Original Research Article

Frequency of MRI Findings in Patients with Neck Pain

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Abstract: ***Background and objective:*** Neck pain is one of the most important factors for degenerative changes in cervical spine. Magnetic Resonance Imaging (MRI) is best imaging modality for evaluation of changes in cervical spine due to neck pain. The aim of this study is to determine the frequency of MRI findings in patients with neck pain. ***Material and methods:*** A convenient sample of 78 patients with neck pain was used in this descriptive cross-sectional investigation referred to radiology department of Gondal medical complex Gujranwala for evaluation of MRI findings of cervical spine in patients with neck pain during a time period of 4 months from January 24, 2022 to May 24, 2022. MRI was done using 1.5T scanner. ***Results:*** The patients belonged to the age group were between 13 to 80 years old, with a mean age ± SD of 44.83 ± 14.22 years. This study showed that female (53.8%) ratio was higher than male (46.2%). Total of 78 patients was suffering from neck pain only 10 were observed with radiating shoulder pain. There were no degenerative findings found in 16 patients. The most common radiological findings were disc osteophyte which account for 46 (59.0%) more prevalent at C5/C6 level. ***Conclusion:*** In this study, neck pain is commonly caused by degenerative changes in cervical spine and it is more common at C5/C6 level. MRI is best modality and it's a non-invasive approach for detecting degenerative diseases early and initiating treatment.
Keywords: Neck pain, Cervical spine, Cervical spondylosis, MRI, Modic changes.

INTRODUCTION

The cervical spine is composed of seven vertebrae. It is divided into two main parts: the upper and lower cervical spines. The upper cervical spine is made up of two parts: C1 (atlas) and C2 (axis). C3 through C7 vertebrae make the lower cervical spine (Windsor *et al.*, 2017). There are eight pairs of cervical nerves (C1 to C8) that conduct motor and sensory impulses (Waxenbaum *et al.*, 2019). Cervical spine comprises disc segments and synovial joints that are linked together via ligaments and muscles. As it does not carry the weight just like lumber spine, it has great flexibility while compromising stability (Izzo *et al.*, 2002). The cervical spine is split into three categories: the suboccipital zone, which is located on the C1 vertebrae, the transitional zone, which is made by the C2 vertebrae, and the typical zone, that is made by the C7 vertebrae and distinguishes primarily in structure and function (Bogduk, 2016). Neck pain is a significant issue in the healthcare profession. As per research studies, 20-65 percent of women and 15-40 percent of men have had neck and shoulder problems at a certain point in their lives, and the incidence increases exponentially (Bovim *et al.*, 1994; Guzman *et al.*, 2009). Neck pain is the second most frequent musculoskeletal disease in population - based studies and patient care, and it is, like low back pain, causes a substantial health and financial stress, and is also a prevalent cause of impairment (Siivola *et al.*, 2002). The most frequent cause of typical neck pain are muscle sprains and strains, labral injuries, and spinal degenerative changes (Cohen & Hooten, 2017).

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Degenerative abnormalities in frequent neck pain individuals include degenerative disc pathology and disc herniation. Previous trauma can also trigger degenerative changes (Daffner, 2010; Karki *et al*., 2015). The cervical intervertebral disc has traditionally been thought to be a frequent cause of neck problems (Peng & DePalma, 2018). Due to immense load that neck pain has on society, it generates roughly a quarter of the financial support and attention that back pain gets (Cohen & Hooten, 2017). According to literature, the dynamics of this zone are affected by many hereditary and physiological parameters, like age, gender, profession, and weight, and also have consequence on the cervical spine's susceptibility to progressive change. Even relatively harmless daily tasks like standing, walking, and laying down can trigger spine disorders (Gunning *et al*., 2001). Persistent neck ache is perhaps the most prevalent symptom amongst younger cervical spondylosis individuals (Lv *et al*., 2018).

Cervical spondylosis is indeed a chronic degenerative alteration with in cervical spine that influences the intervertebral discs, vertebral bodies, ligaments, tendons, and paravertebral muscles. This can proceed to disc herniation, bone deformity, cervical spondylotic radiculopathy, or cervical spondylotic myelopathy (Lo *et al*., 2007; Ma *et al*., 2017; Puvanesarajah *et al*., 2017). Age and work both are possible causes for cervical spondylosis (Hadjipavlou *et al*., 2008; Zejda & Stasiów, 2003). Cervical spondylosis is generally considered to be an elderly disorder (Ito *et al*., 2019; Mamata *et al.,* 2005). The most commonly used imaging feature of cervical spondylosis is cervical disc degeneration (Kelly *et al*., 2012; Peng & DePalma, 2018). Excluding the C7/T1 and C2/C3, disc degeneration is prevalent with in mid-cervical spine (C5/C6) and develops toward advanced disease; disc protrusion gets infrequent at C2/C3. It must be differentiated by a sequence of degenerative changes which include intradiscal tears with osteophytic growths, disc space loss, capsular thickening, spur development, and ligamentous hypertrophy. Cervical spine joint degenerative disorders are more common with in fourth and fifth decades of living and is linked with the aging process (Yaqoob *et al*., 2022). Modic abnormalities, primarily MC1, are believed to be linked with progressively increasing degeneration (Kerttula *et al*., 2012)

Magnetic resonance imaging (MRI) is a non - invasive imaging method that is widely used to evaluate the possible reasons of neck pain. Changes in MRI outcomes amongst individuals seem thought to be linked to age, gender, and quality of life (Alghamdi & Alqahtani, 2021). Whereas MRI is widely used to examine possible explanations of neck pain, the connection among both MRI findings of cervical spine degenerative changes and neck pain is not so well described (Wang *et al*., 2019) Magnetic resonance imaging (MRI) is frequently used for patients with symptomatic spine problems along with its good effectiveness in identifying disc abnormalities (Ubaid & Al-Najjar, 2020).

MATERIAL AND METHOD

This study was a cross sectional study involved a convenient sample of 78 patients who fulfilled the inclusion criteria of neck pain and radiating shoulder pain referred to the radiology department of Gondal Medical Complex Gujranwala during the time period of 4 months from 24 February to 24 May 2022. Patients with history of trauma, surgery, infection and those who were contraindicated to MRI was excluded from this study. After the topic was approved by the University of Lahore, Pakistan review board and ethical committee, the patient was informed that there was no risks and an appropriate diagnosis would be provided. All patients gave their informed consent. For data collection a special Performa was made which included patient age, gender, and symptoms according to these given variables data was collected. MRI was done using 1.5 Tesla Scanner (Siemens) for the evaluation of cervical spine. T1-weighted sagittal images TR/TE (350-550/10-40 milliseconds), FOV (260×260 cm), slice thickness (5mm), T2-weighted sagittal images TR/TE (3000-4000/100-120 milliseconds), FOV (250×250mm), slice thickness (5mm) and for axial images TR/TE (5000-8000/100-120 milliseconds), FOV (220×220mm), slice thickness (5mm) these protocols were used for cervical spine imaging. The images were reviewed and reported by trained consultant radiologist at Shaukat khanum memorial hospital Lahore. The data was analyzed using statistical package for social sciences SPSS version 22. Descriptive statistics in the form of mean, standard deviation, frequencies and percentages was taken.

RESULTS

In this research total 78 patients were selected on the basis of inclusion criteria. Statistics was applied on the entire data from which 36 (46.2%) were male patients whereas 42 (53.8%) were female patients. The majority of the patients associated with neck pain were females in comparison to male.

According to this study analysis (6.4%) patients belong to 11-20 years age group, (14.1%) patients belong to 21-30 years age group, (26.9%) patients belong to 31-40 years age group, (24.4%) patients belong to 41-50 years age group, (16.7%) patients belong to 51-60 years age group, (7.7%) patients belong to 61-70 years age group, and only (3.8%) patients belong to 71-80 years age group (Table 1). The most frequent age group associated with neck pain was 31-40 years. Minimum age recorded was 13 year and maximum age was 80 year.

Table 1: Shows the age and sex of the patient with neck pain

Age group	Male	Female	Total	Percent (%)
11-20	3	2	5	6.4
21-30	6	5	11	14.1
31-40	7	14	21	26.9
41-50	9	10	19	24.4
51-60	5	8	13	16.7
61-70	4	2	6	7.7
71-80	2	1	3	3.8
Total	**36**	**42**	**78**	**100.0**

Out of 78 patient everyone had a history of neck pain and radiating shoulder pain was observed in (13.9%) male and (11.9%) female (Table:2). There were no degenerative changes found in 16 patients in which 11 were females and 5 were male. The radiological finding of degenerative changes includes: disc osteophytes 46 (59.0%), disc bulge 23 (29.5%), disc herniation 9 (11.5%), disc dehydration 17 (21.8%), stenosis 13 (16.7%), narrowing of canal 16 (20.5%), cord compression 6 (7.7%), nerve root compression 13 (16.7%), straightening of cervical spine 27 (34.6%), and modic changes type 2 7 (9.0%) (Table 3). All the variables had the highest prevalence at C5/C6 and C6/C7 level (Fig A and B).

Table 2: Showed that (13.9%) male and (11.9%) female was suffering from shoulder pain

Shoulder pain				
Gender of patient			Frequency	Percent
Male	Valid	Positive	5	13.9
		Negative	31	86.1
		Total	36	100.0
Female	Valid	Positive	5	11.9
		Negative	37	88.1
		Total	42	100.0

Table 3: Shows degenerative findings in patients with neck pain

Degenerative MRI findings	Frequency	Percent (%)
Disc osteophyte	46	59.0
Disc bulge	23	29.5
Disc herniation	9	11.5
Disc dehydration	17	21.8
stenosis	13	16.7
Narrowing of canal	16	20.5
Cord compression	6	7.7
Nerve root compression	13	16.7
Straightening of spine	27	34.6
Modic changes type 2	7	9.0
Total	**177**	**(100.0)**

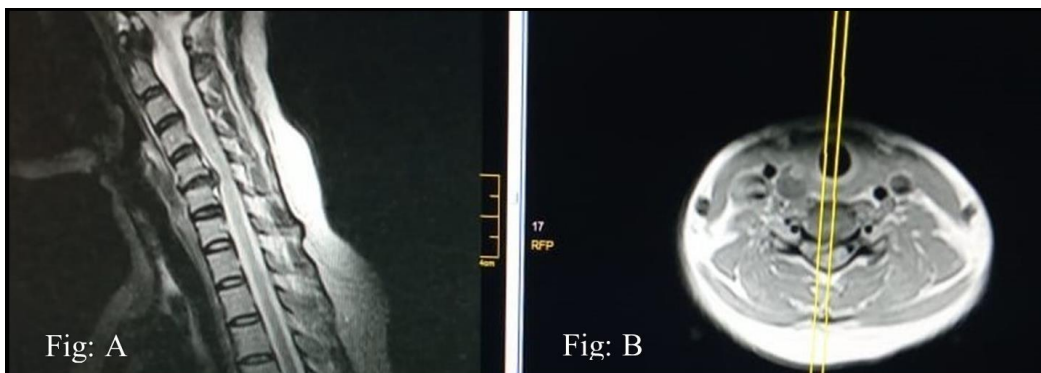∗Some patients had more than one degenerative change in cervical spine.

Fig A and B: Shows Disc osteophyte at the level of C5/C6

DISCUSSION

Cervical degenerative disease is most common, and can be difficult to discriminate between pathological changes and the normal ageing. Little degenerative changes in the spinal column develop during the first two decades of life, so they become more apparent in the third decade and even beyond. Usually occur at the region of vertebral discs and it's most prominent at C5/C6 and C6/C7 (Ali *et al.*, 2014) In this study the clinical symptom was only neck pain and those patients who were suffering from radiating shoulder pain, while similar results was seen in a study in North Nigeria which showed that patient was suffering from neck pain, radicular pain (involving arm, shoulder and hand), other symptoms was also included like gait abnormalities, sensory abnormalities and motor dysfunction (Olarinoye-Akorede *et al.*, 2015). Our study showed female predominance over male which was 42 were female and 36 were male, but there was no differences found in gender according to the study done in Iraq (Hashemi *et al.*, 2003). The most common features of degenerative disease of cervical spine in our study were disc osteophytes which account for (59.0%), straightening of spine (34.6%), disc bulge (29.5%) and disc dehydration (21.8%). Our findings agreed with the fact that neck pain was the common symptom of degenerative changes (Olarinoye-Akorede *et al.*, 2018). In this study the most common level of degenerative changes was at C5/C6 and C6/C7. Same result was seen in Saudi Arabia and Switzerland (Ubaid & Al-Najjar, 2020). This study has several limitations, such as the reality of patient responds to treatment for pathological changes were not followed due to a shortage of time. The sole disadvantage of MRI is that it is expensive, however with the diagnostic performance and effectiveness, it is still a good option.

CONCLUSION

According to the results of this study, the majority of patients with neck symptoms suffered cervical degeneration at a certain stage of life. Some patients along with neck pain also experienced shoulder pain. Degenerative findings include: disc osteophyte which was more prominent but other findings were also noticed like disc bulge, disc herniation, disc dehydration, stenosis, canal narrowing, cord compression, nerve root compression, cervical spine straightening, and type 2 Modic alterations. Some of the abnormalities were more prominent at the C5/C6 and C6/C7 levels. Neck pain found strongly linked with degenerative changes.

MRI is a useful screening tool to determine cervical spine abnormalities that causes neck pain. This is the most effective method for early diagnosis, monitoring, and management of cervical spine disorders. For better results, further research on degenerative changes must be done on larger sample sizes.

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