

Surgical treatment of bilateral nondisplaced isthmic lysis by interlaminar fixation device

ABSTRACT

Study Design: Spondylolysis is a defect in the portion of pars interarticularis. The latter affects approximately 6% of the population. It is caused by repetitive trauma in hyperextension. Low back pain is the most common symptom.

Methods: We implanted interspinous process devices in 12 patients with isthmic lysis without spondylolisthesis for low back pain. The purpose of the surgery was to conduct a minimally invasive procedure.

Results: In eight cases, patients became asymptomatic. In two cases, there has been a considerable improvement. In two cases, no change had been noted.

Conclusion: This good result motivates us to consider this approach a part of therapeutic arsenal for some cases of spondylolysis.

Keywords: Interlaminar device, posterior lumbar fusion, spondylolysis

INTRODUCTION

The pars interarticularis – isthmus – is a posterior part of the vertebra and the crossroads where pedicle, lamina, facet joints, and transverse process join. Isthmic lysis or spondylolysis is a defect in the portion of pars interarticularis. The reason of this defect would be the fracture of the pars interarticularis, acquired usually by repetitive strain suffered during childhood.^[1-7] Some authors suggested a genetic factor because some assessments seem to be resulting in Blacks being diagnosed more often than Whites affected by isthmic lysis, and some ethnic groups seem to be less affected such as the Eskimos.^[1-9,10-12] Spondylolysis affects approximately 6% of the population.^[11] Low back pain is by far the most common symptom. It is exacerbated in the position of extension but not with cough. The second most common sign is radiculalgia which can be felt generally in thighs.^[12] Advances in medical imaging system now allow the early diagnosis of isthmic lysis, in particular among young people. In such circumstances, the treatment is conservative and consists of immobilization with stiffened corset and custom hip for 3 months. In adults, the surgery is decided case by

case according to age, observed symptoms, living and working condition, tolerance and functional discomfort of patient, and efficiency of conservative management. Different technical and surgical options have been advocated by authors: isthmic reconstruction, posterolateral fusion without or with fusion.^[13] We have recently implanted interspinous process devices in 12 patients with isthmic lysis without spondylolisthesis for low back pain. This paper presents the patients outcome after this surgery with a median follow-up time of 31 months.


MATERIALS AND METHODS

Twelve patients underwent surgery for nontraumatic bilateral isthmic lysis without spondylolisthesis. In all

KEYVAN MOSTOFI, REZA KARIMI KHOUZANI¹

Department of Neurosurgery, Clinical Center of Soyaux, Soyaux, France, ¹Department of Neurosurgery, Clinical Center of Rottal-Inn, Bavaria, Germany

Address for correspondence: Dr. Keyvan Mostofi, Department of Neurosurgery, Centre Clinical de Soyaux, Soyaux, France.
E-mail: keyvan.mostofi@yahoo.fr

Access this article online	
Website: www.jcvjs.com	Quick Response Code 
DOI: 10.4103/jcvjs.JCVJS_78_17	

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

How to cite this article: Mostofi K, Khouzani RK. Surgical treatment of bilateral nondisplaced isthmic lysis by interlaminar fixation device. *J Craniovert Jun Spine* 2017;8:239-42.

cases, patients had refractory low back pain and were resistant to conservative treatment. Isthmic lysis was discovered on average 1 year before surgery. No patient had spondylolisthesis. None of the patients had the Pfirrmann disc degeneration Grade more than III in operated spinal level. All patients received before surgery an appropriate treatment to their condition. The latter involved analgesics, nonsteroidal and steroidal anti-inflammatory drugs, physiotherapy, occupational therapy, and epidural infiltrations in the region of lumbar spine. The average period between diagnosis and surgery was 37.58 months. In all cases, lombalgia was present. The latter was characterized in 9 patients (75%) by positional low back pain. Three patients (25%) had permanent low back pain. The lysis level was L5/S1 in 11 patients. One patient had L3/L4 isthmic lysis. The characteristics of patients are shown in Table 1.

RESULTS

All patients were operated by interlaminar devices implantation. The length of stay in hospital was 2 days for all patients. There were no postoperative complications. To enhance the effectiveness, we add cancellous bone powder. Patients are seen 6 weeks and 12 weeks for the first two times in post operative follow-up, and afterward, every three months for two years. The median follow-up period was 31 months.

A lumbar X-ray is performed during every control visit [Figures 1 and 2]. In eight cases, patients became asymptomatic. In two cases, there has been a considerable

improvement, with Oswestry Disability Index (ODI) improved 20.3 points at 3 months' postoperative period in one patient and 19.1 points at 6 months' postoperative period in another patient. In two cases, no change had been noted [Table 2].

DISCUSSION

Isthmic lysis is caused by repetitive trauma in hyperextension. Two mechanisms seem to be added for resulting isthmic lysis: Tensile strength exercised over the pars interarticularis leading to its elongation and at last to its rupture. Direct mechanism termed «cigar clip»: During hyperlordosis, the isthmus is caught between the inferior articular processes of L4 and superior articular processes of S1.^[12-20] Isthmic lysis can lead to spondylolisthesis. Taillard divided spondylolisthesis in four grades. In most of cases, isthmic lysis provokes only a minimally displacement.^[14] Dynamic X-ray photography in extension and flexion can help consider the instability of isthmic lysis. Computed tomography scan has ability to demonstrate the shape of isthmic lysis and intervertebral foramen deformation in sagittal plane, and magnetic resonance imaging is useful for showing the quality of disc when a surgery is decided. The low back pain is predominant symptom of isthmic lysis. The second kind of symptom is distal or proximal leg pain. Symptomatic management of chronic low back pain is usually effective in Grade I. In case of neurological symptoms, difficulties to walk, compromise of sagittal balance, or vertebra displacement, the surgery is necessary. Different surgical techniques are proposed. The gold standard surgery is vertebral osteosynthesis with or without reduction and with or without interbody cage – in

Table 1: Patient's characteristics

Patient	Sex	Age	Time between diagnosis and surgery	Level	Signs	Pfirrmann disc degeneration grade
1	Male	37	7 months	L3/L4	PEL	III
2	Male	38	24 months	L5/S1	PEL	III
3	Female	42	16 months	L5/S1	POL + PA	II
4	Female	41	25 months	L5/S1	PEL + PA	III
5	Male	36	12 months	L5/S1	POL	I
6	Male	47	53 months	L5/S1	POL	II
7	Female	32	19 months	L5/S1	POL	III
8	Female	33	25 months	L5/S1	POL	III
9	Female	38	31 months	L5/S1	POL + PA + RA	III
10	Male	41	120 months	L5/S1	POL + RA	III
11	Female	31	60 months	L5/S1	POL	III
12	Female	35	36 months	L5/S1	POL + RA	III

PA - Paresthesia; PEL - Permanent lombalgia; POL - Positional lombalgia; RA - Radiculalgia

Table 2: Patients, Oswestry Disability Index score before and 6 weeks and 3 and 6 months after surgery

Preoperative		Postoperative 6 weeks		Postoperative 3 months		Postoperative 6 months	
VAS	ODI	VAS	ODI	VAS	ODI	VAS	ODI
8.24 (6-10)	82.2 (59-94)	4.11 (2-6)	39.7 (28-58)	2.38 (1-6)	32.1 (06-32)	2.03 (0-6)	29.8 (04-32)

ODI - Oswestry Disability Index; VAS - Visual analog scale

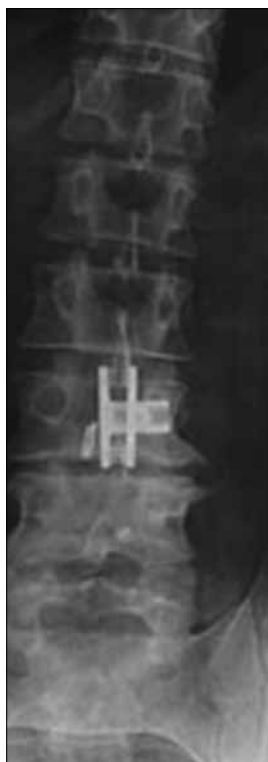


Figure 1: Anteroposterior X-ray images. 1 year after surgery



Figure 2: Lateral X-ray images. 1 year after surgery

case of important discopathy.^[12-19] Direct pars intercaris repair by the Buck's method is an alternative surgery.^[15,16,21]

We saw fit to practice a less invasive technique in the case of Grade I of isthmic lysis without displacement with moderate discopathy – Pfirrmann disc degeneration Grade less than IV. We used a posterior nonpedicle supplemental fixation device for a single level. These devices are intended at first for achieving supplemental fusion with other vertebral fusion materials. We used these devices in 12 patients with bilateral isthmic lysis and without spondylolisthesis. The purpose of the surgery was to conduct a minimally invasive procedure and at the same time, to fix the isthmic lysis and to avoid subsequent displacement. The fusion was enhanced by bone graft material in all patients. This surgery is an alternative procedure to fill the void between a heavy surgical treatment – interbody cage and pedicular screw on the one side and nonefficient conservative treatment on the other side. The low back pain is due to microtraumatic overloading and overuse of isthmus before developing spondylolisthesis and also due to discopathy. As a matter of fact, failing correct functioning of isthmus, the discopathy will be accelerated as the disc will be the only guarantor of segmental spinal stability, and consequently, it will be subject to overload.

An increased use of interspinous implants is recognized in recent years.^[17] It is used notably in the treatment of lumbar

spinal stenosis and second discectomy. Swanson *et al.* showed that the pressure in the disc is reduced in the neutral position with intraspinous device between 20% and 38%.^[18] Gazzeri *et al.* believe that interspinous implants are less effective than bilateral pedicle screw-rod fixation for limiting axial rotation and lateral bending. They may also unload of annulus pulposus and absorb shocks; consequently, they slow down discopathy process.^[17]

We operated our patients with the aim of avoiding a later spondylolisthesis and reducing the overload of disc and subsequently reducing low back pain and improving their life quality. This procedure provides a less aggressive approach to nondisplaced isthmic lysis, less extensive spinal fusion. This procedure provides a less aggressive approach to nondisplaced isthmic lysis, less extensive spinal fusion in the case of spondylolisthesis.

The skin incision is carried out in midline from 5 to 8 cm according to the stoutness of patient. Muscle fascia is incised close to the midline bilaterally. Paraspinal muscles are dissected on either side of the midline using the electrocautery. Muscles are retracted to expose the interlaminar space. After preparation of space, the device is positioned and fixed.

Eight patients (67%) became free pain 3 months after surgery. In two another patients, ODI improved considerably in 6 months.

Therefore, we had good outcome in 10 patients (83.33%). In two patients (16.67%), no improvement was recognized.

VAS improved broadly in patients 6 weeks and 3 months after surgery.

CONCLUSION

We are obviously aware that indications of this procedure are limited in isthmic lysis.

The great care must be taken when establishing an operative indication. Theoretically, intraspinous implant is not suitable for spondylolisthesis and advanced discopathy.

We are also conscious that the number of our patients is limited in this paper. This limited number of patients calls us for caution regarding the interpretation of the outcome. Despite the limited indication, the good results motivate us to consider this approach a part of therapeutic arsenal for some cases of spondylolysis.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

- Drevet JG, Auberge T, Magnol A, Lelong C, Blanc D, Ramponneau JP. Microtraumatic pathology of the lumbar isthmus: Isthmic lysis or spondylolysis. *Rev Rhum Mal Osteoartic* 1990;57:385-92.
- Fredrickson BE, Baker D, McHolick WJ, Yuan HA, Lubicky JP. The natural history of spondylolysis and spondylolisthesis. *J Bone Joint Surg Am* 1984;66:699-707.
- Marcheiti PG, Bartolozzi P. Classification of spondylolisthesis as a guideline for treatment. *The Textbook of Spinal Surgery*. Philadelphia: Lippincott Raven; 1997. p. 1211-56.
- Wiltse LL, Winter RB. Terminology and measurement of spondylolisthesis. *J Bone Joint Surg Am* 1983;65:768-72.
- Rowe GG, Roche MB. The etiology of separate neural arch. *J Bone Joint Surg Am* 1953;35-A: 102-10.
- Neugebauer FL. Aetiologic der sogennauten spondylolisthesis. *Arch Gynäkol* 1882;20:133.
- Borkow SE, Kleiger B. Spondylolisthesis in the newborn. A case report. *Clin Orthop Relat Res* 1971;81:73-6.
- Willis TA. The separate neural arch. *J Bone Joint Surg* 1931;13:709-21.
- Rosenberg NJ, Bargar WL, Friedman B. The incidence of spondylolysis and spondylolisthesis in nonambulatory patients. *Spine (Phila Pa 1976)* 1981;6:35-8.
- Mazel C. Lumbar and lumbo-sacral fusion using Twinflex devices in 114 cases with minimal follow-up of 1 year. *Eur J Orthop Surg Traumatol* 1995;5:271-7.
- Haun DW, Kettner NW. Spondylolysis and spondylolisthesis: A narrative review of etiology, diagnosis, and conservative management. *J Chiropr Med* 2005;4:206-17.
- Vital JM, Pedram M. Spondylolisthésis par lyse isthmique spondylolytic spondylolisthesis. *EMC Rhumatol Orthop* 2005;2:125-50.
- Kimura M. My method of filing the lesion with spongy bone in spondylolysis and spondylolisthesis. *Seikei Geka* 1968;19:285-96.
- Taillard WF. Etiology of spondylolisthesis. *Clin Orthop Relat Res* 1976;(117):30-9.
- Rajasekaran S, Subbiah M, Shetty AP. Direct repair of lumbar spondylolysis by Buck's technique. *Indian J Orthop* 2011;45:136-40.
- Dubousset J. Treatment of spondylolysis and spondylolisthesis in children and adolescents. *Clin Orthop Relat Res* 1997;(337):77-85.
- Gazzeri R, Galarza M, Alfieri A. Controversies about interspinous process devices in the treatment of degenerative lumbar spine diseases: Past, present, and future. *Biomed Res Int* 2014;2014:975052.
- Swanson KE, Lindsey DP, Hsu KY, Zucherman JF, Yerby SA. The effects of an interspinous implant on intervertebral disc pressures. *Spine (Phila Pa 1976)* 2003;28:26-32.
- Bassewitz H, Herkowitz H. Lumbar stenosis with spondylolisthesis: Current concepts of surgical treatment. *Clin Orthop Relat Res* 2001;(384):54-60.
- Rossi F, Dragoni S. The prevalence of spondylolysis and spondylolisthesis in symptomatic elite athletes: Radiographic findings. *Radiography* 2001;7:37-42.
- de Bodman C, Bergerault F, de Courtivron B, Bonnard C. Lumbo-sacral motion conserved after isthmic reconstruction: Long-term results. *J Child Orthop* 2014;8:97-103.