

Myelography in Spinal Disorders - experience of 1400 Cases

Introduction

Myelogram is an X-Ray taken by injecting a contrast agent in the Spinal sub-arachnoid space to see if there is any decrease or blockage in the flow of cerebrospinal fluid in the spinal canal.¹

It is used for the evaluation of multiple disorders of the spine such as degenerative disc diseases, neoplasm of vertebral bodies, thecal sac, spinal nerves, blood vessels, and spinal cord, traumatic spine and infectious disorders of spine.²

With the recent advances in neuroimaging such as computed tomography scans and MRI scan, the role of myelography is on the decline in the developed countries but in under developed countries such as Pakistan this is a very useful test for the diagnosis of spinal disorders as it is cost effective and also relatively less expensive technology is used in this procedure.³

Nevertheless Myelography has also an important role in the presence of computed tomography and magnetic resonance imaging, as with these sophisticated neuro-imaging techniques, abnormal findings are commonly seen in the spine, even in patients who are asymptomatic.⁴ They have a false positive rate of approximately 20% in patients with spinal stenosis.⁵

If a patient has a low backache radiating to lower limbs, but with a normal myelogram, surgery is not advised as in this case Myelogram is the gold standard test for diagnosis of lumbar disc disease.⁶ The purpose of this study is to evaluate the diagnostic accuracy of myelography in spinal disorders, in correlation with clinical presentation of the patients.

Material and Methods

This study was conducted in the department of Neurosurgery Chandka Medical College Hospital Larkana from 1st July 1998 to 30th June 2003. This was a prospective study, for data collection. The Proforma contained categories of age, sex, clinical presentation of the patients with symptoms and signs, myelographic findings, other investigations required to confirm the diagnosis and surgical finding along with histopathology.

Chandka Medical College Hospital is a tertiary care

Hospital with catchment area of whole of northern Sindh (Larkana & Sukkur Divisions) along with vast regions of Balouchistan province. The hospital has limited resources without facilities of sophisticated neuro imaging and a neuro radiologist. The author performed all Myelograms using X-Ray Machine with tiltable table.

Myelogram was done in patients with spinal disorders as low backache with radiation to leg, neurogenic claudication, Para paresis and paraplegia or quadriplegia and quadriplegia, spinal injuries and spondylitis of various aetiologies.

Myelogram was done on an outpatient basis. Only those patients were admitted who had block or other findings on Myelogram correlating with clinical presentation. Patients with a normal myelogram and neurological disability secondary to a spinal disorder were referred to another hospital in another city with neuro- imaging and neuro-physiological facilities.

For myelography the following guidelines were followed:

- Informed consent on a printed Proforma, was taken with full explanation regarding hazards and risks involved in the procedure.
- Needle size used were 20, 22 and 25 gauges depending upon the patient's age and built.
- Xylocaine 2% was used as a local anesthetic.
- Non-ionic, water-soluble contrast agent Iohexol was employed in all cases.
- Position adopted was left lateral and needle was inserted either at L4 L5 region or C1 C2 region depending upon the disease and clinical presentation.
- Appropriate equipment was arranged such as ambubag, endotracheal tube, laryngoscope with all necessary resuscitating drugs to handle the adverse reactions such as seizures, vasovagal reactions and cardio pulmonary collapse.
- X-Ray was taken in antero-posterior, lateral and oblique projections. Other views taken as per requirement of the condition.

Post myelogram patients were advised to take plenty of fluids to excrete out the contrast agent. At least 4 liters of water daily with complete bed rest for 24 hours was necessary.

Exclusion Criteria included:

- Known significant intra cranial pathology with papilloedema.
- Historical or laboratory evidence of coagulopathy.
- Previous Myelography performed within one week.

- History of significant reaction to iodinated contrast media.
- History of seizures without any treatment (Medication was given for 3 days then asked to come back)
- Localized infection at the region of puncture.
- Pregnancy

The radiologist's help was taken for interpretation of myelogram and MRI studies

Results

One thousand and four hundred patients were selected for study, 935 were males and 465 were females. Male to female ratio was 2:1. The age ranged from 8 to 65 years with a mean of 38 years (Table 1). Myelogram was done by lumbar puncture in 1365 (97.5%) cases, while by C1, C2 puncture in 35 (2.5%) cases. Spinal disorders diagnosed on myelography by correlation with clinical presentation are shown in Table 2.

Table 1. Age and sex distribution of patients.

Age group	Male	Female	Total	Percentage
8 years to 15 years	88	3	123	9
16 years to 36 years	452	238	690	49
37 years to 47 years	233	130	363	26
48 years to 65 years	162	62	224	16
Total	935	565	1400	100

Of 149 cases where no block was detected, 85 had paraparesis of sudden onset. They were referred from medical units to exclude a surgical lesion. Twenty-two of the 149 cases with complete spastic paraplegia with no block on myelography were subjected to MRI (magnetic resonance imaging) and 13 (59%) were diagnosed as epidural tuberculous granulomatous involvement of spine confirmed by surgical histopathology. Two patients had

Table 2. Clinical presentation of patients along with myelographic findings

Clinical presentation	No. of patients	Percentage	Myelographic findings
Low backache radiating to legs	836	59.7	Lumbar disc prolapse
Neck pain radiating to arms	85	6	Cervical disc prolapse
Inability to walk up stairs and progressive weakness of lower limbs	15	1	Dorsal disc protrusion
Neurogenic claudication	113	8	Lumbar spinal stenosis
Progressive weakness of lower limbs	36	2.5	Spinal tumors
Backache with low grade fever	53	4	Infective spondylitis
Spina bifida	28	2	Spinal dysraphism
History of trauma to spine	85	6	Spinal canal compromise with fracture and dislocations
Weakness of limbs of sudden onset and spinal pain	149	10.7	No block
Total	1400	100	

non-Hodgkin's lymphoma, while in remaining 7 cases a doubtful inflammatory lesion was diagnosed on MRI.

In 20 cases of 149 patients suffering from quadriperesis, epidural empyema was diagnosed on MRI in 8 cases while in 12 no pathological lesion of

surgical consideration was found.

In 22 cases out of 149, there was a history of severe

Table 3. Pathological lesions of surgical significance found in patients with normal myelography but having findings on MRI scan.

Diagnosis/histopathology	No. of patients	Percentage
Epidural tuberculous granulomatosis	13	8.72
Hon-Hodgkins lymphoma	2	1.34
Epidural abscess/empyema	8	5.36
Total	23	15.42

neck pain along with radiation to upper limbs. No block on myelogram. MRI scan in these patients was within normal limits. In this study, 836 (60%) patients were suffering from lumbar disc disease where xylographic findings correlated with clinical presentation of lumbar disc protrusion.

Of 836 cases with lumbar disc prolapse, 32 (4%) were not satisfied with the results of myelogram. MRI scan was performed for confirmation of diagnosis and the same findings were obtained without any discrepancy (Figure 1). Of 36 patients diagnosed to have spinal tumors on myelogram, 16 were of intradural origin of whom 9 were diagnosed to have meningioma on histopathology while 7 had neurofibromas (Figures 2a and 2b).

Fifteen patients had extradural tumors of whom 13 had metastasis from lungs and prostate and 2 had non-Hodgkin's lymphoma. Five cases of suspected spinal cord tumors were referred for MRI scan and did not return for further work up. Of 28 cases with spinal dysraphism, 16 were suffering from spinal cysts of congenital origin (Dermoid, epidermoid) while in 10 cases spinal lipomatosis and 2 diastematomyelia was found.

In traumatic spine 36 cases out of 85 had canal compromise of more than 75% on myelography and under went decompressive surgery. Cases with infectious involvement of vertebrae (Osteomyelitis/Spondylitis) myelogram was done in 53 patients. Surgery was performed in 38 patients. Tuberculous spondylitis was diagnosed in 26 subjects (Figure 3). Eight cases had pyogenic osteomyelitis and 2 had fungal spondylitis (Aspergillois). In 17 cases where prominent psoas shadows were seen- with less than 25% canal compromise and high probability of tuberculous spondylitis, empiric anti tuberculosis therapy started for 21 days. Fifteen patients had a good response. Surgical biopsy was done in 2 cases revealing non-Hodgkin's lymphoma.

Adverse reactions after myelography was noted in 228 (16.2%) cases where 194 (85%) had post-myelo headache with nausea and vomiting. It resolved with bed rest, plenty of fluids and analgesics. Neck stiffness which resolved with analgesics and muscle relaxants was seen in 25 (11%) cases. Six cases developed meningitis

(2.63%) which was cured with antibiotic therapy corresponding to CSF culture and sensitivity. Two cases undergoing cervical myelography developed seizures which were generalized tonic clonic and patients had no previous history of seizures. Immediate intravenous diazepam, 0.2mg per kg body weight, controlled the seizures.

Discussion

Myelography was the gold standard test for diagnosing lumbar disc prolapse before the advent of computed tomography scans and magnetic resonance imaging.⁷ According to Miller and Krauss myelography is still a useful diagnostic tool specially in the presurgical evaluation of degenerative diseases of the cervical and lumbar spine.⁸

In this study myelogram was done mostly in patients (60%) with low backache radiating to lower limbs. As this is the commonest problem in rural areas of Pakistan where farming and cultivation of land is the main profession of the people, resulting in early degeneration of disc and its prolapse. In this study, myelogram gave 100% diagnostic accuracy when patients were properly selected with a careful history taking and neurological examination.⁹

Recent literature also confirms that when magnetic resonance imaging (MRI) is not available or if the patient has claustrophobia, then myelogram is a useful alternative.^{4,10}

It should also be noted, that computed tomography and magnetic resonance imaging have false positive rates of 20% in patients with low backache and spinal stenosis. The MR imaging examination is some times indeterminate and non-diagnostic and often shows many abnormalities that are difficult to correlate with clinical data.^{5,8}

In this study mostly the disc prolapses found were at the level of L4, L5 and L5, S1 region. This correlates with other studies as 95% of all lumbar disc prolapses occur at this level.¹⁰⁻¹²

The second common disorder found in this study was spinal stenosis in 8% of the cases. Here myelographic findings showed hourglass appearance of contrast flow with demonstration of wavy tortuous roots of cauda equina. Here also myelographic diagnosis was accurate as according to Barynski and Lin, myelography is more accurate than MR imaging for detecting nerve root compression in the lateral recess. In their study it was noted that conventional myelography correctly predicted impingement of nerve root in 93% to 95% of the lateral recess whereas MR imaging under estimated root compression in 28% to 29% of the cases.^{5,13,14} Thoracic disc prolapse found in 1% of the cases in this study was similar to other studies.^{10,15} For the diagnosis of thoracic disc prolapse CT myelogram is preferred as most of the

discs are calcified.^{7,16}

Myelogram was also found useful in the diagnosis of spinal tumors specially of intradural origin while in rest of the neoplasms only a probable diagnosis could be offered. In these conditions magnetic resonance imaging is preferred. For cervical spine disorders, myelogram was also found not very informative. However only large centrally prolapsed discs were identifiable on myelogram as in other studies.¹⁷

The only advantage of cervical myelogram is that the resulting imaging captures the entire length of the cervical spine from the foramen magnum to thoracic spine.

Regarding infective spondylitis, plain radiographs were also found useful and informative. Myelograms were done only in cases where suspicion of canal compromise was present. In this study only 4% of the cases were of infective origin.¹⁸

In spinal dysraphism myelogram was also found informative in cases of dermoid, epidermoid and lipomatosis of spinal canal. However MRI is very informative and helpful in planning surgery.⁷ Most of our cases were therefore referred to other centres and myelogram was done in only 2%.

Regarding traumatic spine, myelogram was done in 6% of the study cases. Although imaging in trauma is largely replaced by MRI, myelography combined with computed tomography is a very useful technique for the evaluation of patients with acute spinal injuries. However myelography does not provide multi planer imaging but it outlines both bones and neural structures and their relation to each other, is clearly visualized in a least expensive easily available single procedure.¹⁹

However MRI is still the choice procedure but myelography can be done if MRI is not available or contraindicated in patients with pace makers, aneurysm clips, prosthetic heart valves or patients with claustrophobia.²⁰

In this study myelogram was done in traumatic spine only when spinal cord syndrome was present but with no fracture dislocation shown on plain radiograph, unexplained post traumatic radiculopathy and delayed onset of neurological disability.

It is concluded that myelogram is economical (costing Rupees 1200 to 1500, against MRI cost Rupees 6000 to 7500) and can be easily performed by radiologists, neurosurgeons or neurologists working in the regional centers with limited facilities of modern neuro-imaging. Myelogram is a very useful test in evaluating patients whose symptoms are strongly suggestive of disc herniation or spinal stenosis. Myelogram is also very effective in decision making when multi level disc disease is found and when it is not known which level is causing the symptoms.

References

1. Daffner RH, Clinical Radiology: the essentials. (2nd ed.). Baltimore: Williams and Wilkins, 1998; pp 85-98.
2. Stratemeier PH: Evaluation of the lumbar spine. A comparison between computed tomography and myelography. Radiol Clin North Am, 1983;21:221-57.
3. Clarke CE, Shepherd DI, Yuill, GM. A critical appraisal of in patients neurological services in a sub-regional Centre. Br J ClinPract. 1992;46:243-48.
4. Lurie JD, Gerber PD, Sox HC. A Pain in the Back - Clinical problem solving. N Eng J Med 2000;343:723-26.
5. Kent DL, Haynor DR, Larson EB, et al. Diagnosis of lumbar spinal stenosis in adults: a meta-analysis of the accuracy of CT, MR and myelography. Am J Radil 1992;58:1135-44.
6. Kerr RS, Cadoux-Hudson TA, Adams CB. The value of accurate clinical assessment in the surgical management of lumbar disc protrusion. J Neurol Neurosurg Psychiatry 1988;51:169-73.
7. Stevens JM. The spine and spinal cord. In: Sutton D, Young JW (eds). A concise text book of clinical imaging. 2nd ed. St.Louis: Mosby, 1995, pp: 803-23.
8. Miller GM, Krauss WE. Myelography: still the gold standard. Am J Neuroradiol. 2003;24: 298.
9. Deyo RA, Rainville J, Kent DL. What can the history and physical examination tell us about low back pain? JAMA.1992;268:760-65.
10. Patel N. Surgical disorders of the thoracic and lumbar spine: a guide for neurologists. J Neurol Neurosurg Psychiatry.2002;73(suppl):i42-i48.
11. Davis RA. A long term outcome analysis of 984 surgically treated herniated lumbar disc. J Neurosurg 1994; 42:282-6.
12. Simeone FA. Lumbar disc disease. In: Wilkins RH, Rengachary SS (eds). Neuro-surgery.Vol. III. 2nd ed. New York: McGraw Hill, 1996:3805-16.
13. Silver HR, Lewis PJ. Decompressive lumbar laminectomy for lumbar stenosis. J Neurosurg 1993;78:695-701.
14. Bartynski WS, Lin L. Lumbar root compression in the lateral recess: MR imaging, conventional myelography and CT myelography, comparison with surgical confirmation. Am J Neuroradiol:2003;24:348-60.
15. Arce AC, Dohrmann GJ. Thoracic disc herniations (review). Surg Neurol 1985;23:356-615.
16. Burke TG and Caputy AJ. Treatment of thoracic disc herniation: evolution towards the minimally invasive thoracoscopic technique. Neurosurg Focus.2004;4:1-7.
17. Murphy RB, Humphreys SC, Fisher DL, et al.

Imaging of the cervical spine and its role in clinical decision making. J South Orthop Assoc 2000;9:24-35.

18. Carragee EJ. Pyogenic vertebral osteomyelitis J Bone Joint Surg Am 1997;79:874-80.

19. Chiles BW, Cooper PR. Acute spinal injury - review. N Engl J Med. 1996; 334:514-20.

20. el-Khoury GY, Whitten CG. Trauma to upper thoracic spine: anatomy, biomechanics and unique imaging features . Am J Roentgenol 1993;160:95-102.

Abstract

Objective: To evaluate the diagnostic importance of myelography in spinal disorders, in correlation with clinical presentation of the patients.

Methods: Patients selected for myelography had presented with history of various spinal disorders such as low backache, neurogenic claudication, paraparesis or paraplegia, quadriparesis or quadriplegia, trauma to spinal region and infective spondylitis. Patients excluded were those with history of allergies to iodinated contrast agents, seizures coagulopathy and pregnant women. Contrast agent was water soluble non ionic agent - Iohexol. Spinal Needles used were of 20,22 and 25 gauge. X-Ray machine with tilttable table was used for myelography.

Results: There were 1400 patients of whom 935 were males and 465 females with male to female ratio of 2.1. Age range was 8 to 65 years. Spinal disorders diagnosed on myelography were lumbar disc prolapse 866 (60%) cases, lumbar canal stenosis 113 (8%), thoracic disc protrusions 15 (1%), infective spondylitis 53 (4%) cases, spinal tumors 36 (2.5%), spinal dysraphism 28 (2%) and traumatic spine in 85 (6%) cases. Free flow of contrast agent with no block was found in 149 (10.64%) cases. These were subjected for MRI scan which revealed significant pathological lesion of surgical importance in 23 cases (1.64%) only.

Conclusion: Myelography is the least expensive valuable diagnostic test in spinal disorders specially in lumbar disc prolapses and lumbar canal stenosis (JPA 54:604;2004).