Patients and Methods**

This study was conducted according to the guidelines of 1995 of Helsinki and was approved by our institutional ethical committee. It was conducted upon 42 female subjects (32 patients were complaining of CINP for at least 6 months duration without apparent cause even after investigation, and 20 were healthy age matched control) they are recruited from *outpatient clinic in Riyadh national hospital during the period from August 2015 to August 2016*. All patients were clinically

assessed and underwent cervical X-ray and MRI examination.

The women enrolled in this study, aged 18-45 years (mean  $\pm$ SD); body mass index (BMI), 98% were right handed.

Complete history taking with full neurological and rheumatological examination was performed for each subject; the neck pain was assessed and categorized into mild, moderate, severe and complete using Neck Disability Index (NDI) which consists of 10 items each of them is scored from 0 - 5. The maximum score is therefore 50, but in our locality female are forbidden to drive so the total score was taken out of 45 convert to 100% and divide by 2, the grading of neck pain severity was done as follows: 0 - 4 = no disability, 5 - 14 = mild, 15 - 24 = moderate, 25 - 34 = severe, above 34 = complete.<sup>[10]</sup>

All patients perform a preliminary X- ray for cervical spine to exclude the possibility of severe degenerative arthritis, local infection, osteoporosis, or cervical fracture.

Patients with previous history of cervical surgery intervention, whiplash injury, evident neurological deficit on examination, X-ray evidence of severe degenerative arthritis, body mass index more than 29, diagnosis of fibromyalgia, history of physical therapy during the last one year were excluded.

MRI Images were examined and analyzed by expert neuroradiologist since August 2015 and for one year blinded for the clinical and paraclinical test results, using (1.5T Philips Achieva, Best, The Netherlands), axial cervical MRIs T1- weighted images were performed from C3 to C7, the slices thickness was 4mm with a 0.5-mm interval the image resolution was 252 252. The multifidus muscle size was obtained bilaterally and the muscle fat infiltration was detected by T2-weighted fast spin echo images.

The statistical analysis was performed with the statistical package of social science (SPSS) and on windows ver

20-0. The continuum were expressed in number and percentage. The difference among group were determined using one way analysis of variance(t-test), for continuous data Chi square test for categorical dat. The comparison between the patients with and without brain MRI abnormality were determined by independent sample t- test.statistical significance was set at  $p < 0.05$ , correction test Receive characteristics (ROC)curve was done with calculation of sensitivity,specificity, accuracy and are used curve for detection of brain abnormalities in patients with CINP

## RESULTS

Demographic data for patients and controls groups are shown in table 1, which shows no statistical difference in age, weight, height or BMI. The disease duration were  $40.03 \pm 18.02$  months among patients group ranging between 10 to 72 months. Out of 32 patients only 3 were left handed while only one female was left handed in control group (Table 1).

The mean CSA in  $\text{cm}^2$  of the multifidus muscle measured by MRI at the level C3, C4, C5 and C6 vertebrae were comparable in patients and controls groups and fail to show statistical significant differences (Table 2).

When the patients group further subdivided into mild, moderate and severe groups according to the neck disability scale and compared to controls group there was a statistical significant difference between the CSA of multifidus muscle in the patients with severe neck pain compared to control group at all studied levels from C3 to C6, the multifidus muscles were smaller among patients with severe neck pain compared to control group. This relation was only in patients with severe neck pain while in patient belongs to mild or moderate neck pain there were no difference between multifidus muscle in patients and controls groups. The ANOVA for multifidus muscle indicated no significant effect of the side ( $F = 0.634$ ,  $P = .53$ ) both in patients and controls groups. (Table 3)

**Table (1). Demographic data of the studied groups**

	Patients	Controls	P-value
Subjects No	32 (61.5%)	20 (38.5%)	
Age (years)	$36.14 \pm 9.14$	$36.95 \pm 8.46$	0.89
Height (meter)	$1.60 \pm 0.08$	$1.61 \pm 0.08$	0.96
Weight (Kg)	$64.05 \pm 8.44$	$58.90 \pm 13.59$	0.93
Body Mass Index	$25.13 \pm 2.69$	$25.17 \pm 2.96$	0.79
Disease duration (months)	$40.03 \pm 18.02$		

The subjects are expressed in means  $\pm$  standard deviation.

**Table (2). Differences in CSA (cm<sup>2</sup>) between patients and control group**

	Patients	Controls	P-value
Multifidus C3 right	0.78±0.10	0.83±0.04	0.06
Multifidus C3 Left	0.76±0.11	0.81±0.05	0.07
Multifidus C4 right	0.83±0.10	0.88±0.04	0.06
Multifidus C4 Left	0.82±0.11	0.92±0.26	0.06
Multifidus C5 right	0.87±0.09	0.91±0.04	0.10
Multifidus C5 Left	0.86±0.09	0.89±0.03	0.12
Multifidus C6 right	0.88±0.16	0.94±0.03	0.10
Multifidus C6 Left	0.89±0.08	0.92±0.03	0.07

The subjects are expressed in means ± standard deviation.

**Table (3). Differences in CSA (cm<sup>2</sup>) according to pain severity compared to control group**

	Patients			Controls
	Mild	Moderate	Severe	
Multifidus C3 right	0.83±0.04	0.83±0.03	0.60±0.07*	0.83±0.04
Multifidus C3 Left	0.81±0.05	0.81±0.04	0.58±0.08*	0.81±0.05
Multifidus C4 right	0.88±0.04	0.88±0.03	0.66±0.07*	0.88±0.04
Multifidus C4 Left	0.87±0.05	0.86±0.04	0.65±0.09*	0.92±0.26
Multifidus C5 right	0.91±0.03	0.91±0.03	0.72±0.07*	0.91±0.04
Multifidus C5 Left	0.90±0.04	0.89±0.03	0.72±0.10*	0.89±0.03
Multifidus C6 right	0.93±0.03	0.85±0.28	0.79±0.06*	0.94±0.03
Multifidus C6 Left	0.91±0.04	0.94±0.03	0.77±0.06*	0.92±0.03

The subjects are expressed in means ± standard deviation, \*p<0.05 = statistical significant difference between the group compared to controls.

## DISCUSSION

In this study we investigate the possible relation between the cervical CSA of the multifidus muscle and the chronic neck pain, we found that the CSA of the cervical multifidus muscle is smaller in female patients with a chronic neck pain in comparison to healthy female in the same age, but this difference significant only in patient with severe neck pain while in women with mild or moderate neck pain this difference were statistically insignificant. Up to date few researches investigate the relation between chronic neck pain and the cervical multifidus muscle, unfortunately their results were not consistent with each other, while in the study of De Loose and his colleagues they found that the CSA is larger in the neck pain group compared to the control group and explained that by the possibility of greater activity of the deep neck muscles in the neck pain group<sup>[11]</sup>, on the other hand Elliott and his colleague in their study 2008, demonstrate that Fatty infiltrates in the multifidus muscle was not features of the insidious-onset neck pain but can occurs in patients with chronic whiplash-associated disorders (WAD)<sup>[12]</sup>, Elliott and his colleague in their study 2014 defeat the previous reports of increased CSA in patients with idiopathic neck pain and his results found multifidus muscle atrophy in both patients with WAD and idiopathic neck pain.<sup>[13]</sup> The controversy of the results obtained may be due to different patient samples, also patient with idiopathic neck pain were not further studied according to severity of their disease, in our study we try to enlarge the sample size and also to divide the patient according to severity of the disease using neck disability index.

Comparing the side to side differences in our studied groups revealed no significant differences between both sides in both patients and controls groups this may be attributed to our entire patient complaining of bilateral neck pain, the asymmetry in muscle size between both sides were found in most studies in unilateral neck disease.<sup>[14-16]</sup>

## CONCLUSION

Chronic neck pain affect the CSA of the cervical multifidus muscle especially in severe cases leading to atrophy of cervical multifidus muscle, so chronic idiopathic neck pain leading to structural changes in cervical muscle and must be managed before occurrence of such changes.

## REFERENCE

1. Mannion AF, Kaser L, Weber E, Rhyner A, Dvorak J, Muntener M Influence of age and duration of symptoms on fibre type distribution and size of the back muscles in chronic low back pain patients. *Eur Spine J* 2000; 9: 273-281.
2. Borghouts JA, Koes BW, Vondeling H, Bouter LM Cost-of-illness of neck pain in The Netherlands in 1996. *Pain* 1999; 80: 629-636.
3. Nordin M, Carragee EJ, Hogg-Johnson S, Weiner SS, Hurwitz EL, Peloso PM, Guzman J, van d, V, Carroll LJ, Holm LW, Cote P, Cassidy JD, Haldeman S Assessment of neck pain and its associated disorders: results of the Bone and Joint Decade 2000-2010 Task Force on Neck Pain and Its

- Associated Disorders. *Spine (Phila Pa 1976)*, 2008; 33: S101-S122.
4. Bogduk N Regional musculoskeletal pain. The neck. *Baillieres Best Pract Res Clin Rheumatol* 1999; 13: 261-285.
  5. Fortin M, Yuan Y, Battie MC Factors associated with paraspinal muscle asymmetry in size and composition in a general population sample of men. *Phys Ther* 2013; 93: 1540-1550.
  6. Stokes M, Rankin G, Newham DJ Ultrasound imaging of lumbar multifidus muscle: normal reference ranges for measurements and practical guidance on the technique. *Man Ther* 2005; 10: 116-126.
  7. Hides JA, Richardson CA, Jull GA Magnetic resonance imaging and ultrasonography of the lumbar multifidus muscle. Comparison of two different modalities. *Spine (Phila Pa 1976 )* 1995; 20: 54-58.
  8. Stokes M, Rankin G, Newham DJ Ultrasound imaging of lumbar multifidus muscle: normal reference ranges for measurements and practical guidance on the technique. *Man Ther* 2005; 10: 116-126.
  9. Fortin M, Macedo LG Multifidus and paraspinal muscle group cross-sectional areas of patients with low back pain and control patients: a systematic review with a focus on blinding. *Phys Ther* 2013; 93: 873-888.
  10. Vernon H, Mior S The Neck Disability Index: a study of reliability and validity. *J Manipulative Physiol Ther* 1991; 14: 409-415.
  11. De L, V, Van den Oord M, Keser I, Burnotte F, Van TD, Dumarey A, Cagnie B, Witvrouw E, Danneels L MRI study of the morphometry of the cervical musculature in F-16 pilots. *Aviat Space Environ Med* 2009; 80: 727-731.
  12. Elliott J, Sterling M, Noteboom JT, Darnell R, Galloway G, Jull G Fatty infiltrate in the cervical extensor muscles is not a feature of chronic, insidious-onset neck pain. *Clin Radiol* 2008; 63: 681-687.
  13. Elliott JM, Pedler AR, Jull GA, Van WL, Galloway GG, O'Leary SP Differential changes in muscle composition exist in traumatic and nontraumatic neck pain. *Spine (Phila Pa 1976)* 2014; 39: 39-47.
  14. Barker KL, Shamley DR, Jackson D Changes in the cross-sectional area of multifidus and psoas in patients with unilateral back pain: the relationship to pain and disability. *Spine (Phila Pa 1976)* 2004; 29: E515-E519.
  15. Hides J, Gilmore C, Stanton W, Bohlscheid E Multifidus size and symmetry among chronic LBP and healthy asymptomatic subjects. *Man Ther* 2008; 13: 43-49.
  16. Hides JA, Richardson CA, Jull GA Multifidus muscle recovery is not automatic after resolution of acute, first-episode low back pain. *Spine (Phila Pa 1976)* 1996; 21: 2763-2769.