PERCUTANEOUS DISCECTOMY FOR TREATING DISCOGENIC LOW BACK PAIN

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ABSTRACT

Objective: to evaluate the role of percutaneous lumbar discectomy in treating discogenic low back pain.
Method : The technique of percutaneous discectomy was evaluated in 34 cases of discogenic low back pain between September 2009 and September 2012. Intervention was performed after failure of conservative management. Inclusion criteria were complaints of back pain with or without radicular leg pain and failure of six weeks of conservative care. The diagnosis of discogenic pain was confirmed with imaging studies "MRI" and positive provocative discography with elicitation of concordant pain. Exclusion criteria were presenting with disc extrusion, evidence of previous back surgery, infection or spinal instability, and marked spinal stenosis, and non-qualifying results on provocative discography. Follow up period was 12 months using visual analogue score (VAS) and Oswestry disability index.
Results: This prospective evaluation demonstrated pain relief defined as 2 points or more relief in VAS, in 63% of the patients at 6 months and 50% of the patients at 1 year regarding the back pain.
Conclusion: percutaneous disc decompression using percutaneous discectomy is a safe and effective procedure in alleviating discogenic back pain with or without radicular leg pain.
Key wards: Discogenic pain, percutaneous discectomy, discography, minimally invasive spine.

INTRODUCTION

Chronic low back pain is the most common ailment in modern industrial societies. It ranks first among musculoskeletal disorders, resulting in serious financial and social consequences (1). The intervertebral disc is the focal point of pathology for most low back pain, including sciatica, though the mechanism and pathway of pain generation and conduction has not been elucidated (2). Kuslich et al. (3)

Treatment of discogenic low back pain by reduction of intradiscal pressure involves removal of part of the nucleus via surgical or minimally invasive methods. Surgical treatments of intervertebral disc herniation are often targeted for patients with uncontained or large herniations, and/or sequestered discs. Patients presenting with small contained herniated discs who have not responded to conservative non-invasive treatment, are often not considered as surgical candidates (4). However, over the last three decades, minimally invasive percutaneous techniques using an intradiscal approach have evolved as a viable option. The various modalities utilized have ranged from intradiscal injection of chymopapain for nucleolysis, percutaneous manual nucleotomy with the nucleotome, and thermal vaporization with laser. These percutaneous disc decompression methods decrease intradiscal pressure by virtue of volumetric reduction of the nucleus pulposus using a minimally invasive approach (4).

The safety and efficacy of percutaneous discectomy procedure have been carefully analyzed showing that a safe volumetric removal of the nucleus is achieved and that no disruption or necrosis of the surrounding vital structures, nucleus, annulus, endplate, spinal cord, or nerve root occurs (5), and that after two channels are created within the disc, intradiscal pressure decreases dramatically (6).

PATIENTS AND METHODS

Patients had to satisfy specific inclusion and exclusion criteria to be enrolled in the study. Inclusion criteria were complaints of chronic low back pain with or without leg pain, and failure of six weeks of conservative care. Conservative care was comprised of the use of posture and activity modifications, physical therapy focusing on lumbar stabilization exercises, and oral NSAIDs. The diagnosis of discogenic pain was confirmed with positive provocative discography with elicitation of concordant pain.

Exclusion criteria were: Patients presenting with disc herniation with sequestration, non-qualifying results on provocative discography, evidence of previous back surgery, infection or spinal instability, and marked spinal stenosis due to extensive osteophytosis, the presence of progressive neurological deficits.

The nature of this study and the associated risks were explained to all subjects along with an opportunity to ask questions and decide whether or not they wanted to participate. Informed consent was obtained.

All patients in this study were subjected to complete evaluation utilizing the following sheet:

i. **Demographic data** including age, sex, smoking and activity level regarding their work and daily life activity.
ii. **Clinical evaluation**
   a) **Neurological evaluation.**
   b) **Pain severity by VAS.**
iii. **Investigations:**

a) Laboratory investigations including CBC, INR and PT

b) Radiological investigations including plain X-rays, MRI.

iv. Discography

- Concordant with patient pain.
- Non-concordant with patient pain.

v. Follow-up using

A Visual Analog Scale (VAS) "a numeric pain scale of 0 to 10 (with 0 being no pain and 10 being the most severe pain)" was administered, and filled out by the patient pre-procedure, and 2 weeks post-procedure, three months, six months and one year post-procedure. The treating physician performed assessments at the above intervals, along with information regarding occupational status, analgesics usage, and patient satisfaction.

Improvement in functional capacity was calculated based on Oswestry disability score pre-procedure, six months, and one year post-procedure.

Statistical analysis:

Statistical calculations were performed to determine the level of significance using chi-squared test and Fischer`s exact test for frequencies less than 5. Significance was based on predetermined alpha level which is <0.05.

Percutaneous discectomy technique:

1) Procedure carried on in surgical room with a fluoroscopic guidance.

2) Patient positioning & Patient skin preparation. The patient is positioned in lateral decubitus position with a towel roll under his hip..

3) Patient anesthesia. Under conscious sedation and local anesthesia.

4) Placement of the probe. In lateral fluoroscopic view the probe should be at the posterior vertebral body line when the annulus is felt. At this point the AP view is obtained, and the tip of probe should be lateral to the medial border of the pedicles. This confirms that the probe is not going through the thecal sac on the way to the centre of the disc (figure 1). Once confirmed to be outside the medial border of the pedicle, the probe is advanced into the centre of the disc and is confirmed in both views to be in the disc centre.

5) Disc aspiration. The disc is aspirated until no more material can be obtained. This usually take 15-20 minute. The probe can be moved back and forth and angled to obtain more disc material.

6) Discharge. After 2 hrs patient can be discharged to home with instructions.

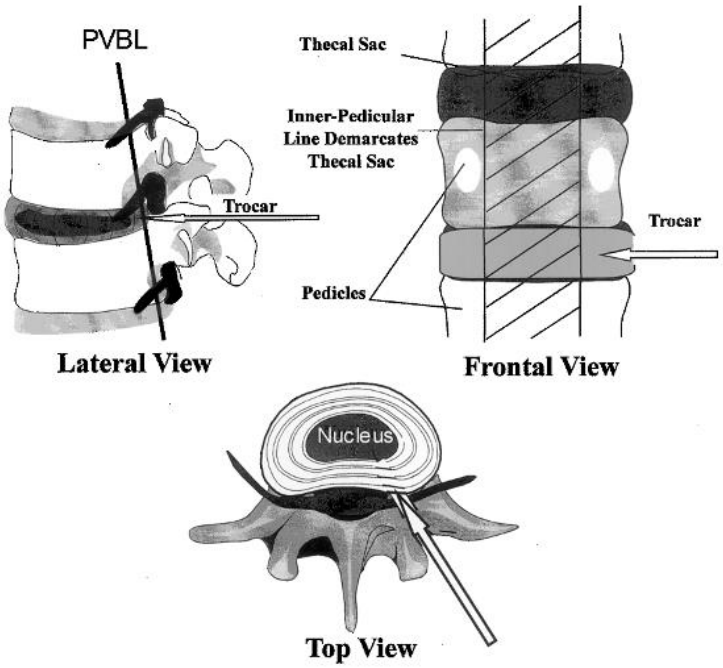


FIGURE 1 . Correct placement of needle against the annulus. The top view shows the correct trajectory of the instrumentation to the center of the nucleus. When the tip of the needle is against the annulus and in the proper trajectory, it should lie at a line that connects the posterior vertebral bodies (PVBL, posterior vertebral body line), and in the frontal view should be lateral to a line that connects the medial border of the pedicles. Only after these views have confirmed that the trocar is not passing

through the thecal sac can the instrumentation be passed into the center of the disc.

Post-operative medications:

- Oral antibiotics for 48hrs.
- NSAID for 5 days.

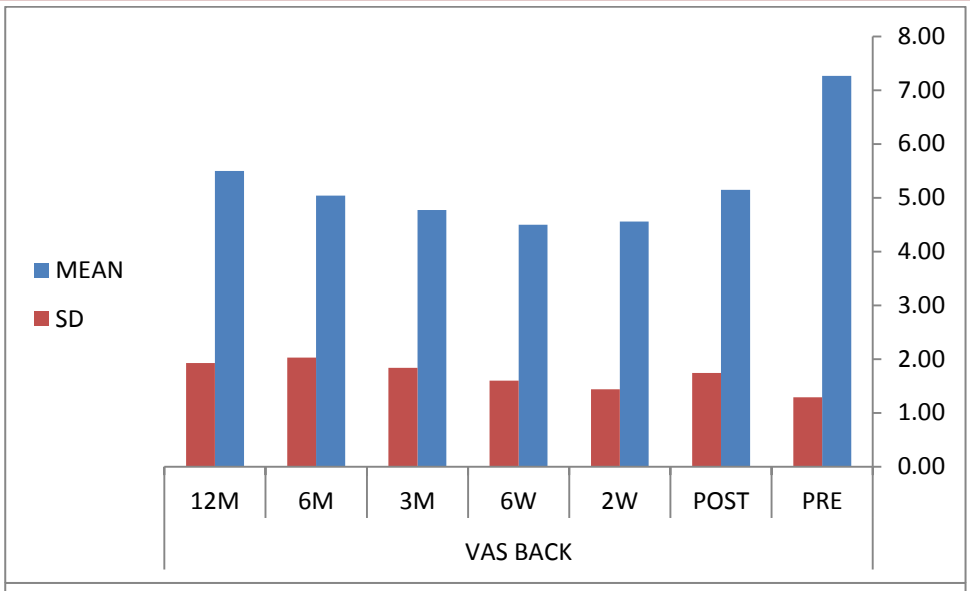
- Muscle relaxant for 5 days.

RESULTS

Demographics of the 34 patients were as coming, patient gender distribution was 32.4% female, 67.6% male, with a mean age of 36.38 ± 8.06 years, ranging from 21 to 47 years. All patients complained of both back pain with leg pain. The average duration of back pain was 17 ±13.6 months, ranging from 1 month to 60 months. The average duration of leg pain was 9.8 ±5.2 months, ranging from 3 months to 24 months. 53% of patients complained of right sciatica, and 47% of left sciatica. 59% of disc herniation was at L4-5 level, 26% at L5-S1 level, and 15% was at both levels "L4-5 and L5-S1". 21% of patients had low activity level, 41% had moderate, and 38% had high activity level regarding their work and daily life activity. A history of 38% of the patients reported smoking.

By comparing the Mean and standard deviation "SD" of the visual analogue scale "VAS" for the back, VAS for the leg, range of motion (degree of lumbar spine flexion as measured by Schober's test "ROM"), subjective work capacity (the degree of how much the patient can cope with his work demands without suffering pain, or needs help), and the Oswestry disability score as a measure of functional disability. Along with the minimum and maximum of each item we found a good improvement post the procedure till the third month post-operative then the improvement decrease slightly towards the twelfth month post-operative but still with a statistically significant good improvement comparing to the pre-operative values (Table 1 & Fig 1).

		MEAN	SD	MINIMUM	MAXIMUM
VAS BACK	PRE	7.26	1.286	5	10
	POST	5.15	1.743	0	8
	2W	4.56	1.440	2	7
	6W	4.50	1.600	2	8
	3M	4.77	1.839	0	8
	6M	5.04	2.028	0	8
	12M	5.50	1.924	2	8
VAS LEG	PRE	7.74	1.082	6	10
	POST	3.59	1.844	1	8
	2W	3.41	1.743	1	7
	6W	3.35	1.824	0	8
	3M	3.71	2.163	0	10
	6M	3.52	1.929	0	8
	12M	4.19	1.767	1	8
ROM	PRE	13.03	1.426	11	16
	3M	14.32	1.376	12	17
	12M	14.27	1.687	12	17
SUBJECTIVE WORK CAPACITY	PRE	50%	0.210	0%	80%
	6W	81%	0.130	60%	100%
OSWESTRY	PRE	30.96	4.653	23	40
	6M	9.81	4.386	2	20
	12M	14.58	4.884	5	25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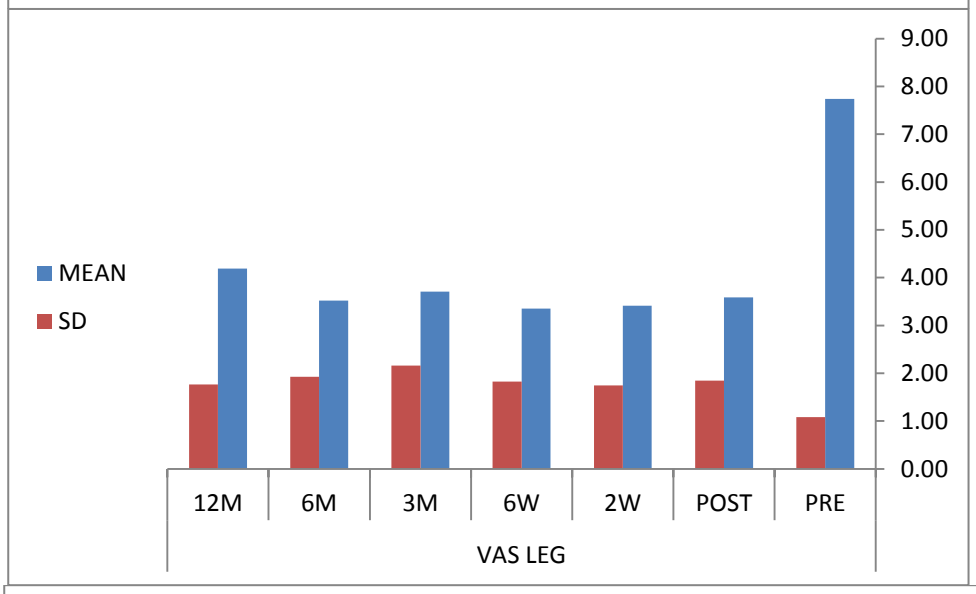
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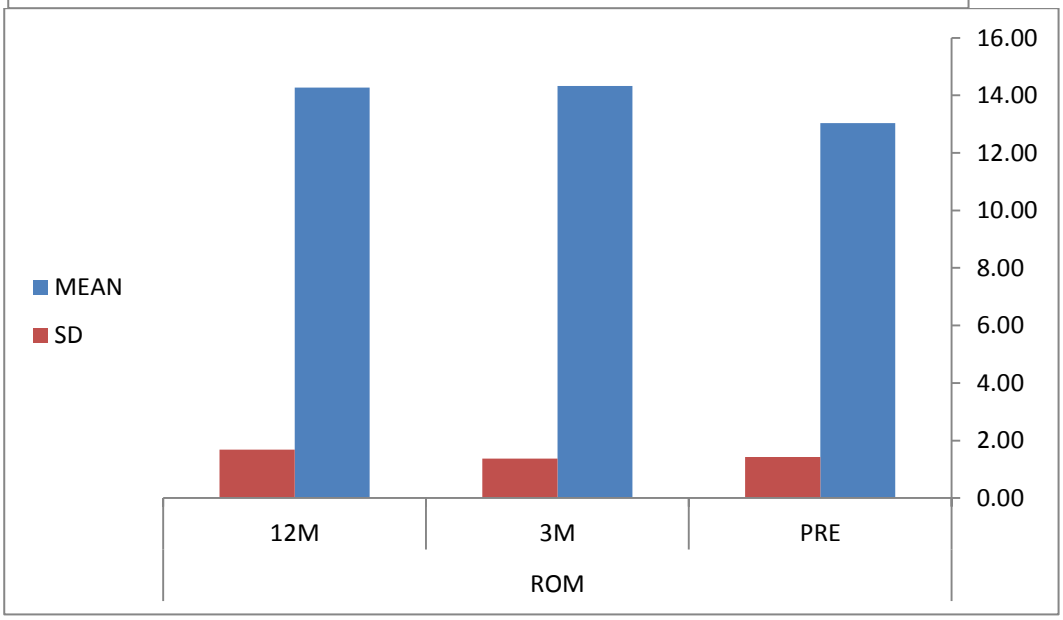
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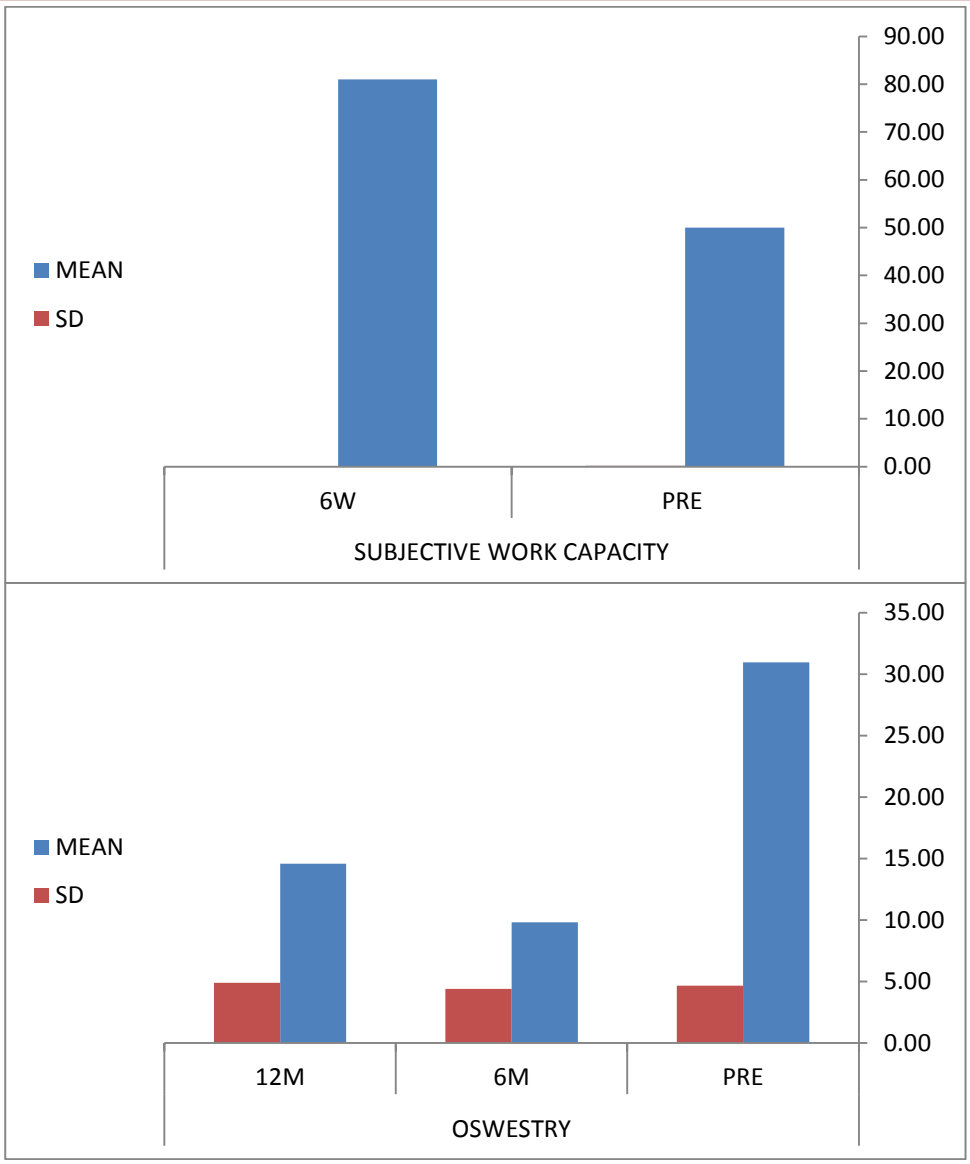


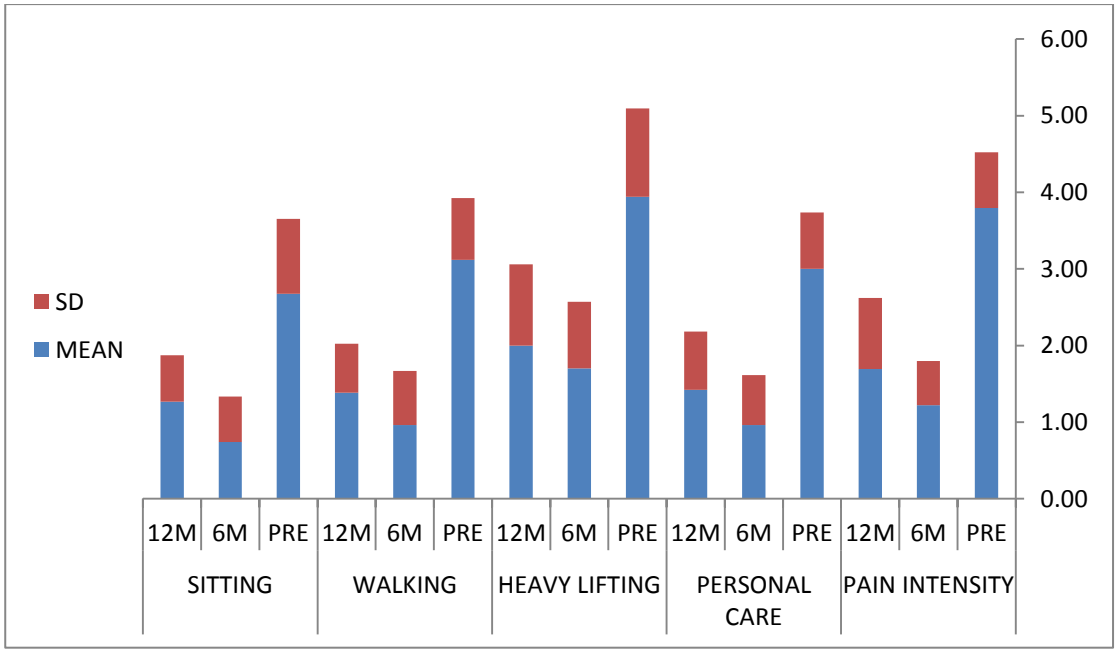
Table 1 & Fig 1: *Comparing Mean, SD, Min, and Max of VAS back, VAS leg, ROM, subjective work capacity, and total Oswestry score pre, post, 2W, 6W, 3M, 6M, and 12M post-operative.*

Oswestry disability score measure ten items of functional capacity for the patients (Pain intensity, Personal care, Heavy lifting, Walking, Sitting, Standing, Sleep, Social life, Travel, and Pain improvement), for each item there are six options taking rank from 0 to 5 describing the patient condition.

We measured the Mean, SD, minimum, and maximum of every item separately and compared these values pre-operatively, 6M, and 12M post-operatively. There was statistically significant improvement for every single item, with slight decrease of the improvement on 12M but still statistically significant good improvement (Table 2& Fig 2).

OSWESTRY		MEAN	SD	MINUMUM	MAXIMUN
PAIN INTENSITY	PRE	3.79	0.729	3	5
	6M	1.22	0.577	0	2
	12M	1.69	0.928	0	3
PERSONAL CARE	PRE	3.00	0.739	2	4
	6M	0.96	0.649	0	3
	12M	1.42	0.758	0	3
HEAVY LIFTING	PRE	3.94	1.153	2	5
	6M	1.70	0.869	0	4
	12M	2.00	1.058	0	5

WALKING	PRE	3.12	0.808	1	4
	6M	0.96	0.706	0	3
	12M	1.38	0.637	0	3
SITTING	PRE	2.68	0.976	1	5
	6M	0.74	0.594	0	2
	12M	1.27	0.604	0	2
STANDING	PRE	3.50	0.749	2	5
	6M	1.30	0.724	0	3
	12M	1.73	0.604	1	3
SLEEP	PRE	1.88	1.008	0	4
	6M	0.41	0.501	0	1
	12M	0.65	0.629	0	2
SOCIAL LIFE	PRE	2.47	0.615	1	4
	6M	0.52	0.509	0	1
	12M	1.08	0.560	0	2
TRAVEL	PRE	2.79	0.770	1	4
	6M	1.04	0.649	0	2
	12M	1.27	0.604	0	3
PAIN IMPROVEMENT	PRE	3.85	0.657	2	5
	6M	0.96	0.759	0	2
	12M	2.08	0.891	1	3
TOTAL	PRE	31.03	4.475	23	40
	6M	9.81	4.386	2	20
	12M	14.58	4.884	5	25



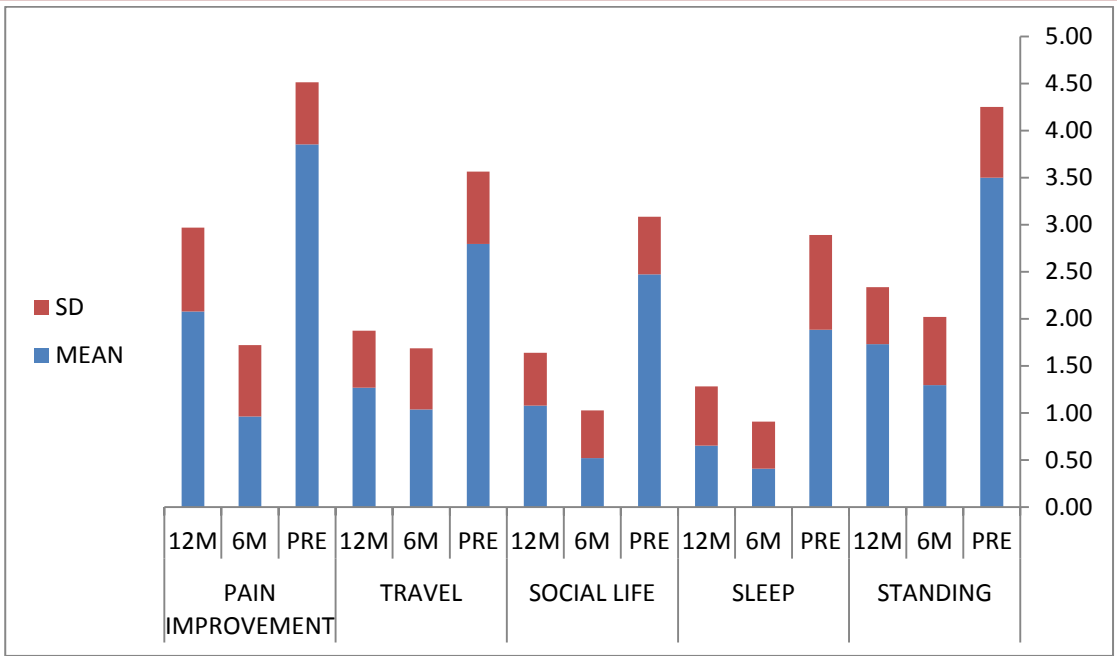


Table 2& Fig 2: *Comparing Mean, SD, Min, and Max of Pain intensity, Personal care, Heavy lifting, Walking, Sitting, Standing, Sleep, Social life, Travel, and Pain improvement "of Oswestry" pre-operatively, 6M, and 12M post-operatively.*

CASE PRESENTATION

Male patient, 33 years old with L4-5 right side disc prolapse with discogenic back pain for 6 months along with right sciatica for 5 months, Schober's test "ROM" was 14 cm. Both his VAS back and VAS leg were 6. Total Oswestry score was 34.

One year after percutaneous discectomy procedure he turned to be medication free, with improvement of his VAS back from 6 to 2, VAS leg from 6 to 1, ROM increased to be 17 cm, his total Oswestry score decreased to 18 instead of 34. He returned to his work after 2 weeks, he was satisfied with the procedure and recommended it to his friends (Fig 3).

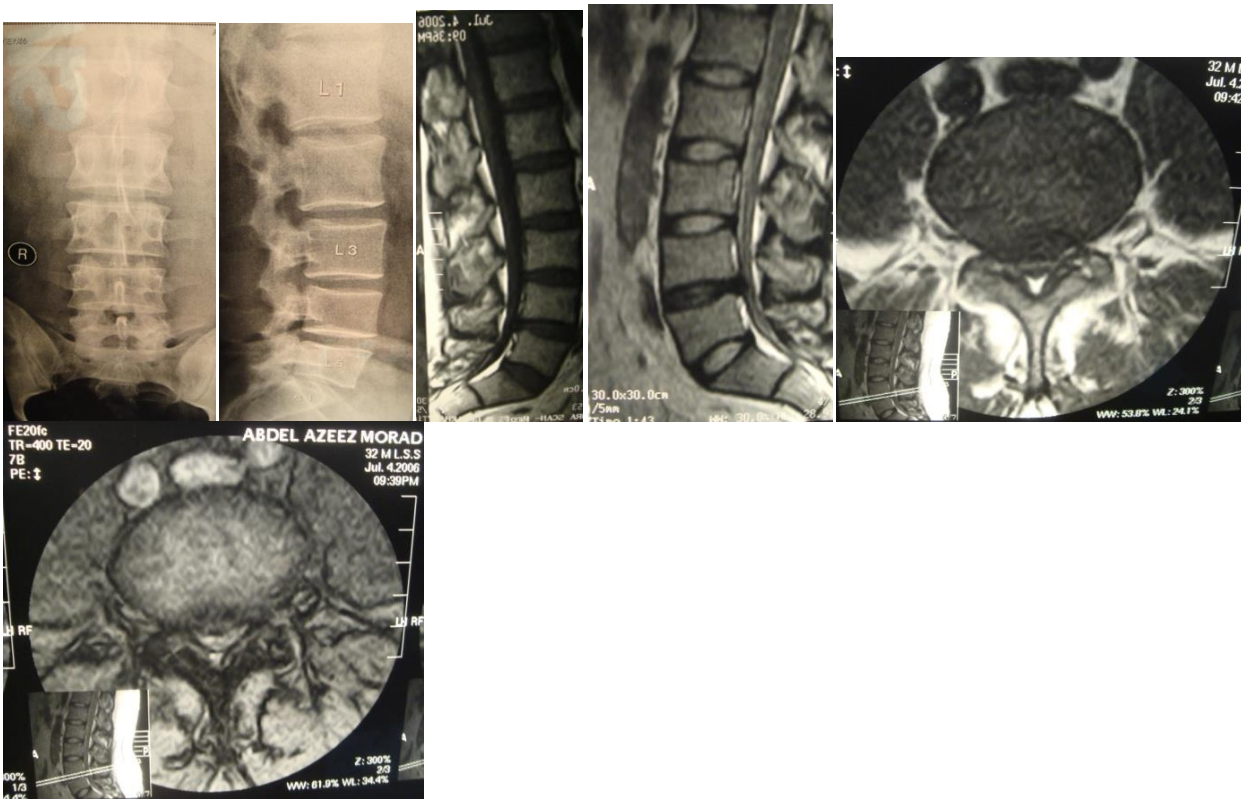


Fig 90: *Case 1.*

DISCUSSION

Chronic back pain is a ubiquitous and functionally disabling condition. Back pain is frequently of multi-factorial etiology with several different pain generators in the back and the spine contributing to a patient's symptoms (7). Discogenic pain is one of the major components of the low back pain syndrome. Imaging modalities including CT and MRI are frequently used to screen for disc disease. There is however, less than optimum correlation between visualized structural abnormalities and a pain generating disc (8).

Discography remains the mainstay for isolating the pain generating disc from one which appears abnormal on imaging studies (9). Discography has also been shown to improve outcome following surgical interventions involving both open procedures as well as minimally invasive techniques (10). Patients included in our analysis had undergone discography to localize the pain generating disc level.

Management of discogenic pain is difficult and complex, and riddled with high failure rates (11). The long-standing theory of Waddell (12) that, "80-90% of attacks of low back pain recover in about six weeks, irrespective of the type of treatment", has been challenged by Croft et al (13). After analyzing Waddell's methodology, Croft et al. reported that Waddell's study was based on the percentage of patients who had not returned to their primary care physician after an initial visit for acute low back pain. In a separate study based on the percentage of low back pain sufferers who were pain and disability free after 3 months, Croft et al. concluded that only a minority of patients with low back pain recover (11).

Treatment of back pain by primary care providers typically involves prescription of Opioids, expensive non-steroidal anti-inflammatory drugs (NSAIDs), or physical therapy.All of these medications will be taken for long term periods carrying a lot of medical troubles for the patients besides a large number of patients will be refractory to medical treatment. Minimally invasive techniques addressing the discogenic pain should therefore be made available to these patients. Percutaneous disc decompression using percutaneous discectomy is another therapeutic option (13).

Percutaneous discectomy has been in use since 1975(14) and was approved for use in the spine in1980. Percutaneous discectomy involves liquifaction of nucleus pulpous by rapidly rotating wire and evacuation by spiral suction. The technique, offers a minimally invasive option of disc decompression while causing very little disruption of the surrounding tissue (15).

Preserving the integrity of these tissues may maintain the flow of nutrients to the cells of the nucleus pulposus, resulting in an increased degree of cellular rejuvenation following the procedure. As several studies by Mochida et al (15) have indicated, there appears to be an inverse correlation between the amount of disc material removed and the long term results. Excessive tissue removal leads to accelerated disc degeneration and instability. The percutaneous discectomy procedure is also attractive in this regard as it involves removal of only a small amount of disc material, typically in the range of 2-3 ml (14).

In contrast to other intr-discal procedure using thermal therapy, percutaneous discectomy has no thermal hazards o end-plates and nerve tissue (15).

CONCLUSION

The preliminary results of a prospective, non-randomized study showed that disc decompression using percutaneous discectomy is a safe and effective procedure in alleviating disco-genic back pain with radicular leg pain. The results of this study demonstrated a statistically significant improvement in pain and functional status at 12 months.

Thus, in patients with chronic discogenic low back pain with contained disc herniation, percutaneous discectomy, a minimally invasive technique for percutaneous disc decompression, not only an alternative modality, but also provides an encouraging outlook.

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