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CASE REPORT

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One Stage Excision of Intraspinal Tumour with Immediate Reconstruction of Spine by Laminoplasty – A Case Report

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ABSTRACT

Laminoplasty is a technique that indirectly achieves decompression of spinal cord and avoids the complications of fusion (Oyama, 1973). It was initially proposed by the Japanese as a treatment of ossified posterior longitudinal ligament in the cervical region. Its use has been expanded since then and is widely used in the thoracic and lumbar region (Lonstein, 1976). We present a case report

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of a 20 year male patient with intramedullary tumour at L2L3 level, who underwent excision and laminoplasty and discuss the surgical procedure, its merits of the procedure.

Keywords: Laminotomy, Laminoplasty, Laminectomy, Intramedullary tumour

1. INTRODUCTION

Laminotomy has become the standard approach to the spinal canal when bony decompression is not the aim (Goel, 1997; Constantini, 2006). Vascular malformations and tumours of the spinal cord are widely accessed by this procedure (Constantini, 2006). Many reconstructive procedures are prevalent in literature, such as transverse placement laminoplasty, restorative laminoplasty, inverse laminoplasty, en bloc laminoplasty and expansive laminotomy (Mimatsu, 1997; Zheng, 2004).

2. CASE HISTORY

30 year male presented with non-radiating, moderate to severe low backache of 8 months duration followed by diffuse pain in both lower limbs of 6 months duration. This was followed by progressive weakness of both lower limbs, loss of sensation below knee in both lower limbs, diminution in perianal sensation and urinary retention of 2 months duration. General physical examination was essentially within normal limits. Neurological examination revealed wasting both thigh and calf muscles along with flaccidity of both lower limbs with power 3/5 to 4/5 bilaterally (Nurick Grade IV). Deep tendon reflexes (DTRs) were absent below L1 level. Planter reflex were not electable bilaterally. All sensory modalities showed 50-75 % loss below L1 dermatome.Preoperative Magnetic Resonance Imaging (MRI) of lumbosacral spine shows cord expansion at L2 L3 with predominantly T1 weighted hypointense and T2 weighted hyperintense, moderately enhancing intramedullary lesion (Figure 1). The patient was provisionally diagnosed to be a L2L3 intramedullary dermoid and was taken up for excision.

Figure 1 Preoperative MRI, Sagittal and Axial Section

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Laminoplasty
An orthopaedic/neurosurgical surgical procedure for treating spinal stenosis by relieving pressure on the spinal cord. The procedure involves cutting the lamina on both sides of the affected vertebrae (cutting through on one side and merely cutting a groove on the other) and then "swinging" the freed flap of bone open thus relieving the pressure on the spinal cord. The spinous process may be removed to allow the lamina bone flap to be swung open. The bone flap is then propped open using small wedges or pieces of bone such that the enlarged spinal canal will remain in place.

Laminectomy
A laminectomy is a surgical procedure that removes the entire back (posterior) portion of the vertebral bone called the lamina, and/or sometimes the attached ligaments and part of the spinous process, to allow visualization of the underlying neural elements (spinal cord and/or nerve roots that branch from it) and intervertebral disc.

Laminotomy
The neurosurgical procedure that removes part of a lamina of the vertebral arch in order to decompress the spinal cord.

Operative procedure /Steps

1. The patient was administered general anaesthesia with endotracheal intubation and was placed in prone position.
2. Electrodes were placed for intraoperative SSEP monitoring (Figure 2).
3. After painting and draping the operative area, a longitudinal midline incision was made over L1L2L3.
4. Skin, subcutaneous tissue was incised along incision line. Lumbosacral fascia along with supraspinous ligaments were incised bilaterally to preserve their integrity.
5. The muscles are dissected subperiosteally from the lateral aspects of spinous processes and the laminae until the facet joints are exposed.
6. The supraspinous and interspinous ligaments were cut at superior end of L1 and inferior end of L3.
7. The lamina were cut with a high speed drill by making an osteotomy medial to facet joints on both sides and the cut lamina and spinous processes were removed en bloc (Figure 2a and 2b).
8. Ligamentum flavum was removed and duramater was exposed.
9. Longitudinal durotomy was performed spanning the tumor and the tumor was excised (Figure 3).
10. Durotomy was repaired with continuous Vicryl 3-0 sutures.
11. Osseoligamentous reconstruction was done by placing the excised specimen insitu and fixing it with prolene sutures.
12. Haemostasis was achieved and incision was closed in layers.

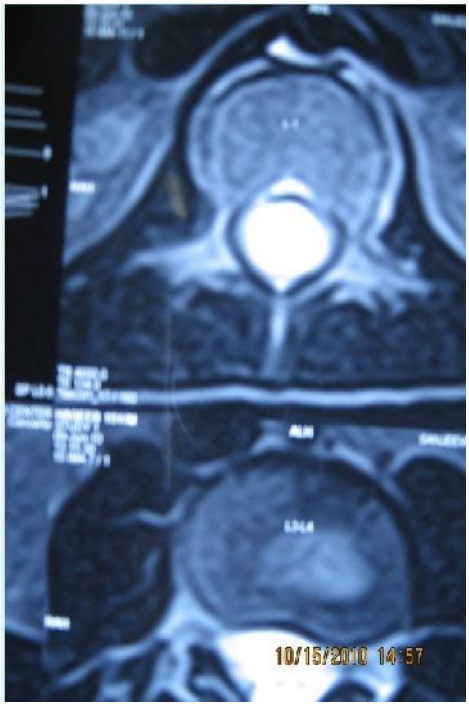

Figure 2 Intraoperative Monitoring System

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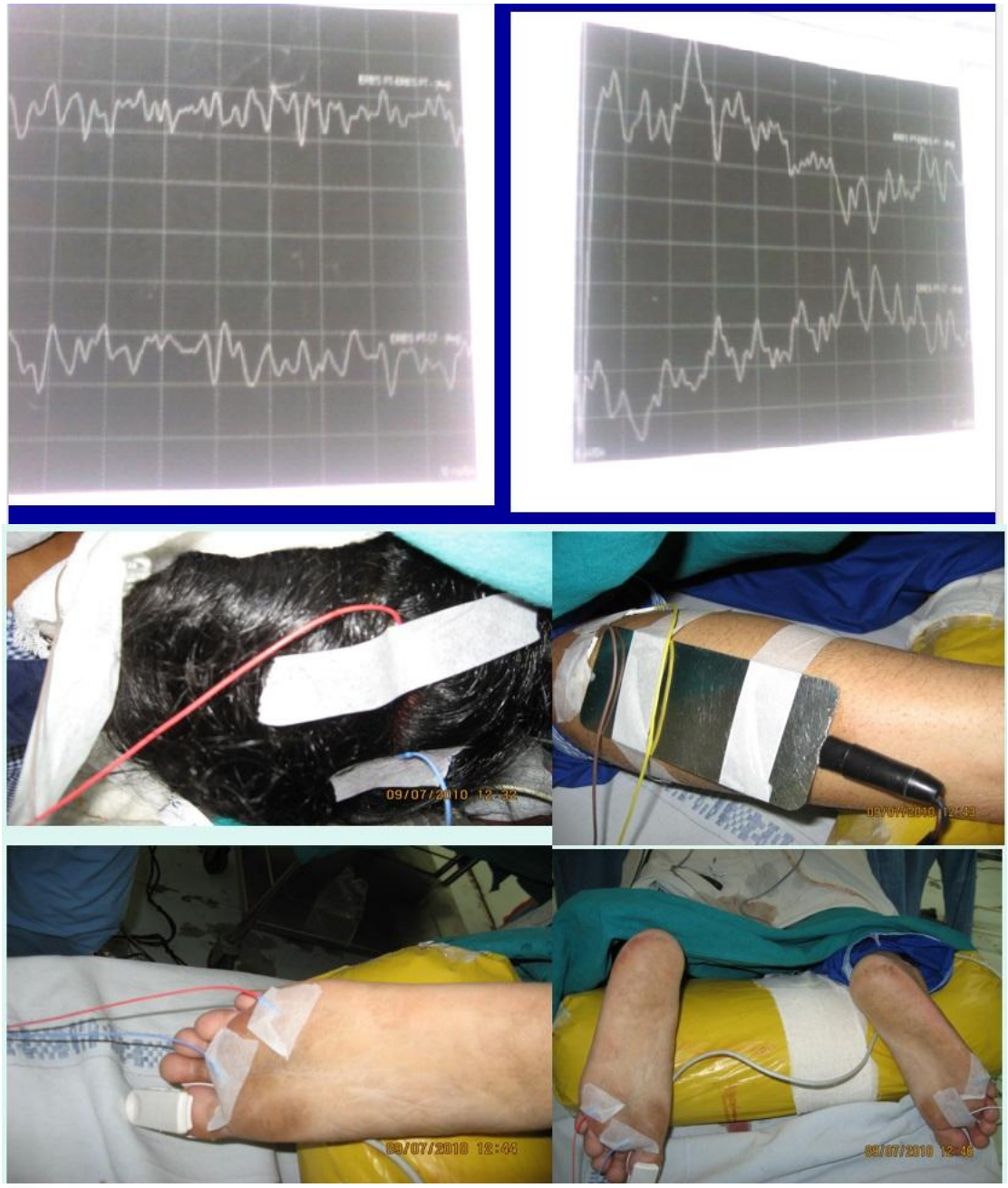

Figure 3a Intraoperative Laminotomy

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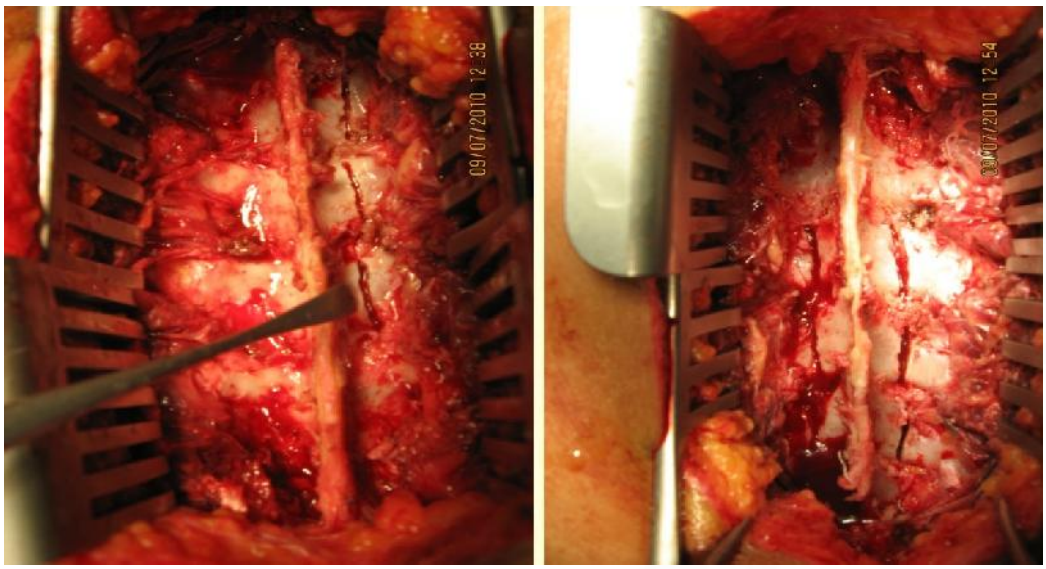

Figure 3b Intraoperative Excised Laminotomy Specimen

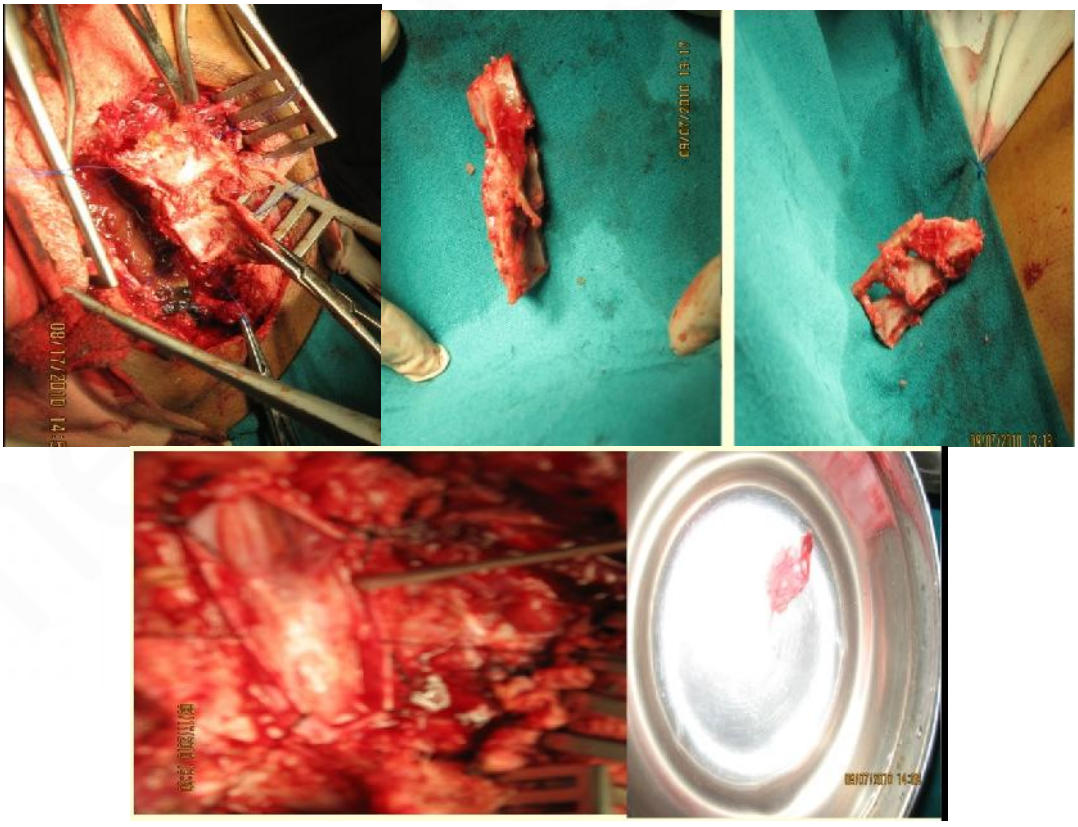

Figure 3 Excised Tumour Specimen

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Patient was managed with intravenous antibiotics and steroids in the post-operative stage. No CSF leak was noted in the post-operative period. The patient was weaned off the urinary catheter on postoperative day 5. By day 10 the patient was able to stand without support and reported complete resolution of pain in lower back.

3. DISCUSSION

Laminotomy was suggested by Sonntag in 2000 (Sonntag, 2000) although confusion prevails regarding the correct terminology. Many studies refer to it as replacement laminotomy, non-expansive laminotomy, osteoplastic laminotomy, laminoplasty, open door laminoplasty, non-expansive laminoplasty, recapping laminoplasty (Asazuma, 2003).

Laminoplasty allows the spinal cord and the neural foramen to be decompressed without directly removing anterior pathology. By preserving the dorsal elements of the spine, laminoplasty preserves spine stability and alignment and decreases the risk of postlaminectomy kyphosis and instability. Additionally, since fusion is not required, complications such as fixation failure, pseudoarthrosis, loss of motion, and adjacent segment degeneration do not occur. This may allow earlier mobilization and rehabilitation compared to other surgical options. In addition, laminoplasty can avoid graft related complications such as graft extrusion, settling, collapse, dislodgement, and fracture.

With laminectomy, epidural scar formation can form between the duramater and muscle leading to postoperative pain and neurologic compression. However, with laminoplasty, the lamina is preserved and it protects the dura from this "postlaminectomy membrane". Preserving the lamina also makes revision procedures requiring posterior approaches safer (Ishida, 1989; Steinmetz, 2006).

Laminoplasty Techniques

Oyama et al. first described cervical laminoplasty in Japanese in 1973 as a treatment for OPLL. Since its initial description by Oyama, laminoplasty techniques have been constantly refined. Most of these changes relate to how the cuts in the lamina or spinous process are made and how the laminae are secured in an open position—with wires or heavy sutures, bone anchors or bone blocks, hydroxyapatite blocks, miniplates, local spinous process autograft, and combinations thereof. All variations in laminoplasty techniques maintain the common theme, however, of repositioning the laminae, expanding the canal, and preserving the dorsal elements to maintain stability. In general, none of these technical variations have proven to be any safer or efficacious than the other. Our approach was to use suture for fixation of excised laminae in the described case.

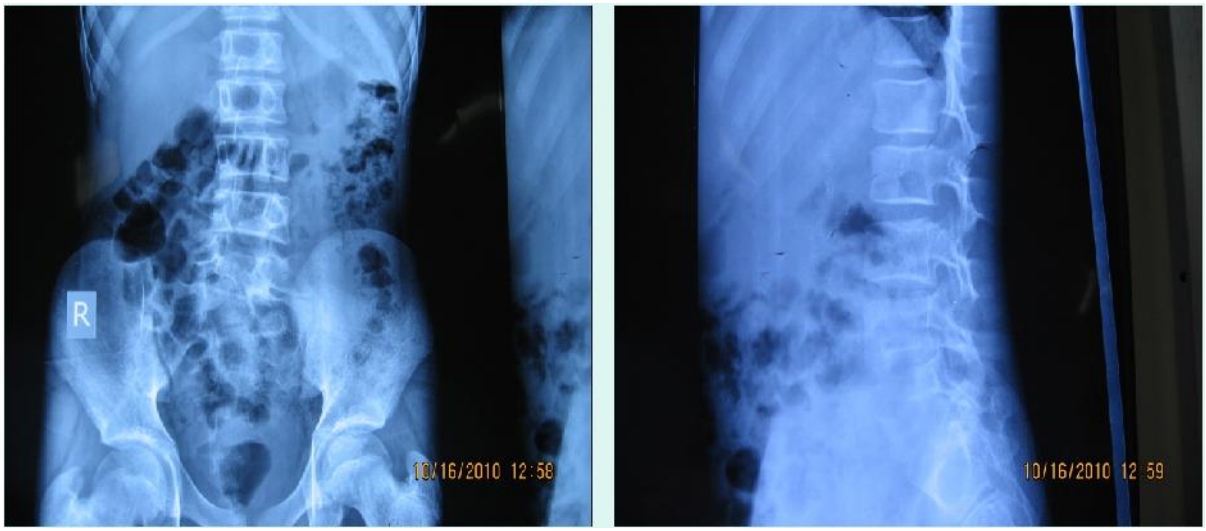

Figure 4a Preoperative Xrays

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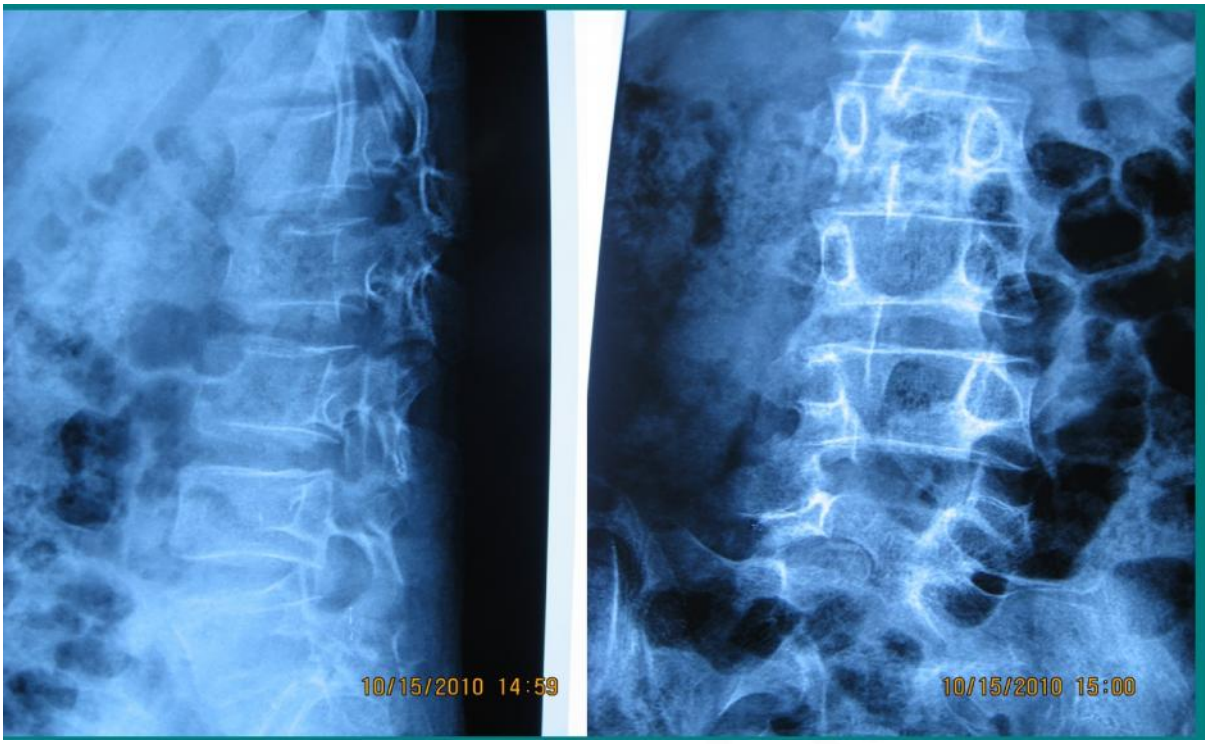

Figure 4b Postoperative Xrays

Figure 5 Patient at follow up standing without support and catheter

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Hara et al and Kawahara et al. reported no complications due to suture fixation. However, with this procedure it is necessary to wear a brace for longer than with mini-plate or pins fixation. Hara et al. reported that their patients were instructed to wear a simple cervical collar or lumbar brace for 2 months when laminoplasty had been performed without internal fixation, while no brace was required if the patient underwent thoracic laminoplasty after the operation (Hara, 2001; Kawahara, 1999). Our patient wasn't kept on any external immobilisation device. The re-attached laminae can provide effective primary stability after fibrous healing between the incision lines in the laminae, and among the interfaces of the paraspinal musculature, laminae and spinous processes. Re-attaching the laminae to the correct anatomical site may make it easier to reconstruct osteotomized spinous processes and detached ligaments, which are also very important in spinal mechanical stability and preventing postoperative epidural scarring. Moreover, it may be easier to get incision line fusion than with other methods. The fusion time of laminae ranges from 1.9 months to 5 months according to the literature. Yücesoy and Crawford reported that, using inverse laminoplasty, bony fusion of the incision line of the laminae was seen in only one third of patients who were monitored for more than 2 years (Yucesoy and Crawford, 2000). During the period of follow up, our patient showed unilateral fusion of the lamina before he was lost to follow up. Though we did not preserve ligamentum flavum, we did not find any clinical or radiological evidence of epidural scarring during the follow up.

Papagelopoulos et al. reported 14-year follow-up results after multilevel lumbar or thoracolumbar total laminectomy for removal of benign intraspinal tumors. Spinal column deformity occurred in 33% of the children, and adolescents and in 8% of the young adults. Spondylolisthesis occurred in 16.6% of the children and adolescents and in 8% of the young adults (Papagelopoulos, 1997). Our case did not develop any bony misalignment during the follow up (Figure 4a and 4b).

4. RESULT

The patient was able to walk without support (Nurick Grade II). Power in both lower limbs gradually improved to 4+/5 without any residual low backache, sensory or bladder and bowel symptoms during 1 year post operatively before he was lost to follow up (Figure 5).

5. CONCLUSION

Technique of laminotomy followed by laminoplasty appears to be an effective approach where bony decompression is not the aim. Reconstruction of osseoligamentous complex appears to provide stability of posterior structural elements and potentially avoids the complications of fusion.

SUMMARY

Laminotomy and Laminoplasty are approaches that achieve access to vertebral canal where bony decompression is not the objective. It appears to provide a rapid access to the canal with lesser biomechanical disruption as it preserves the integrity of the posterior elements. Considerable debate exists due to lack of standardisation of the procedure and long term follow up of patients with laminoplasty as compared to laminectomy. In this paper we have described a case that was approached by laminotomy followed by laminoplasty and have attempted to outline its steps and merits.

FUTURE ISSUES

Whether laminotomy actually reduces the risk of delayed deformities (kyphosis, segmental instability) thanks to reconstruction of the posterior osteo-ligamentous complex,remains an open issue and warrants further biomechanical studies with long term follow up. Further, the technique of laminotomy and laminoplasty is still isn't standardised and, till date, no variation appears to be superior over the other.

DISCLOSURE STATEMENT

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