

**Correlation between MRI changes of cervical spine and EMG finding in symptomatic young adult: prospective study**Kassim A. Hadi Taj-Aldean<sup>\*1</sup>**Abstract**

The purpose of this study was to determine whether subjects with abnormal EMG were more likely to have abnormal MRI findings of cervical spine than those with normal EMG. Between January 2011 and May 2014. Eighty five patients referred to the department of Hilla teaching hospital with shoulder pain underwent EMG and MRI of cervical spine. Two groups were chosen for the MRI study: the first group (n=35) consisted of the normal EMG while the second group (n=50) comprised those with abnormal. The degrees of disc degeneration, anular tear, disc herniation and protrusion were assessed by two radiologists. The differences between the two study groups were evaluated. Eighty five patients do EMG of upper limb, finding 35 patient with normal EMG (NEMG) and 50 patient with abnormal EMG (AEMG). Altogether, 510 discs were analyzed on the MR images (210 discs for patients with NEMG and 300 discs for patients with AEMG). No MR image was excluded due to inadequate visibility or artifacts. The study found that abnormal MRI findings were common in both study groups. Disc herniation was the only MRI finding that was significantly associated with abnormal EMG.

**Keywords:** MRI; Neck and shoulder pain; EMG

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Received 02 January 2015; accepted 02 March 2015; published 28 March 2015

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## Introduction

Symptomatic cervical spondylotic radioculopathy is a prevalent condition worldwide and creates enormous burden on medical and imaging resonance an effective imaging strategy for the demonstration of clinically significant cervical degenerative disease is a fundamental requirement for the management of this condition. MRI has replaced CT myelography in many centers for the imaging of cervical spondylotic radioculopathy because of its high soft tissue discrimination and its multiplanar capability [1].

Inaccurate radiographic diagnosis may be a major cause of poor surgical outcomes. Any surgical decision should be based on symptoms firmly up ported by radiographic evidence [2]. Magnetic resonance (MR) imaging findings and clinical symptoms do not necessarily correlate in the lumbar spine. This has been investigated extensively in asymptomatic individuals [3-8] who may have disk bulging, disk protrusion, or, more rarely, disk extrusion at presentation. Nerve root compression, however, appears to be infrequent in asymptomatic volunteers [6-8].

Magnetic resonance (MR) imaging of the cervical spine combined with standard radiography may represent the reference-standard examination for the work-up of patients with cervical radiculopathy [9, 10]. The diagnostic performance of MR imaging of cervical spine degeneration has been documented in several studies [11-13].

It has been demonstrated that 15% of adolescents suffer from weekly neck and shoulder symptoms [14, 15], the prevalence increases with age [14] and the symptoms among adolescents have increased during the last decade [16]. Neck and shoulder pain is thought to be multi-etiological. There is evidence to show that various work-related factors, such as repetitive tasks and working with the arms raised or the neck bent forward, are related to neck and shoulder pain [17, 18].

Magnetic resonance imaging (MRI) is the most sensitive technique for showing early pathologic changes in cervical spine [19]. Only a few MRI studies of cervical spine have been carried out among subjects with neck pain, abnormal MR morphology of cervical spine was a more common finding in a group of subjects with chronic head/neck pain than among asymptomatic subjects [20].

This study aimed to determine whether subjects with abnormal EMG were more likely to have abnormal MRI findings of cervical spine than those with normal EMG.

## Method

85 patients (52 female, 33 male, age range 18–36 years, average age 23 years) with had been suffering from neck and shoulder symptoms. Patients with a history of previous cervical surgery were excluded from this study, all patients do EMG in Merchan teaching hospital. Two groups were chosen. The first group consisted of the participants who had reported normal EMG (normal EMG group=NEMG). The other group comprised those who had been abnormal EMG (abnormal EMG =AEMG). According to these criteria 35 NEMG subjects and 50 AEMG subjects were found.

Since the MRI study was carried out in the Al Hilla teaching Hospital, MRI was performed on a 1.5 T Intera scanner (Philips Medical Systems) using a phased array spine coil. Each patient was prospectively imaged using the following MR protocol: sagittal turbo spin echo (TSE) T1 weighted images (repetition time (TR) 397 ms, echo time (TE) 14 ms, TSE factor 3, acquisition time 4:09); sagittal TSE T2 weighted images (TR 2498 ms, TE 110 ms, TSE factor 16, acquisition time 4:02); axial T2 weighted images (Driven equilibrium spin echo, TR 1200 ms, TE 120 ms, TSE factor 34, acquisition time 6:20, slice thickness 1.7 mm) from C3 to T1; MR myelography (single shot TSE, TR 8000 ms, TE 1000 ms, TSE factor 256, acquisition time 3:36). MR myelographic images were automatically reconstructed as maximum intensity projections and presented as 9 consecutive images at 22.5° intervals, extending from a right lateral to a left lateral projection. This process did not significantly add to the examination duration.

Two radiologists assessed the MR images cooperatively through discussion, unaware of the participants' pain history. The MR images were reanalyzed separately by both radiologists. The morphology of cervical spine was categorized as showing either no anomaly or anomaly. The posture of cervical spine was evaluated as normal, slightly straightened lordosis, straightened or kyphotic. The degrees of disc degeneration, annular tear, herniation and protrusion were assessed separately.

### *Statistical analyses*

Statistical analyses were performed using SPSS 20.0 for windows. Inc. Data were expressed as mean±SEM. Analysis of Variance (ANOVA) was used for the multiple comparisons among all groups followed by post-hoc tests using LSD method. In all tests;  $P < 0.01$  was considered to be statistically significant.

**Results**

Eighty five patients do EMG of upper limb, finding 35 patient with normal EMG (NEMG) and 50 patient with abnormal EMG (AEMG). Altogether, 510 discs were analyzed on the MR images (210 discs for patients with NEMG and 300 discs for patients with AEMG). No MR image was excluded due to inadequate visibility or artifacts.

No abnormal findings were detected in the facet joints or muscles of the spinal area in the images of NEMG, all of which were in the AEMGG. According to the pain drawing, one of the four subjects suffered from radicular pain in the upper arm (Table 1). The difference between the study groups in the proportion of herniated discs was statistically significant (Table 2). Altogether, 46 discs (25%) were degenerated, of which 38 (83%) were classified as slightly degenerated (grade 1) and 8 (17%) as moderately degenerated (grade 2). The AEMGG subjects had 40 and the NEMG subjects 26 degenerated discs (Table 2).

Thirty-two annular tears (17%) were found, of which 21 (66%) were slight, 9 (28%) moderate and 2 (6%) severe. Fourteen of the tears were in the SG and 18 in the NSG. Forty-seven disc protrusions were detected, 37 (79%) of which were classified as slight and 6 (21%) as moderate. The SG subjects had 18 and the NSG subjects 29 disc protrusions.

abnormal	NEMG subjects N=35	AEMG subjects N=50
Disc degeneration	7	10
Annular tear	9	10
Disc bulging	5	9
Disc protrusion	10	14
Disc herniation	-	11
No finding	4	10

**Table 1.**

Subjects with abnormal magnetic resonance image in (MRI) findings in the normal EMG group (NEMGG) and abnormal EMG group (AEMGG).

abnormalities	NEMG N=219	AEMG N=301	Total N= 520
Disc degeneration	59	72	131
Degree I	14	17	
Degree II	25	31	
Degree III	20	24	
Anular tear	43	64	107
Disc bulging	53	70	123
Disc protrusion	64	85	149
Disc herniation	-	10	10

**Table 2.**

Proportions of abnormal disc findings on MRI in the NEMG and AEMG

Age	Number
18-20 years	22
20-22years	35
22-24 years	28
total	85

**Table 3.**

Distribution of cervical pain in relation to age of patients.

Sex	Number
Male	33
Female	52

**Table 4.**

Distribution of cervical pain in relation to sex.

## Discussion

The results showed that pathological changes of cervical spine in a 24- to 27-year-old population were equally common in symptomatic and asymptomatic subjects. Disc herniation was the only finding significantly associated with neck pain. The finding is in agreement with the study by Schellhas et al. [19], in that abnormal MRI findings are also common in asymptomatic subjects.

However, Schellhas et al. found pathological findings to be more common in symptomatic participants; 73% of the discs were morphologically abnormal in the pain group. The main interest in their study was to assess the accuracy of MRI and discography in identifying the sources of cervical discogenic pain. The age variation was wider (21–48 years) and the mean age higher (34.1 years) than in our study.

The criterion of neck pain was also different, as the participants with cervical symptoms had been suffering from pain for a minimum of 6 months before referral for discography. The classification of abnormalities of cervical spine was analyzed dichotomously as morphologically normal/abnormal.

The age variation of the study population and the criterion of neck pain may have caused the discrepancy in the results. As far as we know, no other MRI studies concerning subjects with neck and shoulder pain have been done so far. All the four disc herniations detected were found in symptomatic subjects, which indicates that possibly only severe pathophysiological changes of discs are associated with neck pain. We could not, however, ascertain the causality between herniation and neck pain in this study. DD and disc protrusion were the most common abnormalities.

The prevalence of DD and disc protrusion were higher than those reported by Lehto et al. [12], who found DD in 3(14%) of the 21 asymptomatic 20- to 23-year-old young adults. No disc protrusions were detected. Matsumoto et al. [17] also found the prevalence of DD and disc protrusion in a 20- to 29-year-old population. The Kappa scores for the two radiologists were 0.67 for DD, 0.44 for annular tears, 0.52 for disc protrusions, and 1.0 for hernias. These show fair to strong agreement.

There were four disc herniations visible lower than in our study. Since DD and disc protrusion were more common findings in the NSG than the SG, the difference between the study populations concerning cervical symptoms does not explain the discrepancy

between the results. Instead, the difference in the imaging system and the classification of DD and disc protrusion may have caused the different results. The limitation of the study is the fairly small sample. However, the study groups were carefully selected based on neck pain history. The study groups were originally derived from a large population consisting of [18-20] high school students.

**In conclusion;** the results expressed as above, pathophysiological changes of cervical spine verified on MRI seem not to explain any remarkable part of the occurrence of neck and shoulder pain in young adults. The results of our study indicate that pathophysiological changes, such as DD and disc protrusion, are surprisingly common findings in cervical spine even among young adults. However, it is possible that only severe changes are associated with neck and shoulder pain. It seems that other factors, such as a heavy workload, dysfunction of muscle metabolism and psychosocial factors, may also contribute to neck and shoulder pain. Because of the small study sample, the finding has to be considered as preliminary and its findings need to be verified in a larger population.

### Competing interests

The author declare that there is no conflict of interest.

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