ORIGINAL ARTICLE

OSSIFICATION AND HYPERTROPHY OF LIGAMENTUM FLAVUM AT THORACIC SPINE

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Background: Hypertrophy of the ligamentum flavum is a pathological condition that causes neurological symptom (radiculopathy and / or myelopathy) and usually occurs in the thoracic,[2] less frequently in the cervical spine that commonly involves thoracic spine. This study was conducted to analyse the clinical presentation and outcome of surgery of ossified ligamentum flavum at thoracic spine. **Methods:** This case series was conducted at Department of Neurosurgery, Liaquat University of Medical and Health Sciences Jamshoro, from January 2010 to December 2012. Patients who presented with thoracic myelopathy due to ossified ligamentum flavum were included. All the patients, after detailed history, clinical examination and radiological investigation under went decompressive laminectomy at the appropriate level. Pre-operative, post-operative and neurology at 06 months follow up was recorded. The patients having thoracic myelopathy due to other causes were excluded from the study. SPSS-10 was used to analyse the data. **Results:** A total of 15 patients were admitted and operated (9 males, 6 females. (M:F ratio of 1.5:1). The majority of patients were in 6th decade. Backache and lower limb weakness was the presenting feature. Overall improvement in preoperative neurological status was seen in 9 (60%) patients. Neurology remained unchanged in 4 (26.6%) patients and worsened in 2 (13.3%) patients. **Conclusion:** The disease is common in 5th and 6th decade. Preoperative duration of symptoms significantly correlates with recovery.

Keywords: Ossified, ligamentum flavum, thoracic myelopathy, laminectomy

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INTRODUCTION

The ligamentum flavum is a yellowish elastic ligament extending form second cervical vertebra to the first piece of sacrum. The ligament is in the dorsal portion of the spinal canal, attaching the laminae and extending to the capsules of facet joints and the posterior aspects of the neural foramina.[1]

Hypertrophy of the ligamentum flavum is a pathological condition that causes neurological symptom (radiculopathy and or myelopathy) and usually occurs in the thoracic,[2] less frequently in the cervical spine.[3] It commonly involves lower thoracic spine (T9–T12) with upper thoracic spine (T1–T4) being the next common site.

The mechanism of hypertrophy and progression of ossification is limited to the ligamentum flavum and neighboring spinal bony arch is spared.[4] The pathogenesis of ossified ligaments is not clear. The factors leading to ossification of LF include trauma,[5] mechanical stress, diffuse idiopathic skeletal hyperostosis,[6] ankylosing spondylitis, hemochromatosis, flourosis, growth factors[6-8] (BMPs, VEGF[9], TGF, Cartilage derived morphogenetic protein-1) and disorder of calcium and phosphorus.[10,11] However etiology remains unknown in most of the cases.

The condition may be asymptomatic,[12] however in patients with large calcifications, it may cause compression of the spinal cord. Numbness in the lower limb is initial symptom of thoracic myelopathy.[8] All patients have motor weakness in lower extremities and difficulty in walking. Root pain and stiffness are not usually seen. Bladder disturbance is seen only in late stages. The role of neuro-radiologic studies is important in determining the etiology of myelopathy.[13] CT remains the investigation of choice to demonstrate the characteristic contours and density of clacific changes (V shaped hyper-density). Spinal MRI shows hypertrophy of ligamentum flavum as dorsolateral low signal mass appearance on both T1 & T2 weighted images.[14-16] Posterior decompression with laminoplasty or en bloc laminectomy combined with lateral fusion is the mainstay treatment.[10] For thoracic ossified ligamentum flavum fenestration or en bloc laminectomy are usually performed.[8] The ossified ligament should be removed carefully because there might be an ossification of the dura matter.

This study was conducted to analyse the clinical presentation and outcome of surgery of ossified ligamentum flavum at thoracic spine.

MATERIAL AND METHODS

The case series included patients operated for thoracic myelopathy due to ossified ligamentum flavum at department of Neurosurgery, Liaquat University of Medical & Health Sciences, Jamshoro between January 2010 to December 2012.

Patients having other causes of thoracic myelopathy were excluded from study. All the patients were admitted through OPD. After detailed history and thorough clinical examination, all the patients underwent radiological investigations like X-Ray Dorsal Spine, CT Scan Dorsal Spine and MRI Dorsal Spine. After exclusion of other causes of thoracic myelopathy, all the patients underwent decompressive laminectomy at the appropriate level. Pre operative neurological status and post operative neurology was recorded on *pro forma*. All the patients were followed-up post-operatively for a period of 6 months and neurology assessed and recorded on *pro forma*. Post-operative improvement in pain and sensation is assessed on verbal rating scale and improvement in motor power is assessed with MRC grading SPSS-10 was used to analyze the data. Frequencies and percentages were calculated for categorical data, whereas means and standards deviation were calculated for numeric data.

RESULTS

During the study period, 15, patients were admitted with thoracic myelopathy due to ossified ligamentum flavum. Patients' age ranged from 50.07 ± 8.40 years as shown in table-1. Forty percent of the patients belong to 6th decade. Male to female ratio was 1.5:1. 80% of the patients were belong to district Tharparkar, a desert area at south east of Sindh, Pakistan. Most of the patients were males constitute 9 (60 %) whereas only 6 (40%) patients were females. All the patients had gradual onset of symptoms.

Pre-operative duration of symptoms ranged from 8 months to 32 months. All the patients presented with backache and weakness of lower limbs. 9 (60%) out of 15 patients had hypoesthesia below the involved segment. Only 3 (20%) patients had preoperative urinary retention.

Six (40 %) patients out of 15 had multisegment disease and 9 (60 %) patients had single segment ligamentum flavum ossification as shown in table-2. Majority of the patients, i.e., 12 (80%) had ligamentum flavum thickness at lower dorsal vertebrae, only 3 (20%) patients had involvement of upper dorsal spine.

Pre-operatively 3 (20%) patients had Grade-0 motor power, 2 (13.33%) patients has Grade-2 motor power, 5 (33.33%) patients has Grade-3, 5 (33.33%) patients had Grade-4 motor power. Out of 15 patients, neurology improved in 6 (40%) patients in early postoperative period, remained same in 5 (33.33%) patients, worsened in 4 (26.67%) patients (Table-3).

At the follow up period of six months, 2 (13.33%) patients had no improvement in neurology, remained Grade-0 power in both lower limbs, complete loss of sensation and they remained catheterized.

Four patients (26.67%) who worsened in early post-operative period, 3 out of them improved neurologically during the follow up period. One patient had no neurological improvement in the follow up period of six months.

Backache improved in 60% of patients whereas 6 (40%) patients had complain of minor pain during the follow up period. During study it was observed that patients who presented earlier with myelopathy improved more than patients with delayed presentation.

Table-1: Age distribution

Age in Years	Patients	Percentage
34–40	2	13.3
41–50	5	33.3
51–60	6	40
61–70	2	13.3

Table-2: Segmental involvement

Age in Years	Patients	Percentage
Single segment disease	9	60
Multi segment disease	6	40

Table-3: Pre-operative, post-operative and motor power at follow up period of 6 months

Age Yrs.	Sex	Disease segment	Pre-Op. motor power	Post Op. motor power	Motor power at follow up (6 month)
56	M	D6-D10	0/5	0/5	0/5
63	M	D9	3/5	4/5	4/5
47	F	D9,D10	2/5	4/5	4/5
35	F	D10	4/5	0/5	0/5
42	F	D5	0/5	1/5	3/5
44	F	D12	3/5	0/5	3/5
51	M	D10-D12	4/5	0/5	3/5
54	M	D10	4/5	4/5	5/5
45	F	D11	4/5	4/5	4/5
37	F	D12	3/5	4/5	5/5
62	M	D9,D10,D11	2/5	0/5	3/5
57	M	D8	3/5	3/5	4/5
49	M	D3,D4	3/5	4/5	5/5
53	M	D10	4/5	4/5	4/5
56	M	D3,D4	0/5	2/5	4/5

DISCUSSION

Calcification of ligamentum flavum is usually encountered in East Asian population and exceptionally reported in caucasion people.[12,17-20] However the disease is now being increasingly recognized as a cause of thoracic myelopathy in Indian population.[20]

Most cases of OLF occur in the thoracic spine or the thoraco lumbar spine[12] and rarely in the cervical spine.[11.] In this study, majority of the patients were males as comparable with other studies.[21] In this study majority of the patients were in 6th decade that is comparable with other studies.[21]

The number of spinal segments having ossified ligamentum flavum varies. 40 to 60% patients has single segment inter laminar disease and in 10-25% the OLF is multisegment.[21] In this study 9 (60 %) patients had single segment and 6 (30 %) patients has multi-segment disease.

In this study, overall preoperative improvement in pre-operative neurological status was seen in 9 (60%) patients. Neurology remained unchanged in 4 (26.6%) patients and worsened in 2 (13.3%) patients whereas a study done at India[21] shows neurological improvement in 84% of patients, unchanged in 12 % and worsened neurological status in 4% of patients who were operated for ossified ligamentum flavum.

Pre-operative duration of symptoms significantly correlates with recovery and indicates the importance of early operative intervention to achieve better result.

The most important and interesting fact of this study in that, the 12 (80%) patients belong to district Therparkar, a desert area of Sindh, Pakistan.

District Therparkar lies at the south east part of Pakistan, where the majority of population sustained on deep under water wells, which are 60–90 meters deep and had slightly bitter and hard water. The cause behind this ossified ligamentum flavum disease in this area is salt and hard water or something else? It needs further long term multicenter studies along with water testing and nutritional assessment to know the cause of the disease prevalence in this area.

CONCLUSION

Pre-operative duration of symptoms significantly correlates with recovery. In this study majority of patients from desert area of Pakistan. Further research and studies of ossified ligamentum flavum are necessary in this part of world.

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