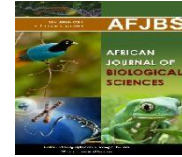


<https://doi.org/10.33472/AFJBS.6.4.2024.539-547>



African Journal of Biological Sciences



Research Paper

Open Access

Functional improvement of patients with symptomatic Lumbo-Sacral disc herniations treated by Percutaneous Transforaminal Full Endoscopic Discectomy

Michael Atif Soliman^{1*}, Wael Mohamed Tawfik Koptan¹, Hossam Salah Eldeen Taha¹, Khaled Ahmed Mostafa Fawaz¹.

¹Department of Orthopaedic Surgery, Faculty of Medicine, Cairo University, Egypt.

*Corresponding author: Michael Atif Soliman.

Mobile: +2-012-22455778.

Email: michaelatif@hotmail.com.

Article History

Volume 6, Issue 4, Feb 2024

Received: 17 Feb 2024

Accepted: 01 Mar 2024

doi:10.33472/AFJBS.6.4.2024.539-547

Abstract

Background: Lumbo-Sacral discectomy is a common Spine procedure. Open microdiscectomy used to be the standard of care when it comes to surgical management of lumbar disc herniation but advancements in more minimally invasive techniques have paved the way for full endoscopic discectomy.

Aim and objectives: To test the Functional improvement of patients treated using Percutaneous Transforaminal full endoscopic discectomy.

Patients and methods: This prospective study was done on 14 patients with symptomatic Lumbo-Sacral disc herniations with an age ranging from 17 to 50 years (mean 31years) operated in tertiary hospitals in Egypt. Functional outcomes were measured using the Visual Analogue Scale (VAS) for both the leg pain and the back pain at the follow up of the 10th day, the sixth weeks and the sixth months, and the Oswestry disability index (ODI) at the follow up of the sixth weeks and the sixth months. And the modified MacNab criteria during the 6-months' visit of the patient.

Results: Significant improvement of the mean VAS for the leg pain from 7.4 pre-operatively to 1.07 after 10 days and to 0.8 at the final follow-up from surgery (P0.001). The mean Oswestry disability index (ODI) was 50.9 pre-operatively which improved after 6 weeks to 11.99 and to 8.3 at final follow-up (P0.001). The mean VAS score for the back pain in our patients was 3.6 preoperatively and improved to 1.78 after 10 days and to 0.9 after 6 months (P0.002). Using modified MacNab criteria at the last follow-up, 11 patients (78.57%) reported excellent results and 3 patients (21.43%) reported good clinical results.

Conclusion: Percutaneous Transforaminal full endoscopic discectomy is an effective method for operative management of Lumbo-Sacral disc herniations. Patients treated by this surgical intervention showed significant improvement as regards both the leg pain, the back pain and also showed adequate functional improvement using the Oswestry disability index and the modified MacNab criteria.

Keywords: Lumbo-Sacral disc herniation, Transforaminal Endoscopic Discectomy, Full Endoscopic Discectomy

Introduction

Lumbo-Sacral disc herniation is a common condition which makes lumbar discectomy one of the most performed spine surgeries. (1. Gugliotta M, 2016)

Microsurgery for lumbar herniated discs is a well-established technique, whether done through open microsurgical retractors or minimally invasive tube retractors, but improvements in endoscopic visualization and instrumentation in addition to patient demands for more minimally invasive procedures, have led to the evolution and increased popularity of endoscopic discectomy. (2. Jasper GP, 2013)

Transforaminal endoscopic discectomy was first introduced by Kambin and Gellman (3. Kambin P, 1983 Apr). In 2001, Yeung and Gore published the methodology including skin marking, how to approach the foramen and clearly identify the pathology (4. Yeung AT, 2001). In 2002, Yeung and Tsou described the YESS transforaminal technique with its ability to address and treat different disc herniations through the transforaminal route. (5. Yeung AT, 2002 Apr)

The endoscopic instruments include the 25 degrees lens which contains an intra-endoscopic, eccentric working channel, a sheath and a bevelled opening, which enables proper introduction and visualization of the instruments through the working channel directly without a clear anatomically performed cavity. (6. Qin R, 2018 Dec)

Various modalities of Lumbar disc herniation treatment options ranging from standard discectomy, microdiscectomy and endoscopic discectomy are still valid options to treat lumbar disc herniations. The idea of less invasive approaches with minimal soft tissue trauma and faster recovery is getting more popular which made full endoscopic discectomy more valid. (7. Jhala A, 2010 Apr)

This study was done to test the functional improvement of patients treated with transforaminal endoscopic discectomy as regards the VAS score, the Oswestry disability index and the modified MacNab criteria.

Patients and methods

This prospective study was done on 14 patients with Lumbo-Sacral disc herniation with an age ranging from 17 to 50 years in tertiary hospitals in Egypt from June 2019 to May 2021. The study protocol and the consent were reviewed and approved by our institutional Ethical committee. Consent was taken from all the patients enrolled in our study.

Inclusion criteria:

Patient with persistent sciatica caused by Lumbo-Sacral disc herniation

Ageing from 16- 60 years old with positive nerve root tension sign,

Disc herniation confirmed by Magnetic resonance imaging or CT scan if MRI was contraindicated

Failure of 6 weeks of non-operative management.

Exclusion criteria:

Recurrent disc herniations

Previous surgery at the operated level

Operated level instability, spinal tumors and infection or vertebral fractures.

Methods:

All patients underwent History taking, clinical examination, preoperative investigations (X-ray, CT scan and MRI), ECG and Echocardiogram if indicated.

Operative techniques:

Transforaminal Endoscopic Discectomy:

The patient lying prone under conscious sedation and with the use of local anaesthesia. The trajectory of the needle is marked by using the Gore and Young needle targeting technique for the

inside-out transforaminal endoscopic discectomy (9. Satishchandra Gore, 2014) and the patient is advised to report any unusual pain, especially in the affected leg during the procedure.

The C-arm in the AP view is used to mark the midline of the spine vertically and the targeted disc level horizontally. Then the C-arm in the lateral view to mark the anterior border of the targeted disc and a Tangential line parallel to the disc is drawn and the distance between the anterior border of the targeted disc and the surface of the skin is measured. Then the distance measured previously is measured from the midline to mark the needle entry from the surface of the skin at the meeting point of the line drawn in the lateral view and a line extending from the midline. The needle should be aiming the medial pedicular line in the AP view and the posterior annulus in the lateral view. Once appropriate needle position is insured the guide wire is then inserted followed by needle withdrawal, a scalpel is used to open the skin to pass the dilator, the sheath is then introduced, a cannula with bevelled tip gives the advantage of using the bevel to steer the bevel of the sheath away from the exiting nerve root and thus protecting it. Care must always be taken not to injure the exiting nerve when approaching the disc thus any radicular pain experienced by the patient must be considered when approaching the foramen.

The endoscope is then introduced and accurate interpretation of the image is mandatory to ensure to safely and effectively target the fragment. Bipolar radio frequency is used for proper hemostasis and a set of instruments including graspers is used to extract the herniated fragment.

Withdrawal of the working cannula and levering on the pars interarticularis is used to enter the canal and visualize the Dural elements and thus assess adequate decompression.

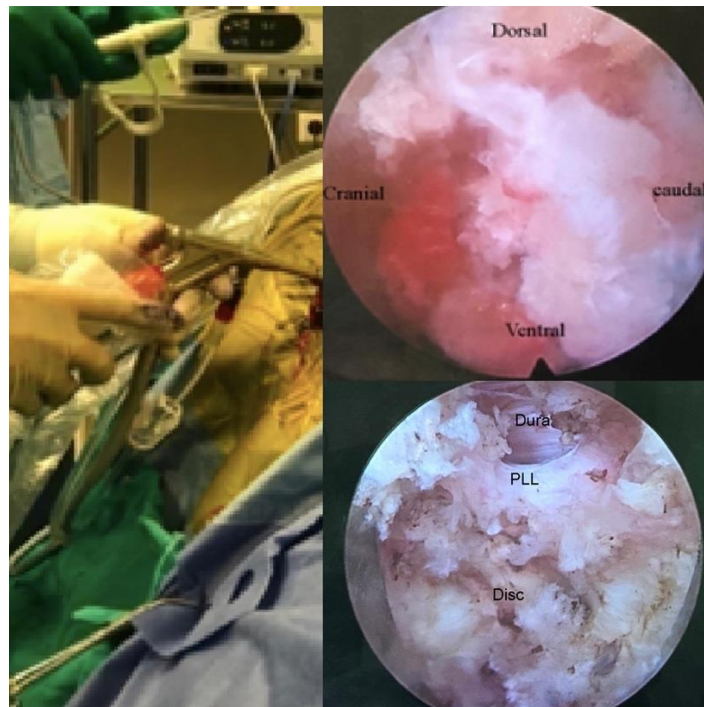


Figure (1): After introducing the endoscope (left), the first image seen with its' direction's interpretation (Right upper) and the endoscopic picture after discectomy with proper visualization of the dura, the disc and the Posterior longitudinal ligament "PLL" (Right lower).

Efficacy Evaluation

Certified Arabic translation of the Oswestry disability index (ODI) was used in functional assessment of the patients. (8. A.S.Algarni, 2014) and Pain degree assessment for both the back and leg pain was assessed using the VAS scale with 10 being the most severe and 0 being free of pain. Also, the modified MacNab criteria was used during the 6-months’ follow-up.

Statistical Analysis

Data were statistically processed in terms of mean ± standard deviation, or median and range when needed. Over time comparisons were done using paired *t*-tests in comparing normally distributed and Wilcoxon signed rank tests for paired (matched) samples when comparing non-normal data. Two-sided *p*-values <0.05 were considered statistically significant. IBM SPSS 22 was used for all statistical analyses.

Results

Table (1): Data of the patients

-Age (years)		31
Sex		
Female		7
Male		7
Occupation		
Accountant		2
Worker		1
Driver		1
Housewife		3
Bookkeeper		1
Retired Military		1
Professional Athlete		1
Student		4
Levels		
L3/4		1
L4/5		9
L5/S1		3
L4/5 + L5/S1		1

14 patients were included with mean age of 31 years (range 17-50). 7 patients were male and 7 patients were female with different occupations as illustrated in the Table 1. The most operated level was L4/5 and the least was L3/4.

Table (2): Comparing pre and postoperative VAS scores for back and leg pain

	Pre VAS Back	10 days VAS Back	6 months VAS Back	Pre Vas leg	10 days VAS leg	6 months VAS leg
Mean	3.6	1.78	0.9	7.4	1.07	0.8
N	14	14	14	14	14	14

	Pre VAS Back	10 days VAS Back	6 months VAS Back	Pre Vas leg	10 days VAS leg	6 months VAS leg
Std. Deviation	2.5	0.8	0.7	1.3	1.32	0.7
Minimum	0	1	0	5	0	0
Maximum	9	3	2	9	5	2

The mean Pre VAS for the back pain was 3.6 which improved to 1.78 at 10 days and to 0.9 at 6 months. The mean Pre-operative VAS leg was 7.4 which improved to 1.07 at 10 days VAS leg and further improved to 0.8 at 6 months Follow-up (Table 2). The change in the VAS score between the preoperative score and the final follow-up for both the leg pain and the back pain was found to be statistically significant with P value of 0.001 and 0.002 respectively.

Table (3): Comparing pre and postoperative Oswestry disability index (ODI) score

	ODI	6 weeks ODI	6 months FUP ODI
Mean	50.9	11.99	8.3
N	14	14	14
Std. Deviation	12.0	4.34	4.4
Minimum	24	8	2
Maximum	66	20	18

As regards to ODI where the mean ODI was 50.9 before the surgery and improved to be 11.99 at 6 weeks follow up and improved further to 8.3 at 6 months follow up which indicates the improvement of patients' disability from severe to minimal disability by 6 months (Table 3). The change in the ODI score between the preoperative score and the final follow-up ODI was found to be statistically significant (P0.001).

Clinical improvement of all patients in both groups was also assessed using modified MacNab criteria where 78.57% reported excellent results and 21.43% reported good results.

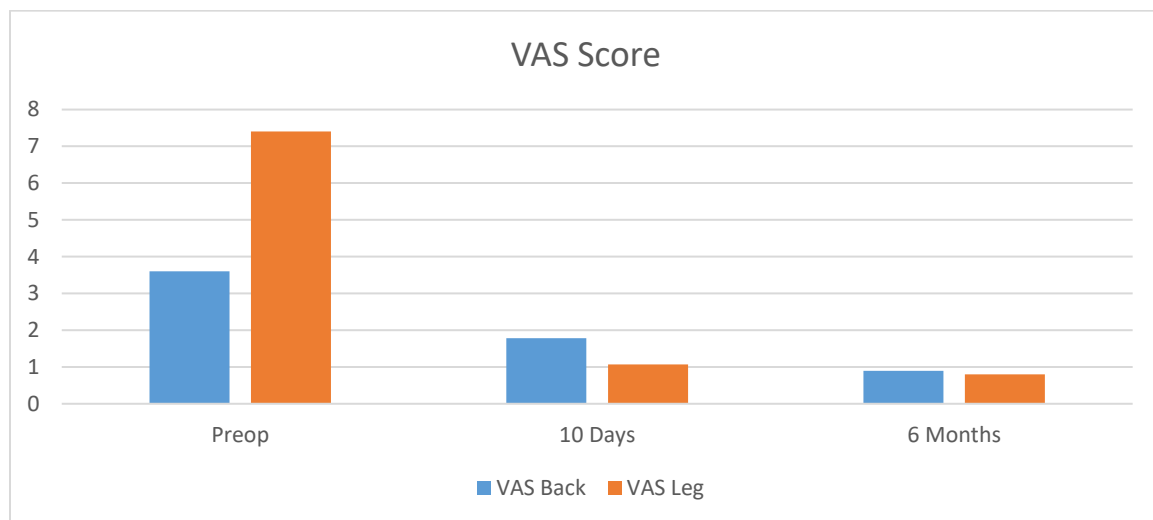


Figure (2): Showing VAS score for both the back pain and the leg pain preoperatively and during 10 days and 6 months follow-up.

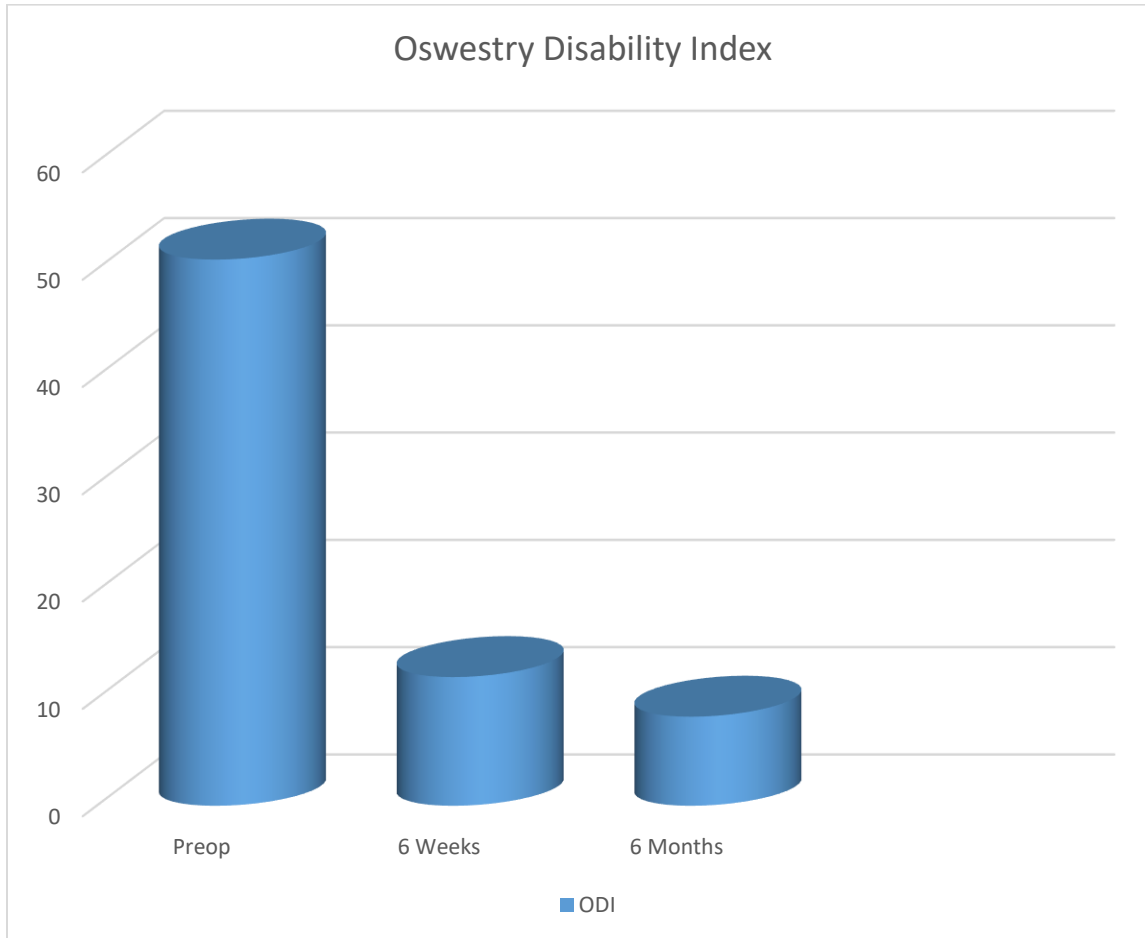


Figure (3): Showing ODI score improvement at 6 weeks and 6 months following the surgery and as compared to the preoperative score.

Case presentation

Male patient 34 years old, driver, smoker with no comorbidities of medical importance. He was presented with a 1-year onset of Rt. Leg pain and low back pain. He was on conservative therapy but with no improvement. By examination, he had manifestations of Rt. Sciatica with positive nerve root tension sign. Intact motor and sensory examination. VAS score: 7 for the back pain & 5 for the Leg pain, ODI score: 46, MRI showed Rt. L4/5 disc with annular tear. He underwent L4/5 Rt. side transforaminal Endoscopic discectomy under local anesthesia and sedation, his postoperative hospital stay was smooth and was discharged the next day on painkillers. 6 Months postoperatively the patient's VAS score was 0 for the leg pain and 1 for the back pain and the patient assumed that the back pain is occasional and related to long days. His ODI at the 6 months follow-up was 10.

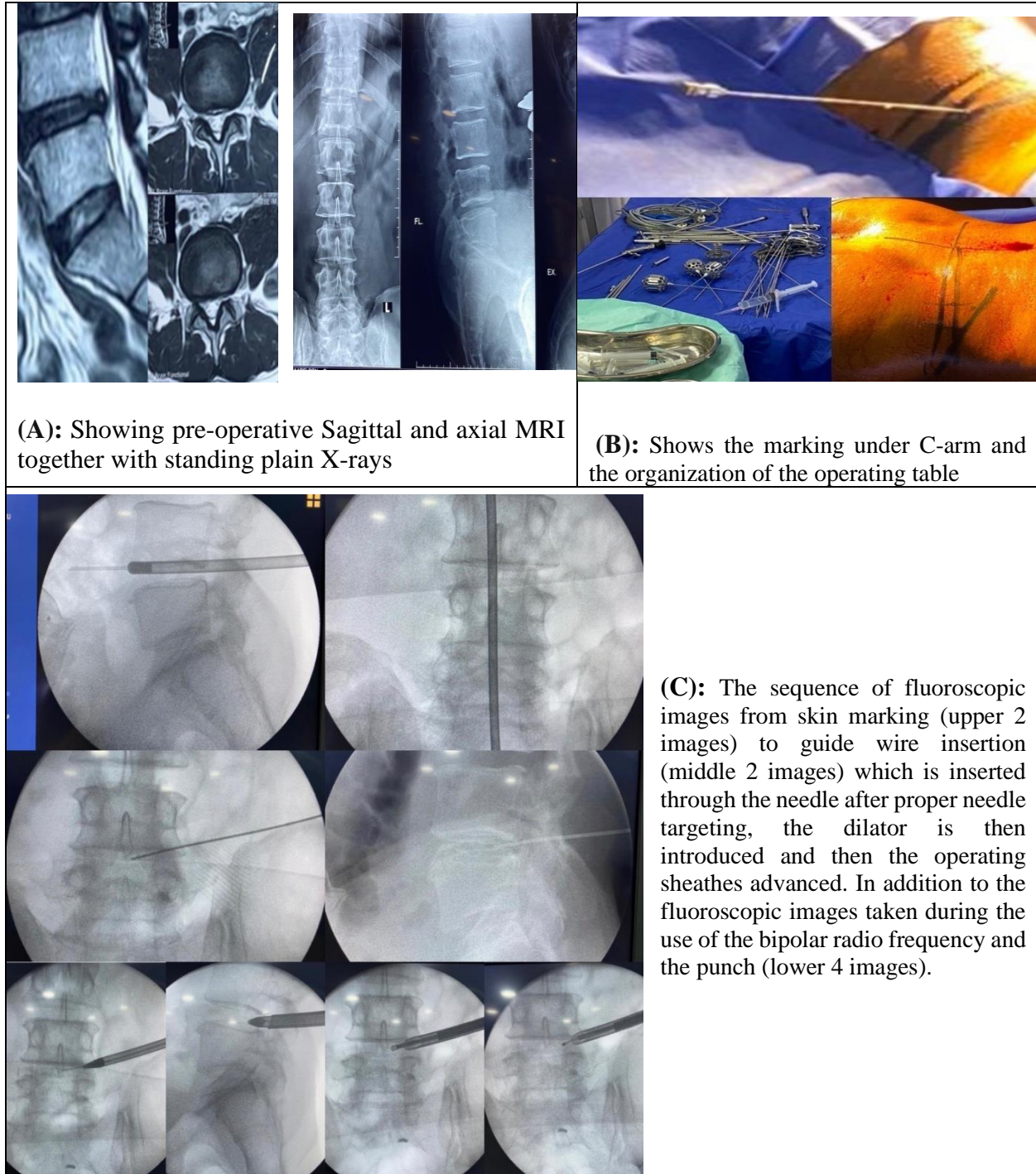


Figure (4): Photos of the case presentation.

Discussion

Open microdiscectomy is the gold standard for discectomy procedures. However, microdiscectomy has the disadvantages of the larger incision needed for proper visualization together with more surgical insult to the paravertebral muscles and more extensive bony resection which might affect the facet joint and hence the stability and may induce more surgical bed scarring. (10. E W Fritsch, 1996)

Percutaneous Transforaminal Endoscopic discectomy gives the advantage of shorter incision, less soft tissue trauma, no bony resection and can be performed using local anesthesia and sedation. Minimal damage to soft tissues and minimal to no bony resection is done which will reduce surgical bed scarring and iatrogenic postoperative stability. (11. Il Choi, 2013 Nov) (12. Vafa Rahimi-Movaghar, 2012 Nov)

In our study, we aimed to test the Functional improvement in our patients as an indication of the efficacy of this tested procedure which was assessed using the Oswestry disability index (ODI) and the Visual Analogue score (VAS) for both the back and the leg pain. Improvement of VAS score for the back pain was noted from the first follow-up at 10 days from surgery where the mean VAS score for the back pain was 3.6 before the surgery and improved to 1.78 after 10 days indicating minimal back pain in the early postoperative period and improved to 0.9 after 6 months. This may be explained by the small incision and the minimal soft tissue impact done in the full endoscopic group. Our result is similar to those reported by Ahn SS et al., and Choi KC et al., showing significant improvement in back pain and thus faster recovery in endoscopic lumbar discectomy patients. (11. Ahn SS, 2016 Feb) (12. Choi KC, 2016)

Our patients showed marked improvement in the VAS score for leg pain with significant improvement in VAS score for the leg pain as compared to the preoperative scores of the patients (P0.001). These results are similar to those encountered by Pravesh S. Gadjradj et al. study which showed improvement of the VAS score of the leg pain after percutaneous transforaminal endoscopic discectomy patients. (15. Pravesh S Gadjradj, 2016 Feb)

In this study, Significant improvement in the ODI score as compared to the preoperative ODI during the last follow-up after surgery where the average ODI dropped from 50.9 to 8.3 at the last follow-up. Similarly, many published studies reached the same results as J.N. Alaistair et al.'s randomized controlled trial where the transforaminal endoscopic patients showed significant ODI improvement (P=0.004) to 1 year. (16. J. N. Alaistair Gibson, 2017)

The modified MacNab criteria was used at the 6 months follow up to assess the improvement of the patient' abilities including pain, mobility, return to work and level of activity, where all of the patients achieved excellent (78.57% of the patients) and good results (21.43% of the patients) which is similar to the results reported by Liu, Wei MM et al. in their study where most of the patients had excellent outcomes. (17. Liu, et al., March 2019).

Conclusion

Percutaneous Transforaminal full endoscopic discectomy is an effective method for operative management of Lumbo-Sacral disc herniations. Patients treated by this surgical intervention showed significant improvement as regards both the leg pain, the back pain and also showed adequate functional improvement using the Oswestry disability index and the modified MacNab criteria.

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