

Original Research Article

Efficiency of Magnetic Resonance Image Versus Electrophysiological Studies In Patients Presented with Neck Pain and Backache in Babylon Province

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Abstract

Neck pain and backache shows major problems in the society and a common reason for consulting a physician, a rheumatologist, an orthopedic, a physiotherapist, etc.

Evaluate the diagnostic accuracy of both electro diagnostic tests and MRI in patient presented with neck pain and lower back ache as well as demonstrate the disproportion between them and their relation to history and clinical findings in Babylon province.

Two hundred fifty subjects of both male and female were involved in this study, 100 with neck pain, 50 with back ache and the other 100 as a control group, ranged from 30-60 years, all of them were free from other medical and neurological diseases which could affect peripheral or central nervous system .

It was conducted on a comprehensive medical and neurological examination in addition to the overall general physical examination of the cervical spine and lumbar sacral spine examination and electrophysiological study which include both nerve conductive study and EMG as well as MRI were done for all the involved groups study. The electrophysiological test were done at the neurophysiology unit of Merjan Teaching hospital in Babylon City ,during the period April\2015 to October 2015.

This study revealed that cervical neck pain and back pain is more common in female than male . In neck pain 89 % had positive EMG results and mainly the C5-C6 roots lesion segment. Majority of patients had moderate roots lesions severity (49.75%) while those who had sever degree showed the lowest percentage (12.4%). 94% showed positive MRI, most of patients had bilateral root lesion (49.4%) and in unilateral, the left side is more common (32.6%).

In this study females were more prevalent than males in developing neck and back pain and these increases with the age. EMG could be more dependable test than MRI in diagnosis root lesion and determining the chronicity of it in which MRI could not reach it, while NCS has little role in diagnosis these cases, so to give more accurate and imperceptible information in diagnosing root lesion both MRI and electro diagnostic study should be done.

Key Words: MRI: magnatic resonance image, EMG: electromyography, NCS: nerve conduction study.

الخلاصة

تشكل الام الرقية والظهر مشكلة كبرى للمجتمع، وهو سبب شائع لاستشارة طبيب الامراض الباطنية ، طبيب امراض المفاصل ، طبيب أمراض العظام ، طبيب العلاج الطبيعي... الخ . تهدف هذه الدراسة الى: ١- تقييم دقة تشخيص الاختبارات الكهروفسلجية في المرضى الذين يعانون من آلام الرقية وآلام الظهر في محافظه بابل. ٢- تقييم دقة تشخيص التصوير بالرنين المغناطيسي في مرضى آلام الرقية وآلام الظهر. ٣- إثبات التناسب بين الدراسات الكهروفسلجية ونتائج التصوير بالرنين المغناطيسي.

شملت هذه الدراسة ٢٥٠ شخصاً، منهم: ١٠٠ مريضاً يعانون من الآم الرقية وكذلك ٥٠ مريضاً يعانون من الآم الظهر ، وكذلك ١٠٠ شخصاً طبيعياً بعد استثناء الامراض الاخرى التي تؤثر على الجهاز العصبي. الفحوصات الكهروفسلجية تم إجرائها في وحده الفسلجة العصبية في مستشفى مرجان التعليمي في مدينه بابل للفترة من نيسان ٢٠١٥ الى تشرين الاول ٢٠١٥.

وقد أجريت تاريخ طبي شامل بالإضافة إلى الفحص العام الشامل البدني، وفحص العمود الفقري العنقي والقطني العجزي بالرنين المغناطيسي والدراسة الكهرو فسلجية للعصب الوسطي والعصب الزندي والعصب الشظي والعصب الظنبوبي لكل من مرضى الام الرقبه والام الظهر الذين بدت عليهم الاعراض والاشخاص الطبيعيين، وقد شملت هذه الدراسة الاعمار التي تتراوح بين ٣٠-٦٠ سنة.

اثبتت هذه الدراسة ان الاناث هي الاكثر شيوعا لالام الرقبه والالام الظهر، بالنسبة لالام الرقبه كان هناك (٨٩٪) من المرضى لديهم نتائج موجبة بالنسبة لتخطيط العضلات وغالبية المرضى كانوا يعانون من تهدل الفقرات العنقية للجذور (C5-C6) في تخطيط العضلات والرنين المغناطيسي. وكان غالبية المرضى يعانون من اصابة الجذور العنقية المتوسطة الشدة (49.75%) واقلهم كان يعاني من إصابة شديدة للجذور (12.4). معظم المرضى الذين يعانون من آلام الرقبه الثنائية (49.4%) كانت آلامهم تنتقل الى كلا الاطراف اما الام الرقبه من جهة واحده فالجانب الايمن هو الاكثر شيوعا حوالي (32.6%).

الاستنتاج: ١- آلام الرقبه وآلام الظهر تصيب مجموعه الاعمار المتوسطة والكبيرة ولها علامات واعراض مختلفه. ٢- الإناث هي أكثر انتشارا من الذكور في اصابات آلام الرقبه وآلام الظهر وهذا يزيد مع التقدم في العمر. ٣- التصوير الكهربائي يمكن أن يكون اختبار يمكن الاعتماد عليه في تشخيص وتحديد شدة آلام الرقبه وآلام الظهر أو مضاعفاته التي لا يمكن للرنين المغناطيسي الوصول لها. ٤- دراسة التوصيل العصبي له دور قليل في تشخيص الام الرقبه والام الظهر. ٥- إعطاء معلومات دقيقه جدا في تشخيص الآفة الجذرية في كليهما، وينبغي أن يتم التصوير بالرنين المغناطيسي ودراسة تشخيصية كهربائية.

Introduction

Neck pain and backache are a major problem, and it constitutes an important a common reason for consultation with physician, rheumatologist orthopedic, physiotherapist, etc [1].

Cervical and lumbosacral radiculopathy are the results of irritation and/or compression of the nerve roots as it exits the spine and it consider the most common cause of neck and backache in which the pain may be described as a dull ache, piercing pain, or a burning sensation. The pain may radiated to the shoulder, arms and hands as well as the legs or feet, and may include paresthesia ,tingling as well as weakness and may be accompanied by motor or sensory deficits in areas innervated by the affected nerve root [2].

Diagnosis of these major problem is suggested by history and corresponding physical examination findings, confirmation is achieved with MRI and electrodiagnostic study. Magnetic resonance imaging (MRI) considered as the method of choice for the evaluation of the spine in which it is a non-invasive technique, without exposing the patient to the risk of radiation and it reveals an excellent soft tissue contrast[3].

Nerve conduction studies of the electrodiagnostic tests is a useful tool to assess the function of the peripheral

nervous system and to determine the underlying pathology whether axonal or demyelinating conditions in diagnosing both diffuse and focal neuropathy [4].

Needle electromyography (EMG) is performed to exclude, diagnose, describe and follow diseases of the peripheral nervous system and muscle. Needle electromyography refers to the recording and study of electrical activity of muscle using a needle electrode [5].

Materials and Methods

Three groups were involved in this study, 100 patients presented with neck pain, 50 patients presented with backache and third one is 100 control subjects.

At the neurophysiology unit of Merjan Teaching hospital in Babylon City ,during the period April\2015 to October 2015, the electrodiagnostic tests were performed.

All the involved groups were chosen to be free from any medical and neurological problems, as well as the disease that affect the function of the nerves ,such as diabetes mellitus, hepatic failure, renal failure , patients with pace maker, history of previous median and/or ulnar nerves and brachial plexus injury or mechanical problems in the neck or back were excluded in this study, regarding the control subjects were from hospital working staff and

relatives, all their age ranged from 30-60 years old.

Instruments Used in this Study

1. Electromyography:

EMG is a technique used to detect the electrical potential generated by muscle cells to evaluate and record the electrical activity produced by the skeletal muscle fibers [6,7]

2. Nerve Conduction Studies:

is a technique used to evaluate the function of the peripheral nervous

system by detecting the amplitude and conduction velocity of both sensory and motor fibers for median, ulnar, peroneal, tibial and sural nerves of both upper and lower extremities [8].

3. Magnetic Resonance Imaging

This investigation gives many detailed information about the spinal cord, intervertebral discs, bones, and soft tissue structures [9].

Results

Table 1: Distribution of neck pain patients according to socio-demographic variables .

Socio-demographic variables		
Age (years)	(48.66± 7.908)	(30-60)
Gender		
Male	26	26%
Female	74	74%
Total	100	100.0%

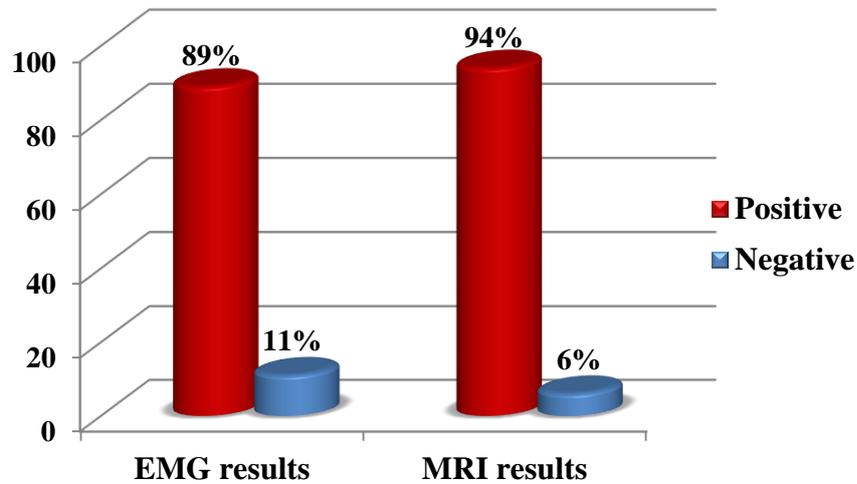


Figure 1: Distribution of patients according to EMG and MRI results. (Neck pain patients).

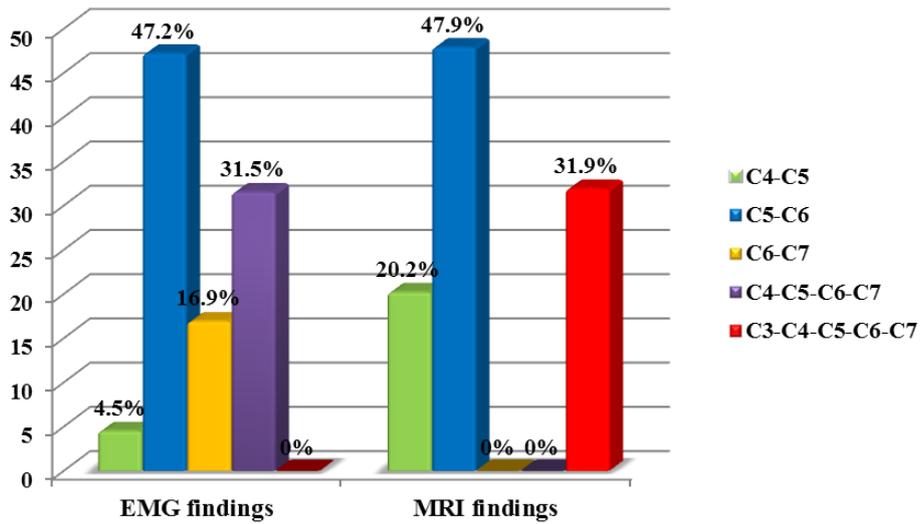


Figure 2: Comparison of EMG findings versus the MRI findings regarding root affected of patients with cervical radiculopathy.

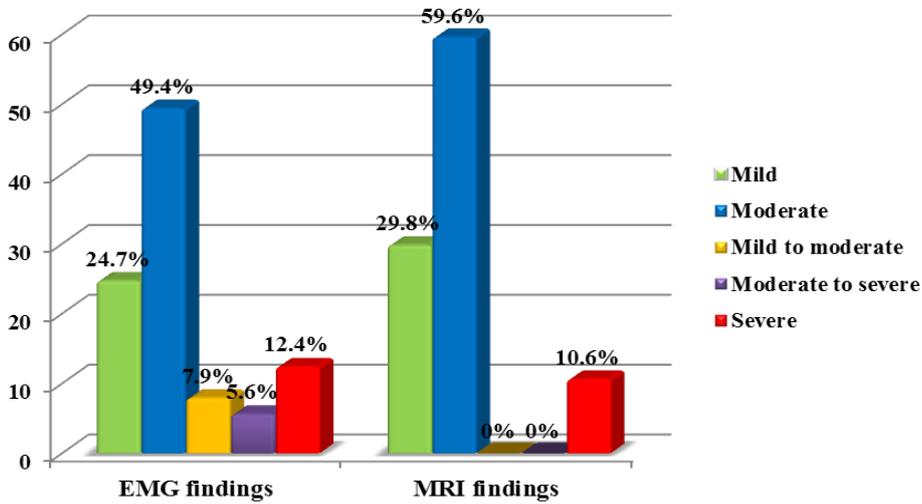


Figure 3: Comparison of EMG findings versus MRI Finding Regarding Severity of Cervical Radiculopathy

Table 2: Comparison of EMG findings versus MRI finding regarding cervical radiculopathy (Neck pain patients).

EMG findings versus MRI finding		MRI finding (cervical radiculopathy)		Total
		Present	Absent	
EMG findings (cervical radiculopathy)	Positive	87	2	89
	Negative	7	4	11
	Total	94	6	100

Sensitivity = $(87/94) \times 100 = 92.6\%$

Specificity = $(4/6) \times 100 = 66.66\%$

Positive predictive value = $(87/89) \times 100 = 97.7\%$

Negative predictive value = $(4/11) \times 100 = 36.36\%$

Overall accuracy = $(87+4/100) \times 100 = 91\%$

Table 3 : Distribution of backache patients according to socio-demographic variables

Socio-demographic variables. Back pain patients		
Age (years)	(48.88± 7.51)	(30-60)
Gender		
Male	48	48%
Female	52	52%
Total	100	100.0%

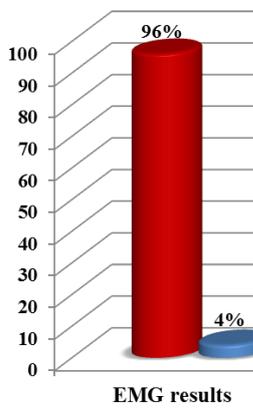


Figure 4: Distribution of backache patients according to EMG and MRI results.

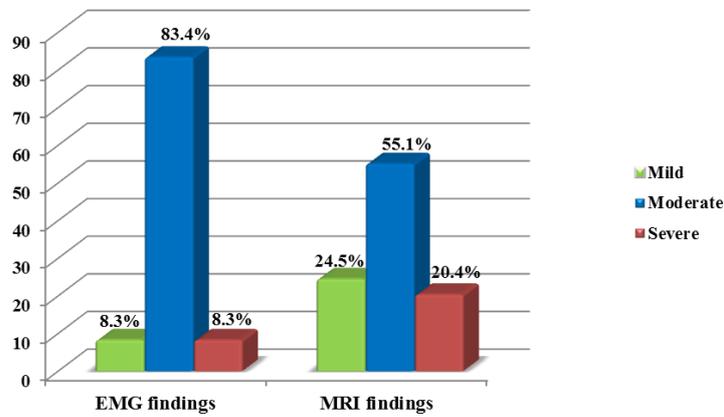


Figure 5: Comparison of EMG findings versus the MRI finding regarding severity of lumbar radiculopathy.

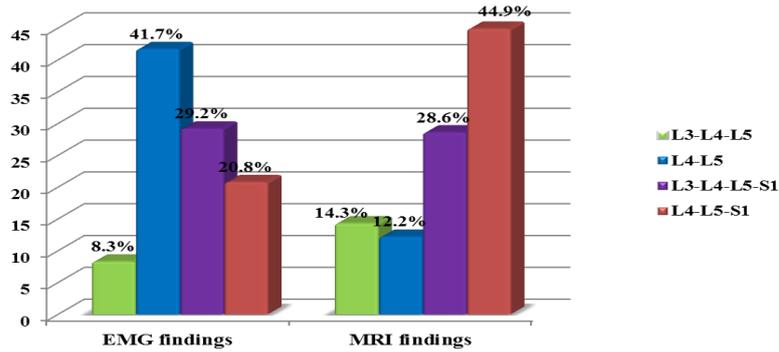


Figure 6: Comparison of EMG findings versus the MRI finding regarding root affected of patients with lumbar radiculopathy.

Table 4 : Comparison of EMG findings versus MRI finding regarding lumbar radiculopathy.

EMG findings versus MRI finding		MRI finding (lumbar radiculopathy)		Total
		Present	Absent	
EMG findings (lumbar radiculopathy)	Positive	48	0	48
	Negative	1	1	2
	Total	49	1	50

Sensitivity = $(48/49) \times 100 = 97.95\%$

Specificity = $(1/1) \times 100 = 100\%$

Positive predictive value = $(48/48) \times 100 = 100\%$

Negative predictive value = $(1/2) \times 100 = 50\%$

Overall accuracy = $(48+1/50) \times 100 = 98\%$

Statistical Analysis: It was performed using SPSS version-17 [10].

Discussion

All the patient groups ranged between 30 to 60 years and most of them were female results agreed with [11,12], in which they found that the prevalence of neck pain is highest in middle age female. This results disagreed with [13], who found that the majority of symptomatic neck pain and back pain patients are found between the ages of 30 and 60, and that men are more affected than women. The distribution of patients with neck pain according to EMG and MRI results ,According to EMG (89%) of patients diagnosed as cervical radiculopathy, while according to MRI (94%) of patients diagnosed as cervical radiculopathy.

In This study , 89% of patients were positive for electromyography findings. The results revealed that electromyography was specific test in diagnosis neck pain and determine its severity in neck pain patients .This findings agreed with [14].

In control group: 11 % revealed negative results, This indicates that ectromyography is a sensitive test and can demonstrate neurological changes even in asymptomatic persons, This agreed with [15].

This result did not agree with [16], who demonstrated that in radiculopathy; EMG and NCS, have little prognostic value in radiculopathy when compared to clinical and psychosocial factors.

The distribution of patients with cervical radiculopathy according to EMG results

including (severity, chronicity, EMG side and root affected). According to this study , majority of patients revealed C5-C6 roots involvement, This result agreed with [17] which they demonstrated that radiculopathy (nerve root compression) due to cervical prolapse usually occurs at the C5-C6,C6- C7 [18], in which it reveals that the most common cause of cervical radiculopathy is disc herniation at C5-C6 leading to root compression at the C6 level, with clinical and neurological examination the biceps and triceps reflex which are innervated by the fifth and sixth cervical nerve roots, are usually decreased.

This result not agreed with [19], who demonstrated that whenever there is increase in joint motion this will lead to the growth of osteophyte , and this is most clearly visible at C5-C6 and C6-C7 as well as these two levels regarded as the most common sites for disc prolapse, with C6-C7affected more often than C5-C6, Most of patients in this study had moderate cervical root lesions on electromyography and chronic cervical radiculopathy, this means that most of patients seek medical advice after the disease had been progress to moderate or severe Or the pain became in tolerable when the cervical roots lesion severity progressed to moderate or severe .

In this study most of patients had bilateral neck pain and in unilateral pain ,the left side is more common [20], this may be due to the reason that chronic neck pain usually associated with spondylosis

which is typically bilateral, whereas neck pain due to root lesion is more commonly unilateral in which the pain radiate according to the involved root and the corresponding area which innervate by it.

This indicates that patients in this study had symptomatic vertebral prolapse and some of them their conditions complicated to radiculopathy.

Regarding sensitivity, specificity, positive and negative predictive value of EMG findings in comparison to MRI finding regarding cervical radiculopathy, The sensitivity of EMG to detect cervical radiculopathy was (92.6%) that mean the EMG was able to detect approximately (93%) patients with cervical radiculopathy correctly meanwhile, its specificity was (66.66%) that mean the EMG was able to detect approximately two half of those persons free from cervical radiculopathy correctly. The positive predictive value was (97.7%) that means approximately (98%) of patients with cervical radiculopathy according to EMG are more likely to have real cervical radiculopathy, meanwhile, the negative predicative value was (36.36%), which means only (36%) of those free from cervical radiculopathy according to EMG are really free from cervical radiculopathy. these result agree with [21], due to this more specific in diagnosis of chronic neck pain.

The sensitivity, specificity, positive and negative predictive value of EMG findings in comparison to MRI finding regarding lumber radiculopathy ,The sensitivity of EMG to detect lumber radiculopathy was (97.95%) that mean the EMG was able to detect approximately (98%) patients with lumber radiculopathy correctly meanwhile; its specificity was (100%) that mean the EMG was able to detect approximately all persons free from lumber radiculopathy correctly. The positive predictive value was (100%) that means approximately all patients with lumber radiculopathy according to EMG are more likely to have real cervical radiculopathy; meanwhile, the negative predicative value was (50%), which means half of those free from

lumber radiculopathy according to EMG are really free from lumber radiculopathy. These result agree with [22]. The distribution of patients with lumber radiculopathy according to MRI results regarding the severity and the most common root affected, these results agreed with [23] who demonstrate that L4-5 is the commonest involved level in lumbosacral radiculopathy, followed by L5-S1 and L3-4 and this may be due to lumbar spondylosis which considered a more common cause of radiculopathy in older adults [24].

Conclusions

Neck pain and back pain were aging disease effects middle and old age groups, has different signs and symptoms. Females were more prevalent than males in developing neck pain and back pain and these increases with the age. Electromyography could be more dependable test than MRI in diagnosis root lesion and determining the chronicity of it in which MRI could not reach it.

4-Nerve conduction study has little role in diagnosis cervical neck pain and back pain.
5-To give more accurate and imperceptible information in diagnosing root lesion both MRI and electro diagnostic study should be done.

References

1. Aggarwal, P; Aggarwal B, Jain, D. 2010. Clinical approach to neck pain. *Indian Journal of Rheumatology* ; 5(4): 193–198.
2. Boutin R, Steinbach L, Finnesey K. (2000). MR imaging of degenerative diseases in the cervical spine. *Magn Reson Imaging Clin N Am.*, 8(3):471–490.
3. Mitchell T, O’Sullivan PB, Burnett AF, Straker L, Smith A. 2008. Regional, differences in lumbar spinal posture and the influence of low back pain. *BMC Musculoskelet Disord* 9: 152
- 4.Schoeck A; Mellion, M; Gilchrist J. Christian F. 2007. Safety of nerve conduction studies in patients with implanted cardiac devices. *Muscle Nerve.*;(35):521–524.
- 5.Boutin R; Steinbach L. Finnesey K. 2000. MR imaging of degenerative diseases in the

- cervical spine. *Magn Reson Imaging Clin N Am.* ;8(3):471–490.
6. Reaz M. BI, Hussain, MS, Mohd-Yasin, F. 2006. Techniques of EMG signal analysis: detection, processing, classification and applications.
 7. Nikias CL, Petropulu AP. *Higher-Spectral Analysis: A Nonlinear Signal Processing Framework.* Prentice Hall; New Jersey, 1993.
 8. Philips EP. 2001. *Cliffs Quik Review anatomy and physiology,* Hungry Minds, Cleveland, New York, PP:133-119.
 9. Song K, Choi B, Kim G, Kim, J. 2009. Clinical usefulness of CT-myelogram comparing with the MRI in degenerative cervical spinal disorders: is CTM still useful for primary diagnostic tool.
 10. Daniel WW. 2009. *Biostatistic: A foundation for analysis in the health sciences.* 7th ed. John Winey. Philadelphia.: pa. 55.
 11. Binder A. 2007. Cervical spondylosis and neck pain. *BMJ*(334):527-531 Blumenthal ,S; Herskovitz S, Verghese J. 2006 .Carpal tunnel syndrome in older adults. *Muscle Nerve,* (34):78–83.
 12. Sarig-Bahat H. 2003. Evidence for exercise therapy in mechanical neck disorders. *Man Ther;*(8):10-20.
 13. Kelly J, Groarke P, Butler J, Poynton A, O'Byrne J. 2012. The Natural History and Clinical Syndromes of Degenerative Cervical Spondylosis. *AdvOrthop.* ; (2012): 393-412.
 14. Fisher M. 2002. Electrophysiology of radiculopathies. *Clinic Neurophysiol,* 113 (3):317-35.
 15. Chichkova, R, Katzin L. 2010. EMG and Nerve Conduction Studies in Clinical Practice. *Practical Neurology* ;(19):32-38.
 16. Miranda P, Gomez P, Alday R. 2008. Acute traumatic central cord syndrome: analysis of clinical and radiological correlations. *J Neurosurg Sci.* ;52(4):107-112.
 17. Abbed K, Coumans J. 2007. Cervical Radiculopathy: Pathophysiology, Presentation, And Clinical Evaluation. *Neurosurg,* 60:S-28–S-34.
 18. Polston D. 2007. Cervical radiculopathy. *Neurol Clin.,* 25(2):373- 385.
 19. Boyles R, Toy, P; Mellon J, Hayes, M, Hammer B. 2011. Effectiveness of manual physical therapy in the treatment of cervical radiculopathy: a systematic review. *J Manual and Manipulative Therapy,* 19 (30): 135-142.
 20. Rhee J, Yoon T, Riew K. 2007. Cervical radiculopathy. *J Am Acad Orthop Surg;* 15(8):486–494.
 21. J. C. van Rijn N. Klemetso JB. Reitsma et al, 2006. Symptomatic and asymptomatic abnormalities in patients with lumbosacral radicular syndrome: clinical examination compared with MRI. *Clinical Neurology and Neurosurgery,* 108(6): 553–557.
 22. Curlee PM, 2008. Spinal Stenosis. In: Canale ST, Beaty JH, editors. *Campbell's Operative Orthopaedics,* 11 ed. Mosby :2274-2288.
 23. Amato AA, Russell JA 2008. *Neuromuscular Disorders.* United States of America: McGraw-Hill Professiona
 24. Summers BN, Singh JP, Manns RA. 2008. The radiological reporting of lumbar Scheuermann's disease: An unnecessary source of confusion amongst clinicians and patients. *British J Radiol.,* 81 (965): 383–5.