



## Original Research Article

## Evaluation of clinical and radiological outcome of disk preserving functional cervical disk surgery

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## ABSTRACT

**Introduction:** Cervical radiculopathy is a neurological dysfunction wherein a nerve root in the cervical spine becomes inflamed with disc herniation and uncovertebral osteophytes accounting for the majority of cases. The standard surgical treatment for this cervical radiculopathy till now is posterior laminotomy and anterior discectomy with or without fusion. This study describes the outcome of a minimally invasive anterior cervical disc preserving technique of upper vertebral transcorporeal anterior microforaminotomy to treat cervical radiculopathy.

**Objective:** To Evaluate the clinical and radiological outcome of disk preserving functional cervical disk surgery.

**Material and Methods:** This is a prospective non randomised hospital based study. The study population included 11 patients operated for cervical radiculopathy with the new technique at the department of Neurosurgery, Manipal Hospital, Bangalore during July 2007 to June 2010. The patients were followed up from 8 to 30 months with a mean follow up of 17 months for clinical and radiological outcome.

**Results:** The mean age of the patient was  $40.09 \pm 9.71$  years. The majority of the patients (five) were in 31-40 age groups. Male patients (63.6%) were more as compared to females. All patients in this study had neck pain, radicular pain and weakness. Clinical symptoms were between 1 to 3 months. The mean preoperative visual analogue scale score was 8.55 and postoperative score was 1.18. The VAS score reduced significantly postoperatively and it was statistically significant. There was no significant reduction in the disc height postoperatively.

**Conclusion:** The Disk preserving functional cervical disk surgery is a minimal invasive procedure with the least complications and adequate motion at the operated site.

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### 1. Introduction

There are 8 pair of cervical roots from c1 to c8 in the cervical spine. These branch from the spinal cord and exit through intervertebral foramen.<sup>1</sup> These nerves further branch to supply muscles to enable functioning of shoulders, arms, hands and fingers. The most common cause for cervical radiculopathy are damaged or inflamed nerve root due to cervical herniation or bone spur.<sup>2</sup>

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To accomplish direct decompression of the compressive disc fragment, Robinson and Smith<sup>3</sup> in 1955 and Cloward<sup>4</sup> in 1958 pioneered the anterior cervical discectomy with bone fusion. Outcomes achieved using this technique reportedly has been comparable to those using the posterior approach.<sup>5,6</sup> The treatment was well conceived in principle, with the idea of direct anterior decompression of the offending structures, but it had the inherent disadvantages of loss of disc height (for discectomy without fusion cases) and fusion of a mobile motion segment.<sup>7-9</sup> One of the main complications associated with the loss of a motion

segment is the adjacent segment disease, the incidence for which has been quoted from 25 to 81 % in various long term studies.<sup>10,11</sup> The cause of this adjacent segment disease, though not yet clear, has been postulated as the increased intradiscal pressure at the adjacent level, resulting in osmotic gradients and metabolic deficiencies.<sup>12–14</sup> In addition, the anterior fusion technique has been also been fraught with a significant incidence of pseudoarthrosis and bone graft related problems.<sup>15–17</sup>

The author wish to describe a modification of Jho's technique of upper vertebral transcorporeal anterior microforamiotomy to treat cervical radiculopathy, which is safer and easier. The new technique avoids breaching the medial wall of the transverse foramen, attempting to preserve lower end plate and is located more medially than Jho's technique. We report a prospective analysis of the clinical results of the patients treated by this technique.

## 2. Material & Methods

This hospital based non randomised prospective study was carried out among 11 consecutive patients who were operated for cervical radiculopathy with the new technique at the department of Neurosurgery during July 2007 to June 2010. The patients were followed up from 8 to 30 months with a mean follow up of 17 months. Inclusion criteria for surgery were Unilateral cervical radiculopathy not responding to conservative treatment of more than 6 weeks (or earlier if patients exhibited profound weakness) and Imaging studies corresponding to the clinical features. Exclusion criteria included Presence of cervical spondylotic myelopathy symptom, Previous cervical spine surgeries and Multilevel disc prolapse.

The study was started after obtaining ethical clearance from hospital ethical board and informed consent from the patients.

The results were analysed based on the clinical and radiological outcome in this study. Statistical test like percentage and mean were used for presentation of the data. Diagnostic evaluation was performed by anterior-posterior and lateral standard radiographs of the cervical spine and magnetic resonance imaging (MRI) evaluation of the cervical spine.

Post Operative Protocol All patients had followup X-ray of the cervical spine anterior and posterior view with flexion and extension study, at 4 weeks and at subsequent follow up.

Surgical results were graded as Excellent – patient exhibited complete resolution of all symptoms, Good – patient experienced relief of radiculopathy but still experienced occasional mild residual nonradicular discomfort, Fair – patient exhibited mild residual symptoms of radiculopathy, with or without mild/moderate residual nonradicular discomfort, Poor – patient continued to exhibit significant radicular symptoms, with or without nonradicular discomfort, Unchanged or worse.

## 3. Results

The patients were in the age group of 28 to 59 years. The majority of the patients (five) were in 31-40 age groups and only one patient was in <30 year group. Male patients ( 63.6%) were slightly higher as compared to females(36.4%). The major symptoms experiences by the patients were neck and radicular pain followed by weakness. Radicular numbness was seen among majority of patients. 7 patients exhibited radicular muscle weakness 1 patient exhibited shoulder abduction weakness.

As per the duration of symptoms, 4 patients had symptoms between 1-3 months, 3 patients less than 3 months whereas others had symptoms more than 3 months. Based on the cervical nerve root affected the C6-7 level was affected in majority( 7) of patients whereas C4-5 level was least affected. 9 patients had an excellent surgical results w here as 1 patient had good to fair results.

Preoperative MRI of a case of C6-7 left posterolateral disc prolapsed with nerve root compression. Post operative CT scan of the cervical spine done in the first week, showing the area drilled in the C6 vertebra. Post operative follow up X-ray after 6 months showing adequate motion at the operated site.

## 4. Discussion

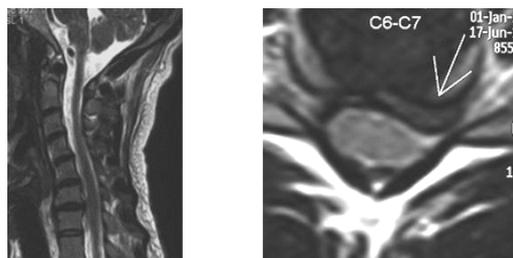
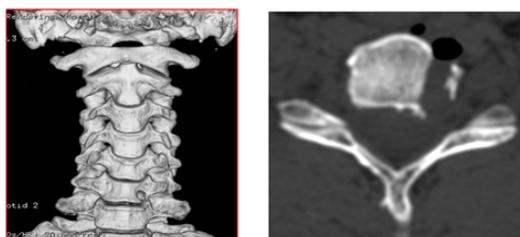
The first surgical technique with direct access to a limited anterior foraminal compressive lesion was introduced in 1989 by Snyder and Bernhardt<sup>13</sup> who reported an anterior fractional interspace decompression. But their technique still required removal of the lateral one-third of the disc. George et al<sup>18</sup> revisited the original technique of Verbiest<sup>19</sup> for oblique transcorporeal approach for anteriorly located lesions in the cervical spinal canal, but it needs to expose the vertebral artery with its inherent risks and is more suitable for lesions extending over a wide area.

In the present study the patients were in the age group between 28 to 59 years. The mean age of the patients being 40.09±9.71 years. Our study showed that Male patients( 63.6%) were slightly higher as compared to females(36.4%). The findings are similar to study carried out by Gun Choi et al and Jaganath Jay et al were in mean age of the patients with cervical radiculopathy was 46 an 48 years and showed male predominance.<sup>20,21</sup> But whereas the study by Jho HD et al showed female predominance.<sup>22</sup>

The major symptoms experienced by the patients in our study was neck and radicular pain followed by weakness. Our results are similar to studies by Saringer et al and Gun choi et al were incidence of these symptoms were 94% and 80% respectively.<sup>17,20</sup> Our study revealed motor weakness at the affected site were as study carried out by H.D. Jho et al revealed motor weakness in 61.5% and 80% in Gun Choi et al studies.<sup>22</sup> Our study revealed sensory loss among 54.5% patients. Whereas H.D Jho et al study, Saringer et

**Table 1:** Evaluation based on VAS and Disc Height

Characteristics	Variable	Pre op	Post op
VAS	No pain , 0	0	0
	Mild pain, 1 2 3	0	11(100.0%)
	Mod pain, 4 5 6	0	0
	Severe pain, 7 8 9 10	11(100.0%)	0
	Mean $\pm$ SD	8.55 $\pm$ 0.93	1.18 $\pm$ 0.40
	Inference	Mean VAS score is significantly reduced post-operatively with t=21.804; P<0.001**	
Disc Height	<5.0	0	1(9.1%)
	5.0-5.5	4(36.4%)	5(45.5%)
	5.5-6.0	6(54.5%)	4(36.4%)
	6.0-6.5	1(9.1%)	1(9.1%)
	Mean $\pm$ SD	5.59 $\pm$ 0.31	5.49 $\pm$ 0.32

**Fig. 1:** Preoperative MRI of a case of C6-7 left posterolateral disc prolapsed with nerve root compression**Fig. 2:** Post operative CT scan of the cervical spine done in the first week, showing the area drilled in the C6 vertebra.

al study and Gun Choi et al revealed sensory loss among 60.6%, 97% and 25% of patients respectively.<sup>17,20,22</sup>

None of the patients in our study had any complications. Whereas the common complications encountered in other studies were CSF leak, nerve root injury and infections.<sup>21</sup> Other complications manifested includes ipsilateral incomplete transient palsy of recurrent laryngeal nerve, transient horners syndrome, transient hemiparesis, discitis.<sup>23</sup>

The followup duration ranged from 12 to 86 months (median 36 months) in Jho HD et al<sup>22</sup> study, from 2 to 17 months in Saringer et al study with a mean of 8.2 months. In the present study the followup duration ranged from 8 months to 25 months with a mean of 16.9 months. The average preoperative and postoperative disc heights measurements were 5.59 $\pm$ 0.31 and 5.49 $\pm$ 0.32 respectively. In Gun Choi et al,<sup>20</sup> study preoperative and postoperative disc height measurements were 6.1 $\pm$ 0.7 and 5.7 $\pm$ 0.7mm respectively.

There was no case of postoperative instability at the latest follow up visit as measured by dynamic flexion and extension views. A theoretical risk with this technique could be the risk of vertebral body collapse during the early postoperative period, as the drill hole creates a stress riser. However, no such complication was seen in our study group as the drill hole occupied only 1/8th of the vertebral area.

Though the outcome observations in this series are based on a small number of patients, the excellent short-term results are encouraging. Lack of complications like Horner's syndrome and recurrent laryngeal nerve palsy and avoiding the danger to the vertebral artery prove the benefits of the current technique. Strict selection criteria and direct access to the offending lesions are some of the factors contributing to good outcome in a large number of patients.

**Conclusion** The major symptoms experienced by the patients were neck and radicular pain. C6-7 cervical root level was affected in majority patients. Majority of the had

an excellent surgical results. Post operative follow up X-ray after 6 months revealed adequate motion at the operated site.

## 5. Conflict of interest

None

## 6. Source of funding

None

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