

Evaluation of Cervical Disc Degeneration in Patients with Neck Pain on Magnetic Resonance Imaging

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Abstract

Background: Cervical disc degeneration is the most common pathology that in most of the cases clinically present as

Objective: To evaluate the cervical region abnormalities in patients with neck pain on magnetic resonance imaging.

Methodology: In this descriptive study 180 adult patients were included. All patients had been collected from DHQ hospital Gilgit and Ghurki Trust teaching hospital. After informed consent, data were collected through 1.5 tesla GE (closed bore) and 0.35 tesla Hitachi (open bore) MRI machines.

Results: Findings show that among 180 adult patients, 136 presented with disc degeneration among which 81 were males and 55 were females. Among 81 males, 63 had disc degeneration at multiple levels while 18 had single disc degeneration. In females 35 patients showed multiple disc degeneration while 20 involved a single disc.

Conclusion: It is concluded that disc degeneration is prevalent in males than females. Disc degeneration at multiple levels is higher than single disc degeneration in both genders.

Keywords: Disc degeneration, magnetic resonance imaging.

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Introduction:

Neck pain is prevalent in the general population. It constitutes that about 30% of the population of people affected by persistent pain¹. There are many factors that cause neck pain in the general population. Factors related to health that elicit neck pain are previous pain episodes, pain in body regions related to the neck, and physical and mental exhaustion. Factors other than health includes age and gender². One of the structure that elicit neck, upper extremity pain and headache include cervical intervertebral disc³. cervical vertebral disc is consider as one of the most common source of neck pain⁴. Pain from disc is thought to originate from annular tears or disc degeneration (DD)⁵. The prevalence of disc degeneration is found to be 14% in individuals less than 40⁶. There are 25 intervertebral disc that lie between the adjacent surfaces of the vertebra uniting them from the axis to the sacrum with 6 disc in the cervical region⁷. The most important function of the intervertebral disc is mechanical, it transmit loads, dissipates energy and help in mobility of joint⁸. Cervical degenerative disease is common and it is often difficult to distinguish pathological changes from the normal aging process. Neck, shoulder, and brachial pain is frequently encountered and the majority of patients presenting with these symptoms do not need consideration for surgery. Patients and doctors may feel that there is “something” that should be done although, in fact, this is rarely the case. MRI scans may well reinforce this delusion by demonstrating abnormalities. Such findings must, however, be put into perspective. Cervical disc degeneration reaches a prevalence of nearly 95% by the age of 65 years, so it is hardly surprising if the majority of patients have some abnormality on their scan.⁹

Disc degeneration is common incident but there is no universally proved definition of disc degeneration. According to surgeons and radiologists disc is degenerated if osteophytes are present and signal intensity is lost on MRI. Whereas the majority of patients with C6 and C7 radiculopathies had diagnostic motor, reflex, and sensory changes. In this series more than three quarters of patients had neck pain, over a half had scapular pain, and nearly a fifth anterior chest pain.¹⁰

Most herniated discs will lead to painful limitation of neck motion, particularly neck extension or rotation to the side of the pain. Some patients gain relief of symptoms by raising an arm or resting the hand on the back of the head. Worsening of symptoms with Valsalva activities is common.

The most common levels of disc herniation are C5/C6 and C6/C7 leading to compression of the C6 and C7 roots, respectively. C3 root compression is very rare and may present with pain and numbness around the mastoid and pinna. C4 root compression may cause pain and numbness in the back of the neck, over the scapula, and sometimes the anterior chest.¹¹

In sagittal T2 weighted image of MRI, the nucleus pulposus appears hyperintense while the surrounding annulus fibrosus appears hypointense. However a degenerated disc appears dark and the nucleus pulposus is not well differentiated from the annulus fibrosus. a disc can be categorized as degenerated if it exhibits at least one of the following imaging findings :desiccation ,fibrosis ,narrowing of the disc space ,diffuse bulging of the

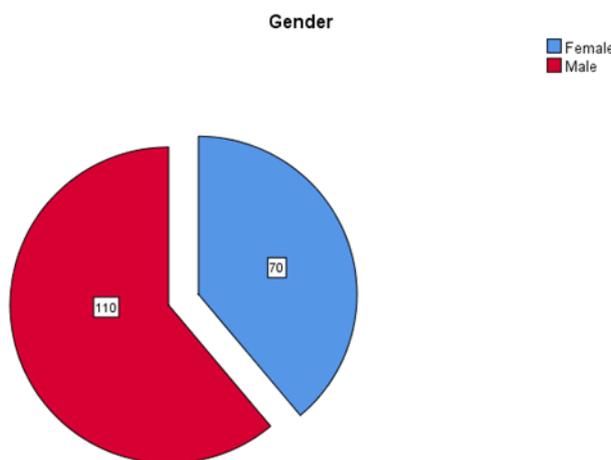
annulus beyond the disc area, extensive fissuring defects and sclerosis of the end plates ,or osteophytes at the vertebral apophyses. ¹²

Magnetic resonance imaging has played a dynamic role in our study for the investigation of neck pains that associate with different cervical spine pathologies. Disc degeneration related pathologies was most prevalently found on Magnetic resonance imaging. Our study will bring a profound effect in not only the management of the cervical spine pathology but will also play a key role in devising the surgical plan for multiple pathologies.

Results:

Gender		
	Frequency	Percent
Female	70	38.9
Male	110	61.1
Total	180	100.0

Table 1: Represents that out of 180 patients, 110 were males and 70 were females.



Disc Degeneration		
	Frequency	Percent
Absent	44	24.4
Present	136	75.6
Total	180	100.0

Table 2: Represents that disc degeneration was present in 136 patients and was absent in 44

Single/Multiple		
	Frequency	Percent
Multiple	98	54.4
Nil	44	24.4
Single	38	21.1
Total	180	100.0

Table 3: Represents that multiple disc degeneration was present in 98 patients and single disc degeneration was present in 38 while 44 patients were normal.

		Disc Degeneration		Total
		Absent	Present	
Gender	Female	15	55	70
		21.4%	78.6%	100.0%
	Male	29	81	110
	Count	26.4%	73.6%	100.0%
Total	Count	44	136	180
	% within gender	24.4%	75.6%	100.0%

		Single/Multiple			Total
		Multiple	Nil	Single	
gender	Female	35	15	20	70
	Count	50.0%	21.4%	28.6%	100.0%
	Male	63	29	18	110
	Count	57.3%	26.4%	16.4%	100.0%
Total	Count	98	44	38	180
	% within gender	54.4%	24.4%	21.1%	100.0%

Table5: Represents the number of disc degenerated in males and females. Single disc degeneration was present in 20 females and 18 males. 20 females and 29 males had disc degeneration at 2 levels while 10 female and 23 males had degeneration at 3 levels .disc degeneration at four level was present in 5 females and 11 males.

		Frequency of Disc degeneration					Total
		0	1	2	3	4	
gender	Female	15	20	20	10	5	70
	Count	21.4%	28.6%	28.6%	14.3%	7.1%	100.0%
	Male	29	18	29	23	11	110
	Count	26.4%	16.4%	26.4%	20.9%	10.0%	100.0%
Total	Count	44	38	49	33	16	180
	% within gender	24.4%	21.1%	27.2%	18.3%	8.9%	100.0%

Disc Degenerated	Frequency	Percent
C3-C4	5	13.2
C4-C5	3	7.9
C5-C6	23	57.8
C6-C7	7	18.4
Total	38	100.0

Table 6 and 7 : Represents the frequency of disc degeneration at single level of cervical vertebra.it shows that frequency of C3-C4 is 5 C4-C5 is 3 C5-C6 is 23 and C6-C7 is 7.C5-c6 is most commonly degenerated disc at single level.

Discussion

Neck pain is fairly prevalent in the adult population which may be due to pathological or age related changes. The incidence of cervical degenerative diseases rises with increasing age and cervical intervertebral disc degeneration (IVDD) is identified to be the main cause of spine disorders which result in neck pain as reported by Pinjie Chen, Chunlei Wu¹³.

In the present descriptive study, out of 180 patients having neck pain 110 were males and 70 were females with their age ranging from 14 years to 83years. Cervical disc degeneration was present in 136 (75.6%) individuals out of which 81 were males and 55 were females. Disc degeneration at multiple levels was seen in 63 males and 35 females while single disc degeneration was present in 18 males and 20 females. In this study we found that disc degeneration at single level was most common at C5-C6 followed by C6-C7 which is in agreement with a study by Morio Matsumoto et. al who studied 497 asymptomatic subjects to evaluate disc degeneration¹⁴.

In the present cross sectional study disc degeneration at two levels were most common at the level of C5-C6, C6-C7 and second most common was at C4-C5, C5-C6 and was least at C4- C5, C7-D1. Suzuki et. Al (2018), analyzed the pattern of cervical disc degeneration in 1059 symptomatic patients and concluded that single level degeneration was more common in C5-C6, C4-C5 and C6-C7 respectively. Multilevel degeneration mostly occurred in C5/C6 & C6/C7 followed by C4-C5 & C5-C6 and C3-C4 & C4-C5. Continuous level of degeneration was more common as compared to skip level degeneration. C7-T1 and C2-C3 were rarely involved in multilevel degeneration. Middle cervical region C5-C6 was most commonly affected with degenerative changes¹⁵.

In our study, multi-level disc degeneration is more frequent than single level disc degeneration. After analysis of data in the present study it is found that C4-C5, C5-C6, C6-C7 was most affected in individuals having disc degeneration at three levels of cervical vertebra and C2-C3, C3-C4, C4-C5 was rarely affected. Degeneration at four different levels of vertebra was common at the level of C3-C4, C4-C5, C5-C6, and C6-C7. Chul Hun Kim conducted a magnetic resonance study of cervical spine in 92 patients with neck pain to evaluate the severity of disc-degeneration and disc protrusion and reported that abnormal degenerative changes at more than one disc was seen in a total of 88 (95.7%) patients. No patient had any degeneration at the C2-C3 disc; but 9 (39.13 %) had a protruding C3-C4 disc, 52 patients (56.52%) had a protruding C4-C5 disc and 45 patients (65.22%) presented with C5-C6 or C6-C7 disc protrusion. The current study shows that in patients with single level degeneration, there was none in which the C2-C3 level was affected. 5 patients (13.2%) had degeneration changes at the C3-C4 level and 3 patients (7.9%) at C4-C5 level degeneration while 23 patients (57.8%) and 7 patients (18.4%) demonstrated degenerated changes at C5-C6 and C6-C7 levels respectively.¹⁶

Nakashima et al (2015), carried out a study on 1211 healthy subjects to determine the frequency and distribution of abnormalities of cervical on MRI the age of subjects ranged from 20 to 70 years. Their study concluded that disc bulging was most commonly seen in about 87.6% subjects. Spinal cord compression was seen to mainly occur at single level 58% or two level 38% mostly affecting C5-C6 (41%) and C6-C7 (27%).¹⁷ These abnormalities increased with age in frequency and severity .In our present study results conclude that multilevel disc degeneration was present in 98 patients (54.4%) and 38 patients (21.1%) had single level disc degeneration. Both studies also demonstrate that C5-6 and C6-7 were the most commonly degenerated levels and that C2-3 and C7-D1 were rare to show degenerative changes.



Image 1 shows disc degeneration shows at multiple levels at C4, C5, and C6

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