



Research Article

Advantages Roles of Epiduroscopic Techniques in Diagnostic plus management of Lumbar Canal Stenosis

Authors

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Abstract

Background: Lumbar Canal Stenosis as commonest disorder affected by degenerative spine diseases which is required surgical intervention. These disorders depend on clinical and MRI picture alone in diagnostic data assessment. We advise to use confirmatory diagnostic interventional Epiduroscopic technique to improve diagnosis, also more as supportive technique during managements of lumbar canal stenosis.

Aim of study: We evaluated the effectiveness of percutaneous Interventional Epiduroscopic Techniques in diagnosis, plus advantages in management of Lumbar Canal Stenosis.

Patients & Methods: A prospective study of 40 patients with Lumbar Canal Stenosis, were diagnosed in Sulaimaniyah city private clinic and private hospital from July 2012 till August 2014, according to the clinical presentation, plus MRI Magnetic Resonance Imaging techniques, also according to inclusion exclusion criteria in diagnosis of stenosis clinically, radiologically. All these patients were preparing for treatment by lumbar spine surgery exploration with decompression laminectomy, post using the Percutaneous Epiduroscopic Techniques through sacral canal under fluoroscopic guide, there were 14 patients excluded from surgical decompression laminectomy, after using Epiduroscope. That observe the canal closures will open by Epiduroscopic technique, when only primary tethering the roots within the cord were seen, post exclusion the secondary tethered cord syndrome. Also, the patients become free from sign of stenosis & improvement of claudication clinically immediately post interventional procedure by Percutaneous Epiduroscopic Techniques through sacral canal under fluoroscopic guide. The Caudal Epidurogram showed restriction in spread of contrast caused by stenosis level both in axial, and or foraminal obstruction. That is important for determination the level of stenosis was seen by fluoroscope, until complete the procedure with adequate visualization of all stenosing level in axial plus foraminal in the lumbar canal stenosis. Using pressurized saline with dye for observational under fluoroscope.

Outcome: The disorders have been confirmed clinically, radiologically, plus by Interventional Epiduroscopic Technique. Will Improved the diagnosis, plus improvement in the treatment orientation of decompression level of Lumbar Canal Stenosis.

Results: The Epiduroscopic techniques in all lumbar spinal canal stenosis patients has led to exclusion 14 patients from original 40 patients that they were selected randomly. The early preliminary Epiduroscopic before the decompression for those patients under gone decompression laminectomy of the lumbar canal stenosis patients will lead immediately to improvement in the canal opening visualized in the epidurogram, without any eliminate of stenosis or obstruction both in axial, plus foraminal direction. That improvements

post Epiduroscopic technique were tethering of the roots intraoperative seen, supporting the clinical, plus radiological Magnetic Resonance Image MRI data. The outcome was noticed with significant improvement in the mean of Stanford score and ODI (Oswestry low back disability score) from baseline at follow up visit for 6,12,24 Months according to Sciatica Pain, Functional Outcome, return back to work, Psychological status, Change in Narcotic intake, with the General Satisfaction rate. Revealed high outcome results in the diagnosis, plus managements, with minimal interventional procedure, minimal complications rate in lumbar canal stenosis patients.

Conclusion: We concluded that Percutaneous Epiduroscopic Techniques for 2 years follow up using in the spinal canal stenosis of degenerative origin patients can improve the diagnosis plus managements is superior to the immediate surgical exploration with decompression laminectomy alone in these groups of patients.

Introduction

The Evaluation of lumbar canal stenosis post clinical, with radiological assessment data by MRI, with advantages of functional outcome of percutaneous epiduroscopic evaluation assessment, as interventional diagnostic procedure in will improve the surgical decompression of lumbar canal stenosis¹. The management recently of spinal pain is directed toward minimal surgical techniques, spinal endoscopy has become widely used for patients with lumbar canal stenosis of degenerative spine origin. Recently the additional use of lasers has extended the skills and indications of epiduroscopy, and has been named Epiduroscopic Laser Neural Decompression^{1,2}.

Endoscopic procedure is now an essential technique in medicine. Since the importance of the gastroscope was introduced for the diagnosis of gastric disease by Schindler in 1940, it has become an essential tool in gastroenterology. After that, colonoscopy was performed for the diagnosis and management of occult gastrointestinal bleeding in 1976. In 1985, a preliminary study described the results and method of epiduroscopy and spinaloscopy^{3,4,5,6,7}.

Epiduroscopic Adhesiolysis used for Treatment of Failed Back Lumbar Spine Syndrome Caused by Fibrosis-Adhesion, also for treatment of these tethered spine syndrome. For adhesiolysis in the epidural space, with direct drug administration at the pathologic site in the epidural space. However, most of pain are focusing on the therapeutic aspect, when they try to perform epiduroscopic procedures. A comparison of epiduroscope and

MRI shows us that Epiduroscopy is a better tool for diagnosing the vertebral level of low back pain or leg pain patients⁶.

In the 1930s, Burman^{1,2,7} applied Myeloscopy for observation of the subarachnoid space in cadavers^{7,8}. Saberski and Kitahata subsequently developed an epidural endoscope, and it has now become possible to insert a video-guided catheter with an external diameter of 0.9 mm and a fiberoptic scope for direct observation of the epidural space through the sacral hiatus^{9,10,11}.

What is Epiduroscope

Epiduroscopic technique is a method of directly visualizing and potentially treating pain generators inside of the spinal column, using a small flexible fiberoptic scope is inserted through a tiny incision and pass through Sacral Canal will be seen in figure 1.1, The areas of concern can be visualized on a video monitor then Medication can be injected through the same catheter^{12,13,14}.

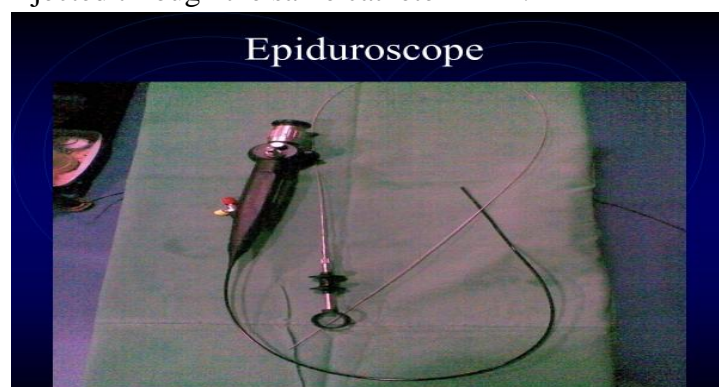


Fig.1.1: Epiduroscope small flexible fiberoptic scope visualizing spinal canal.

The precise localization of painful structures in the spine of patients with low back pain and/or pain radiating (LBP/RP) to the lower extremities is important for targeted therapeutic intervention.

This procedure we study the effectiveness of percutaneous Epiduroscopic Adhesiolysis in management of fibrosis & adhesion resultant from failed backed lumbar spine surgery from this Surgical technique can confirm the management of Epidural fibrosis and adhesion. Specific to surgical technique that confirmed after exclusion other causes that lead to recurrent of symptoms^{7,14,15}

The advantages of these study to determine and specify which spinal segment the pain was elicited via endoscopic evaluation figure 1.1. That will confirm the vertebral level from where the pain was thought to originate as determined by clinical evaluation and by MRI^{7,9}. Epidurography is both diagnostic and treatment tool figure 1.10,1.11 will be seen by epidurogram visualize the canal obstruction level. It is used to assess the structure of the epidural space in the spine by injecting contrast dye under fluoroscopic guidance. This procedure is usually also done before epidural therapeutic material administered to ensure accurate delivery of treatment material to the source of pain. The procedure is used in the detection of herniated discs that are not seen with myelography^{7,9,11}.

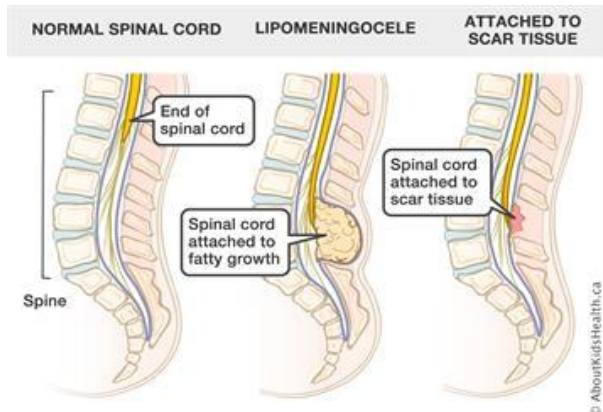


Fig: 1.2: Tethered cord syndrome secondary causes



Fig.1.3: Thick Filum Terminale

Study indicate that Epiduroscopy is more reliable than either clinical evaluation or MRI for determining the vertebral level where clinically significant spinal pathology occurs in patients with spinal canal stenosis diseases with Low Back Pain or Root Pain^{8,9,11,16}. Failed back surgery syndrome (FBSS) refers to a condition in which the symptoms remain unchanged or worsen after surgery for lesions of the vertebrae, or interference in daily life remains. It is a syndrome of intractable chronic pain for which no effective treatment has been established. The cause of this condition remains unclear but has been variously attributed to adhesions in the epidural space after back surgery, physical obstruction of the peripheral nerves, and nerve root damage^{17,18,19,20}. The aim of these studies evaluation of the significance diagnostic markers obtained from using Epiduroscope by assessment accuracy of the obstructing spinal cord stenosing level Patients with chronic low back and leg pain. The outcome of treatment was predicted based on direct visual information (hyperemia, vascularity, and fibrosis) and mechanical information (pain to touch, contrast spread, and patency) obtained through Epiduroscopy^{21,22,23}. Tethered Cord Syndrome occurs when the spinal cord gets stuck to the bottom of the spinal column and is stretched. Tethered spinal cord syndrome is a neurological disorder caused by tissue attachments that limit the movement of the spinal cord within the spinal column. These attachments cause an abnormal stretching of the spinal cord. Tethered cord means that spinal cord cannot move freely inside their spinal column. The spinal cord bundle of nerves

that carries messages between the brain and the body is stretched. Tethered cord can cause problems with bladder function control, bowel daily activities or walking disturbance. The most common causes of tethered cord are shown in Figure 1.2, There are Primary and secondary causes example Lipomeningocele (fatty growth) and scar tissue lipomeningofibrosis following back surgery^{7,8,9,24}

The Primary iatrogenic causes; which isolated primary anomaly. However, the Secondary Causes are

- spina bifida. Myelomeningocele
- Lipomyelomeningocele
- Dermal sinus tract (a rare congenital deformity)
- Diastematomyelia (split spinal cord)
- Lipoma (a benign, fatty growth)
- Tumor
- Thickened/tight filum terminale (a delicate filament near the tailbone)
- A history of spine trauma
- A history of spine surgery



Fig.1.4: MRI: Lipomyelomeningocele



Fig.1.5: MRI: Diastematomyelia

The most common signs & Symptoms of a tethered cord syndrome; due to improvement in neurological examinations and in the interpretation of imaging studies^{2,8,9,24}.

- Lesion on the lower back
- Fatty tumor or deep dimple on the lower back
- Skin discoloration on the lower back
- Hairy patch on the lower back
- Back pain, worsened by activity and relieved with rest.
- Leg pain, in the back of legs, burning pain in the analgesic (painless on examination)
- Leg numbness or tingling, weakness or muscles wasting
- Changes in leg strength
- Deterioration in gait
- Progressive or repeated muscle contractions
- Leg deformities
- Spine tenderness
- Scoliosis (curvature of the spine)
- Bowel and bladder problems; bladder and bowel dysfunction, manifested by increased frequency or urgency of urination or constipation

Patients & Method

A prospective study of 40 patients all of them with Lumbar Canal Stenosis, were diagnosed in Sulaimaniyah city private clinic and private hospital from July 2012 till August 2014, selection was according to the clinical presentation, plus MRI Magnetic Resonance Imaging, also according to inclusion exclusion criteria in diagnosis of lumbar canal stenosis clinically and, radiologically. All these patients were preparing for treatment by lumbar spine surgical exploration with decompression laminectomy, were using preliminary Percutaneous Epiduroscopic Techniques through sacral canal under fluoroscopic guide, there were 14 patients excluded from surgical decompression, that were observed the canal obstruction will open after using the epiduroscope, when only the tethering of the roots within the cord were visualized. Also, the patients improved

from previous sign of stenosis, plus improvement in patients complaining clinically, with improvement in the claudication sign immediately post interventional procedure by Percutaneous Epiduroscopic Techniques through sacral canal. The other 26 lumbar canal stenosis patients, where Caudal Epidurogram showed restriction in spread of contrast caused by stenosis level both axial, and or foraminal obstruction, were decompression laminectomy for them. That is important for determination the stenosing spinal vertebral level were visualized by MRI, also confirmed stenosis obstruction level were seen by fluoroscope, until complete the procedure with adequate visualization of all stenosing level in axial plus foraminal obstruction in the lumbar spine patients. Using pressurized saline with dye for observational under fluoroscope technique.

Procedure

All 40 patients underwent Epiduroscope through sacral canal, the caudal epidurogram showed restriction in spread of contrast caused by stenosis obstruct the lumbar canal, when using pressurized saline irrigation range of 30-40 ml. Also use 1% 5ml lignocaine injected locally into skin and soft tissue around canal space, with usage of dye for visualization of the caudal canal epidurogram, showed restriction in spread of contrast caused by stenosis with obstruction of the lumbar spinal canal, both axial or foraminal. This reflect exact level of obstruction primarily with proper orientation for the direction, secondly the patients with primary setting cord tethering as an isolated anomaly tethered cord syndrome. Showed opening in the obstructed canal for 14 patients out of these 40 patients selected for lumbar canal decompression laminectomy procedure. Post excluded the most common secondary causes of tethered cord syndrome (The Spinal Lipoma Lipomyelomeningocele, Tight Filum Terminale, Diastematomyelia, and Myelomeningocele), these to include only the primary isolated anomaly of tethered cord syndrome, these within exclusion-inclusion criteria.

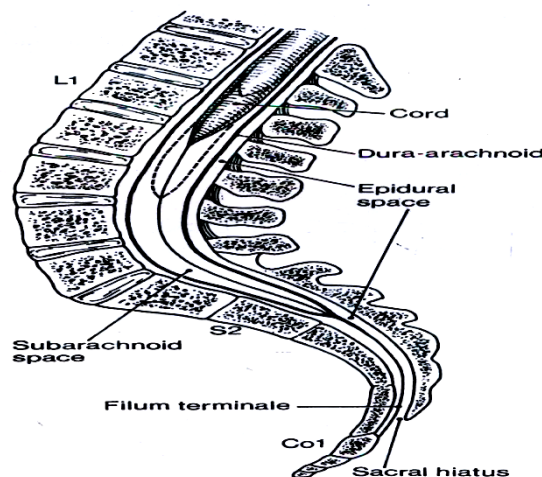


Fig.1.6: Sacral Canal

The improvement in diagnosis with spinal MRI done to all patients before any intervention techniques, also confirmation of the canal obstruction by interventional epiduroscopic procedure done to all 40 patients. The residual patients that were continue obstruction in the lumbar spinal canal stenosis post epiduroscopic procedure, decompression laminectomy was done for them.



Fig.1.7: MRI Lumbar Canal Stenosis L4, L5



Fig.1.8: MRI Lumbar Canal Stenosis Two level L4,L5

Procedure

- 1% 5ml lignocaine injected locally into skin and soft tissue around canal space.
- Saline used intermittently until the spinal canal open were seen by fluoroscope – fluorogram, until complete procedure with adequate visualization of the canal opening, also the saline mixed with 2- 3 ml Marcaine.
- Mostly the level of L4, L5 vertebral level were canal stenosis obstructions seen in these patients group, they were 14 patients excluded from the decompression laminectomy. That were underwent epiduroscopic technique used for all 40 patients, the lumbar canal opening mostly of tethered cord syndrome for these 14 patients of isolated primary tethering, without real factor for lumbar canal obstruction.
- The other 26 patients were prepared for classical decompression laminectomy.

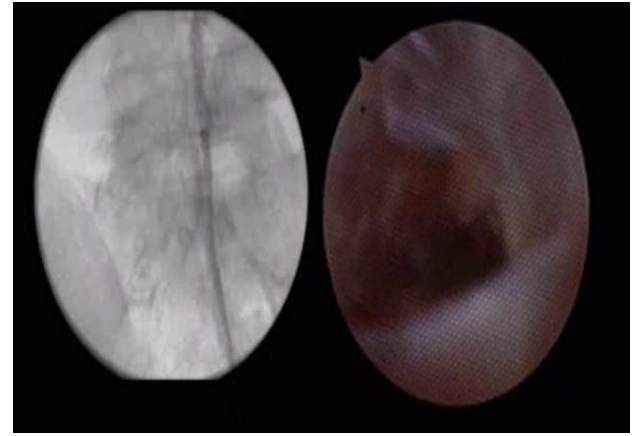


Fig.1.11: Epiduroscope/ Epidurogram showing Canal Opening

In Figure 1.9,1.10 the Caudal Epidurogram Showed Restriction in spread of contrast caused by stenosis obstruction in the lumbar canal will be opened by irrigation through pressurized saline range from 40 -80 ml according to the size & level which were obstructed by stenosis of the lumbar canal.

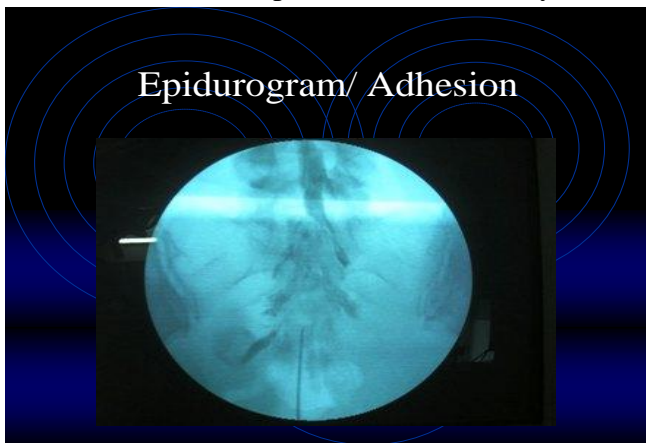


Fig.1.9: Epidurogram using Epiduroscope both in diagnosis and treatment L5 Obstruction



Fig.1.12: X ray; Post-Surgical decompression L4+ L5 Laminectomy

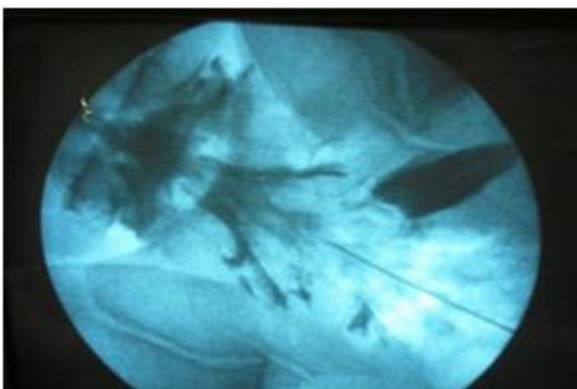


Fig.1.10: Epidurogram using Epiduroscope visualization obstruction level



Fig.1.13: MRI Lumbar Canal Stenosis L4

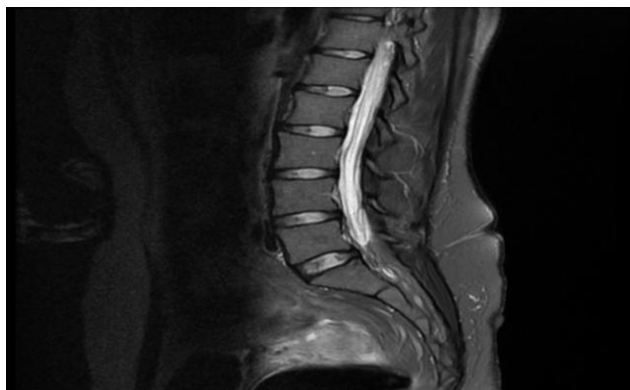


Fig.1.14: MRI Lumbar Canal Stenosis Tethered cord syndrome

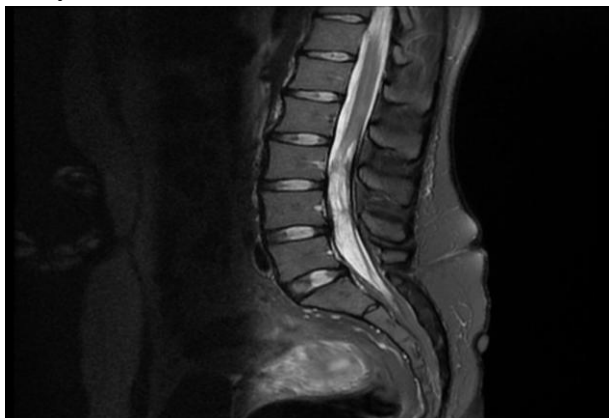


Fig.1.15: MRI Lumbar Canal Stenosis Tethered cord syndrome

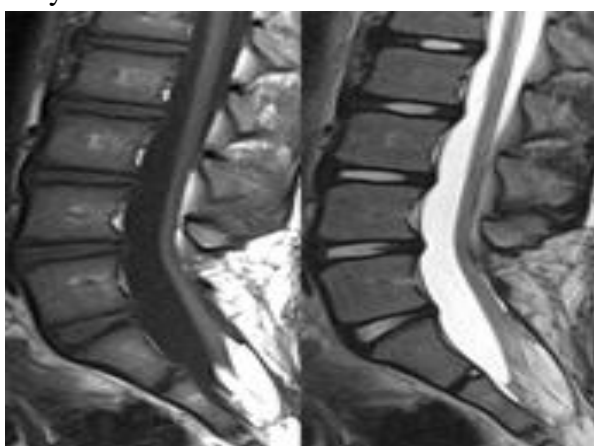


Fig.1.16: MRI Lumbar Canal Stenosis Tethered cord syndrome

Outcome

The disorders have confirmed clinically, radiologically, plus confirmation by interventional epiduroscopic technique. This confirmation will improve the diagnosis, plus improvement in treatment of lumbar canal stenosis, those 14 patients out of 40 forms 35% of totally prepared patients for decompression laminectomy will improved by opening the lumbar canal stenosis

during epiduroscopic procedure alone primary, also improved the clinical data post interventional techniques, secondly more orientation for the direction of decompression level of lumbar canal stenosis in both axial & foraminal obstruction.

Results

The Epiduroscopic Techniques In all lumbar spinal canal stenosis patients, those prepared for decompression laminectomy will lead to improvement in 14 patients 35% from the original 40 patients were selected randomly, those were detected as primary isolated tethered cord syndrome. The early preliminary epiduroscopic procedure before the decompression for those patients under gone decompression laminectomy will lead to opening of the lumbar canal stenosis patients, that observed in the canal by immediate opening of the lumbar spinal canal visualized in the caudal epidurogram, also without any eliminate of stenosis or obstruction both in axial, and foraminal obstruction. That improvement post epiduroscopic technique were observe the tethering of the roots beyond clinical complaining, plus radiological Magnetic Resonance Image MRI data. The outcome was noticed with significant improvement in the mean of Stanford score and ODI (Oswestry low back disability score) from baseline were detected at all follow up visit for 6,12,24 Months, both for primary tethered cord syndrome were opened by epiduroscopic technique alone, also for the other patients under went decompression laminectomy. This study was evaluated according to Sciatica Pain, Functional Outcome, return back to work, Psychological status, Change in Narcotic intake, with the General Satisfaction rate. revealed high outcome results in the diagnosis, that were 35% of patients not required decompression laminectomy during intervention, plus more orientation for decompression both axial, and foraminal obstruction during intra operative decompression laminectomy procedure in managements, with minimal complications rate in lumbar canal stenosis patients.

Stanford score

- Back Pain: 0 - 10
- Medication Use: 0 - 10
- Life Restrictions: 0 - 10
- Satisfaction of condition: 0 – 10

Stanford Score

- * Functional outcome
- * Return back to work
- * Psychological Status

ODI (Oswestry low back disability):

- 0%-20%: Minimal Disability
- 21%-40%: Moderate disability
- 41%-60%: Severe disability
- 61%-80%: Crippled
- 81%-100%: Absolute bed ridden

Stanford Score Index

Table 1.1: Stanford Score Index Before & After Diagnostic/ treatment by Epiduroscope & surgical laminectomy

Stanford Scoring	Mean	Final Mean Scoring	P- value<
Baseline/ Before	1.9		
6 Month/ post-surgical intervention	5.9	7.23	0.0001
12 Month/ post-surgical intervention	6.9		
24 Month/ post-surgical intervention	8.9		

ODI Oswestry Score Index

Table 1.2: ODI Oswestry Score Index Before & After Diagnostic/ treatment by Epiduroscope & surgical laminectomy

ODI Oswestry Scoring	Mean	Final Scoring	P- value<
Baseline	52%		
6 Month	24%	16.66	0.0001
12 Month	16%		
24 Month	10%		

Complications

No major complications for those patients were diagnosis & treated by epiduroscopic technique, such as nerve damage, epidural damage, or infection, were encountered either during or after procedure. The residual patients required decompression laminectomy, the complications were the same for that type of surgery. However, less rated than the other decompression done without epiduroscopy that because the more orientation with specification exact site of obstruction in axial, and foraminal direction post epiduroscopic techniques usage.

Discussion

Tethered cord syndrome (TCS) or occult spinal dysraphism sequence refers to a group of neurological disorders that causes related to the malformations of the spinal cord. The secondary causes of tethered cord syndrome, Various forms include tight filum terminale, lipomeningo-myelocele, split cord malformations (diastematomyelia), dermal sinus tracts, and dermoids cyst.

All forms involve the pulling of the spinal cord at the base of the spinal canal. Which were excluded from the patients selected for this study, the inclusion was only for primary anomalies of tethered cord syndrome²⁴.

The lumbar spinal stretching of tethered cord syndrome of primary origin, lead to compression of the roots within the covering dural sheath, that lead to interfere with the daily activity, usually leading to progressive spinal cord damage if untreated. This supportive by our study treatment by minimal intervention technique for release of the stretching with opening of the lumbar spinal canal obstruction without requirement major surgical decompression laminectomy^{7,8,9,24}.

The diagnosis of the vertebral level from which low back pain, or leg pain where originates will improve by exact localization of painful factor in the spine of patients with low back pain with or without the radiating pain to the lower limbs. Also, to determine and localize which spinal segment where the pain generated via using

endoscopic evaluation, compare to the vertebral level from where the pain was generated from the lumbar spine, were diagnosed by clinical evaluation and MRI²⁵. This outcome result is supported in our study using epiduroscopic technique in confirmation the diagnostic obstructing of lumbar canal stenosing of vertebral level segment. This study indicates that epiduroscopy is efficient in evaluation, with confirmation the level in relation to clinical data, plus MRI for determining the exact vertebral level where lumbar canal spinal stenosing pathology observe, which is more localization in these groups patients presented with root pain or low back pain, this results outcome confirm the outcome results by our study²⁵.

The direct visualization by this technique whether Hyperemia, tethering, adhesion, fibrosis or mechanical obstruction factors like pain to touch, contrast distribution in the canal, and obstruction level opening, these were visualized with treatment accordingly by epiduroscopy.

Supporting our study in the outcome results during the diagnosis plus treatment when opening the stenosis in the lumbar canal²⁶.

A comparison of epiduroscopy and MRI shows us that epiduroscopy is a better tool for diagnosing the vertebral level of low back /or leg root pain patients²⁵. Epiduroscopy is a technique using for observation of the epidural space using an endoscope through the caudal approach, from sacral hiatus were we detection the different spaces in the epidural region. This advantage was supported the benefit in our study that confirmation of clinical, plus MRI during diagnosis of lumbar canal stenosis, to observe by epiduroscopy as technique are superior in diagnosis, plus improvement the outcome treatment results^{25,26}.

Conclusion

We concluded that Percutaneous Epiduroscopic Techniques for 2 years follow up using in the lumbar spinal canal stenosis for degenerative origin patients will improvement of the diagnosis

plus accurate localization and managements, were evaluated superior to the immediate surgical exploration with decompression laminectomy alone in these groups.

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