

# Cervical Spondylotic Myelopathy: Functional Outcome after Modified Hirabayashi Laminoplasty

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## ABSTRACT

Spondylotic myelopathy is an old age problem of cervical spine. Different modes of treatment are available. Surgical intervention is indicated when conservative trials failed. Traditional laminectomy may cause multiple complications especially kyphotic deformity and epidural scarring. To avoid these complications a variety of laminoplasties were evolved in Japan as an alternative to laminectomy. This series is of twenty five cases having cervical Spondylotic myelopathy. All were having long tract signs preoperatively. Modified Hirabayashi laminoplasty was done at our centre and were assessed clinically and radiologically postoperatively. Root decompression was done if indicated on preoperative assessment. All patients were followed up for the mean post operative period of 12.2 months. Functional outcome of modified Hirabayashi laminoplasty was assessed by using Japanese Orthopedic Association (JOA) scoring system. The mean preoperative score was 7.8 (6-11) that was improved to the mean of 12 (8-16). The percentage of functional outcome was 19% to 85.71% (mean 47.21%) till the last follow up. Three patients (12 %) developed transient C5 palsy postoperatively. But it was recovered fully within three months period. Modified Hirabayashi laminoplasty is a better alternative of laminectomy & even that of traditional Hirabayashi laminoplasty because none of our patient developed post operative kyphotic deformity, epidural scarring & even spring-back phenomenon which is a common complication of traditional Hirabayashi laminoplasty. We recommend it a safer procedure in spondylotic cervical myelopathy.

**Key words:** Cervical spondylotic myelopathy, laminoplasty,

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## INTRODUCTION

In the past times patients of cervical spondylotic myelopathy were treated conservatively. But poor compliance to conservative treatment & progressive nature of the disease indicated surgical interventions<sup>1</sup>. Before 1980, multiple surgical techniques were trialed like anterior cervical decompression & fusion (ACDF), laminectomy with & without fusion, multiple level corepectomies<sup>2</sup>. All these techniques were associated with complications like restriction of movements after ACDF, kyphotic deformity and laminectomy membrane formation after laminectomy and recurrence of symptoms after multiple level corepectomies<sup>3</sup>.

To avoid these complications multiple level laminoplasty was tried in Japan in early seventies. Hattori<sup>4,5</sup> reported first time Z-shaped laminoplasty in 154 cases, which was found difficult & technical demanding by others. Later on Hirabayashi<sup>6</sup> reported technically easy classical open-door laminoplasty with good results. Baba & Tomita<sup>7</sup> modified Hirabayashi technique by spinous process suture technique to keep the lamina elevated in 217 cases. Other modifications reported are by Tani<sup>8</sup>, unilateral

approach & HA spacer in 30 cases, Green<sup>9</sup>, rib allograft as a spacer in 130 cases, Kurokawa<sup>10</sup>, french-window double-door laminoplasty while splitting the spinous process in 497 cases, and Tomita<sup>11</sup>, iliac crest auto graft spacer for splitted spinous process in 43 cases.

We used modified Hirabayashi (Shaffrey) technique by using dental plates & bone graft on one side of the lamina and reported the results.

## PATIENTS AND METHODS

We treated 25 patients of cervical spondylotic myelopathy at our centre with modified Hirabayashi laminoplasty technique. All were having long tract signs. There were 15 males & 10 females with mean age of 62.24years. All patients were taken conservative trial for mean of 9.04 months (4 to 15months) with no improvement. Thorough preoperative clinical and radiological evaluation was done along with systemic survey. Ten patients (40%) were having bowel & bladder dysfunctions. Four (16%) were having symptoms of cervical radiculopathy.

We assessed the functional outcome of modified Hirabayashi laminoplasty by using JOA scoring system at the mean follow up of 12.2 months (5 to 20 months) and compared it with preoperative status.

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**Surgical technique:** Through standard posterior approach<sup>12</sup>, Hirabayashi open-door cervical laminoplasty was done at the appropriate level assessed clinically & radiologically. At the more symptomatic side complete laminotomy was done, while incomplete laminotomy on the other side to make the hinge. Lamina was displaced posteriorly by sectioning ligamentum flavum & to keep the canal wider. Complete laminoplasty side was fixed with dental plates. Foraminotomies were performed at the required levels to decompress the nerve roots. After restoration of canal diameter, haemostasis secured & wound closed in layers over suction drain. Hard cervical collar was used for 6-8 weeks. On second post operative day plain radiographs were advised. To check the cervical stability Lateral flexion-extension views were performed on removal of collar. Post operative cervical canal diameter was confirmed on cervical CT scan.

## RESULTS

We did not encounter any patient with kyphotic deformity, spinal instability, pseudo-membrane formation, spring back phenomenon, recurrence of symptoms, persistent neck or shoulder pain and post operative neck stiffness in average follow up 12.2 months of our 25 patients. While using the generally accepted JOA scoring system we assess the functional outcome of our patients. The mean pre-operative score was 7.8 (6-11) and mean post-operative was 12 (8-16).

The following formula<sup>13</sup> was used to calculate the rate of recovery.

$$\frac{\text{Post-operative Score} - \text{Pre-operative}}{\text{Full recovery (17)} - \text{Pre-operative Score}} \times 100$$

The mean percentage of recovery was 47.21% (19% to 85.71%) in our 25 patients. The recovery was higher as much as 85.71% in non-diabetic patients and 80% in patients having symptoms of less than six months duration. The recovery of bowel and bladder dysfunction was as lower as 20% in diabetic patients. Three patients (12%) developed transient C5 root palsy and were recovered fully with in three months. Four patients (16%) with cervical radiculopathy recovered fully after Foraminotomies.

## DISCUSSION

The surgical treatment of cervical spondylotic myelopathy remains controversial because of post-operative complications of the chosen operative

methods like kyphotic deformity and compressive membrane formation after laminectomy and instability after inter body fusion<sup>14</sup>. Cervical laminoplasty is the operative technique which avoids these sort of complications in which posterior arch is opened through bilateral laminotomies complete on more symptomatic side and incomplete on outer side<sup>15</sup>. Although widening of spinal canal diameter can be achieved by traditional open-door laminoplasty but this may lead to spring back phenomenon even in 40% cases<sup>16</sup>. Multiple modifications have been adopted to prevent this spring back phenomenon which are suture techniques through facet<sup>7</sup>, intraspinous HA spacer<sup>8</sup>, allograft or auto iliac crest graft<sup>9</sup>, or alternating cervical laminoplasty<sup>17</sup>.

We have used dental mini plates to prevent the spring back phenomenon with adequate canal diameter restoration and produced good results. We have not encountered the typical post laminoplasty axial neck or shoulder pain in any of our patients which is reported 42-60% in literature<sup>18</sup>. Three (12%) of our patients developed transient C5 root palsy, although reported in 8% cases<sup>19</sup>, but all of them recover fully in three months periods.

Functional outcome of modified Hirabayashi laminoplasty in spondylotic cervical myelopathy is 47.21% in our hands which is comparable to 55% published in literature<sup>2,6,10,16,19</sup> with longer follow up. We recommend it a easier and safer procedure with minimal complications in cervical myelopathy patients who do not respond to conservative treatment.

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