ORIGINAL RESEARCH PAPER
Volume - 10 | Issue - 07 | July - 2021 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

THE RADIOLOGICAL DIVINER OF THE RESIDUAL SCIATICA AFTER LUMBAR DISC SURGERY

Radiology

Malabeh Qamar	Radiology Department, King Hussein Medical Center - Royal Medical Services, Amman-jordan
Aldurgham Renad	Radiology Department, King Hussein Medical Center - Royal Medical Services, Amman-jordan
Al Abdallat Anas	Orthopedic Department, Farah Medical Center - Royal Medical Services, Amman-jordan
Abu Kaff Mohammed	Neurosurgery Department, King Hussein Medical Center - Royal Medical Services, Amman-jordan
Aldrous Rafeed	Neurosurgery Department, King Hussein Medical Center - Royal Medical Services, Amman-jordan
Allouzi Rakan	Neurosurgery Department, King Hussein Medical Center - Royal Medical Services, Amman-jordan
Khresat Wesam	Anasthesia Department, King Hussein Medical Center - Royal Medical Services, Amman-jordan
Makhamreh Basel	Anasthesia Department, King Hussein Medical Center - Royal Medical Services, Amman-jordan
Alqroom Rami*	Neurosurgery Department, King Hussein Medical Center - Royal Medical Services, Amman-jordan. *Corresponding Author

ABSTRACT

INTRODUCTION: Conventional and microscopic spinal surgeries are commonly performed procedures for disc herniation. Lumbar spinal surgery indeed is beneficial, but its results are highly variable and hard to predict. In one third of patients, low back pain is not completely alleviated, or it recurs, and these cases might enroll into the category of « failed back surgery syndrome » . To interpret the postoperative imaging results properly, it is essential to understand the natural course of the surgical procedure in addition to the normal postoperative appearances.
OBJECTIVES: This study steered to appraise the connotation between nerve root alterations, disc space changes, and epidural fibrosis amendments in relation to the postoperative clinical presentation.
METHODS AND PATIENTS: Patient images and medical reports from January 2016 till January 2020 were acquired from the King Hussein Medical Center (KHMC) database and reviewed in a retrospective analysis. This study was approved by the Royal Medical Services Institutional ethics committee (46/11/2020).
RESULTS: The study final population included 71-males and 52-females, with 178-disc levels operated, who met the inclusion/exclusion criteria, male-to-female ratio was 1.37:1, while median age was 47.31±6.7years.
CONCLUSION: The clinical importance of postoperative nerve root alterations is still being debated. The coexistence of nerve root thickening, enhancement, epidural fibrosis with recurrent sciatica postoperatively may induce surgical treatment. This study showed that detailed knowledge regarding surgical procedures, the normal course of the postoperative changes, and potential complications is essential for proper conclusive evaluation.

KEYWORDS

Recurrent disc; epidural fibrosis; nerve root thickening, nerve root enhancement.

INTRODUCTION

Conventional and microscopic spinal surgeries are commonly performed procedures in the management of symptomatic disc herniation of lumbar spine. For some patients, lumbar spinal surgery indeed is beneficial, but its results are highly variable and hard to predict for the individual patient [1,2]. With increasing surgical invasiveness, Potential postoperative unwanted complications following spinal surgery(viz, neural compression due to hematoma, recurrent disc herniation, epidural fibrosis, dural tear with pseudo-meningocele formation, and infection) also tend to be higher. Also, specific complications related to the use of spinal instrumentation that include mal-positioned instrumentation hardware and failure of spinal fusion leading to instrumentation loosening or breakage [3,4]. In 10 to 40% of patients who had surgical interventions on the lumbar spine, low back pain is not completely alleviated, or it recurs, and these cases might enroll into the category of « failed back surgery syndrome » which need management. This syndrome triggered by many causes and multiple factors are often intricate. Hence, it is important to differentiate between the normal postoperative findings with those related to failed back surgery syndrome[1-3].

Deciding which imaging technique to apply will depend on the type of surgical intervention performed, whether metallic material was used, and the clinical suspicion. It is essential to know the advantages and limitations of the available imaging techniques to ensure the optimal evaluation of these patients, especially after interventions carried out with instrumentation to minimize the artifacts due to these materials[5]. To interpret the postoperative imaging results properly, it is essential to understand the natural course of the surgical procedure that has been performed in addition to the normal postoperative appearances. Plain radiographs and computed tomography scans still have a foremost role in evaluating fusion and in the assessment of complications related to instrumentation hardware. Cross-sectional imaging techniques (CT and MRI) are more sensitive than radiographs and play an increasingly important role in evaluation of patients with lumbar spine surgery [6]. Magnetic resonance imaging has a cardinal role in the evaluation of the postoperative spine[3]. In Many reports, gadolinium-enhanced MRI study is the technique of choice for inspecting recurrent symptoms following discectomy[1,3,5-10]. This study steered to appraise the connotation between nerve root alterations, disc space changes, and epidural fibrosis amendments in relation to the postoperative clinical presentation such as persistent or recurrent sciatica after lumbar disc surgery with use of post contrast magnetic imaging. In addition, to review the typical early and late post-laminectomy MRI findings of the natural course of healing process, as well as the pathological appearances associated with the unwanted complications.

MATERIALS AND METHODS

Ethics

Patient images and medical reports from January 2016 till January 2020 were acquired from the King Hussein Medical Center (KHMC) database and reviewed in a retrospective analysis. This study was approved by the Royal Medical Services Institutional ethics committee (46/11/2020). As this study was a retrospective analysis, the requirement for patient consent was waived.

Patients

We collected data from 833 consecutive adult patients who had first-time surgery for one or two levels of a herniated lumbar disc previously, in all these patients presented during study period with new or persistent moderate /severe low back pain plus radicular pain (visual analogue scale (VAS) between 4 and 10) for low back pain and leg pain, as well as persistent pain more than 6-weeks despite the use of other conservative treatment options (physical therapy, medication, etc.) . Patients underwent serial physical examinations , radiological assessment utilizing pre- and post-contrast MR imaging (T1- and T2-weighted sagittal and axial view) were obtained and assessed mainly for recurrent disc herniation in addition to the other changes in the site of surgery [Figure 1]. The measurements of clinical outcome that were evaluated included the visual analogue score for radicular pain, and lower back pain. Type and degree of disc herniation, intervertebral disc pattern of enhancement, nerve root thickening, postoperative epidural fibrosis. Also, potential habitual risk factors such as smoking status, or traumatic events were considered probable risk factors contributing to lumbar disc herniation recurrences were assessed. One hundred twenty-three patients were eligible for the final stage analysis of this study. Patients were selected based on inclusion criteria of having disc disease surgery for one level/ two levels of lumbar disc herniation, and still had postoperatively a moderate or severe lower back pain with radicular pain (visual analogue scale (VAS) between 4 - 10) in the lower back/ leg and had persistent pain more than six weeks despite the use of other conservative treatment options (physical therapy, medication, etc.). We excluded patients presented with acute deficits, documented postoperative infection, spondylolisthesis, arachnoiditis . Patients who had only axial back pain with no radiculopathy, patients underwent spinal instrumentations, or had spinal tumors resection surgeries, also, patients lost follow up were excluded too.

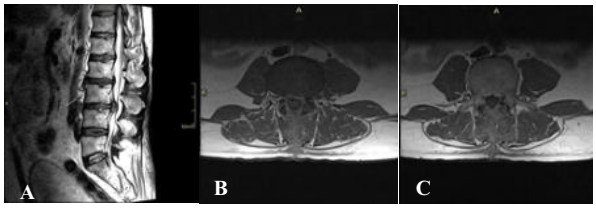

Figure. I: a) sagittal T2WI: Post- operative changes at the level of L3-4; with recurrent right paracentral disc protrusion, b) axial T1WI post contrast shows right paracentral non-enhancing recurrent disc compressing right nerve root at the RT lateral recess, with circumferential rim of enhancing adhesions extending posteriorly, c)axial T1WI at a lower level: focal enhancement in the center of the thecal sac indicating post-operative nerve roots enhancement.

INCLUSION/ EXCLUSION CRITERIA

INCLUSION CRITERIA:

1) One or two levels of lumbar spine disc disease surgery.
2) persistent radicular pain more than 6-weeks
3) A minimum follow-up of 6-months.
4) Failed postoperative conservative management.

EXCLUSION CRITERIA WERE:

1) Inadequate documentation of follow up.
2) Oncology cases scheme, spondylolisthesis, arachnoiditis, and postoperative infection.
3) The presence of severe systemic disease(heart disease, thromboembolism, bleeding tendency, renal malfunction)
4)Age
5) Patients with acute deficits, spinal instrumentations.
6) Patients who had only axial low back pain without radicular pain.

Study Design

This review conducted in a retrospective manner, by analyzing the medical archives and radiological images of all consecutive patients screened at King Hussein Medical Center (KHMC). Patient medical reports were recovered from the hospital electronic database.

Radiologic evaluation assessment

Postoperative radiological images obtained using MR imaging scanners of 3T (Intera; Philips Medical Systems, Best, the Netherlands). All patients were studied radiologically by applying the following imaging sequences before contrast material administration: turbo spin-echo axial T1-weighted imaging (TR, 550 ms; TE, 8.0 ms) with a 3-mm section thickness and a 0.4-mm interspace, and turbo spine echo sagittal T1-weighted image (TR, 600 ms; TE, 8.0 ms) with a 3-mm section thickness and a 0.4-mm interspace, axial turbo spin-echo T2-weighted image (TR,2500ms;TE,100ms) ,and sagittal TSE T2WI (TR,2154ms ;TE120ms), and sagittal STIR sequence(TR,3077ms;TE,80ms) with a 3 mm slice thickness and a 0.4mm interspace . After intravenous infusion of 0.1 mmol/kg of gadolinium-DTPA (Magnevist; Bayer Schering Pharma, Pittsburgh, Pa), fat suppressed axial T1-weighted image, sagittal T1-weighted image sequences were repeated with slice thickness of 3mm . The primary evaluation was achieved through the neural exit foramina at the level investigated. Axial images span included one level or more above the operative site to at least one level below the surgery site (except for the terminal disc level L5-S1, where the caudal slices were ended at the mid-point of S1 body). The Field-of-view displayed over 200 × 200 mm for axial images and 300 × 300 mm for sagittal images. The imaging matrix extent was 256 × 205 for axial images, while in sagittal images was 512 × 256. Contrast MRI was done at two intervals, around 3-months and 6-months intervals postoperatively. The discectomies levels at which surgeries performed were evaluated for nerve root enhancement, thickening, epidural fibrosis, and recurrent disk herniation. Two radiologists (M.Q and A.R) were blinded to the patient's previous medical history and were unaware of the current presentation or the exact level of radiculopathy.

***Measurement of Nerve Root Enhancement (*NRE)**

Nerve Root Enhancement frequently evaluated in 2 ways: either by comparing pre/ postcontrast axial T1-weighted images or by comparison the enhanced nerve root to the equivalent nerve root on the opposite side[Figure 2]. Enhancement was stated as existing or absent. A similar technique was applied for contralateral nerve root assessment with the postcontrast. Visual assessment was conducted by two independent radiologists with long term experience (more than 8-years). In case scenario, the two observers disagreed, we performed pixel measurements. Then, NRE was interrelated with clinical presentation. On review of the medical record of each patient, the distribution of typical radiculopathy, occurrence of dermatomal deficits as well as loss of muscles reflex were used to outline the level of the radicular pain. In addition, a few patients had undergone supplementary nerve electromyographic studies, and the conclusive results were also added to determine the involved root level. The association between NRE and clinical symptoms was determined when the site of NRE at the previous surgery was matched with the level of radiculopathy from typical neurologic signs and/or electromyographic studies.

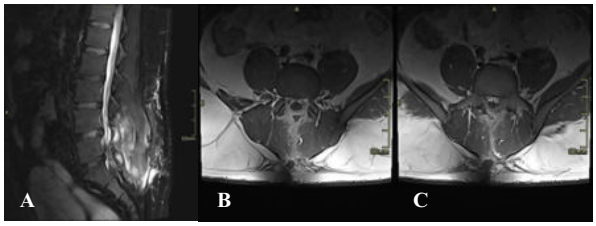

Figure. II: a) Sagittal STAIR demonstrates postoperative changes at the level of L4-5 ,Small hyperintense lesion at the site of the laminectomy indicates localized collection, b) Axial T1WI post contrast shows circumferential enhancing tissue surrounding the thecal sac representing post- operative scar (epidural fibrosis).There is focal enhancement of the thickened left epidural L5 nerve root. Two peripherally enhanced localized collections at the site of laminectomy not causing mass effect upon the thecal sac, c) Axial T1WI post contrast at a lower level, there is a faint enhancement in the S1,S2 traversing nerve roots within the thecal sac.

Nerve Root Thickening (NRT)

Increase of a more than 50% in diameter of a nerve root compared with the contralateral nerve root at the same level was defined as Thickening. To avoid misreading due to adjacent scar tissues, nerve root thickening was assessed only on postcontrast images. Thickening of nerve roots was also correlated with clinical signs. [Figure 3].

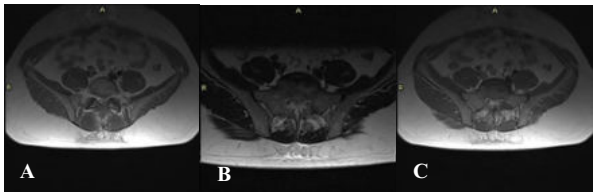

Figure III: a) Axial T1WI post-contrast at the level of L5-S1 shows minimal left anterior epidural enhancing adhesions compressing left

S1 nerve root. b & c) Axial T2WI and axial T1WI post-contrast demonstrate mild thickening with central T2 hyperintensity along with focal heterogenous enhancement of the left epidural S1 nerve root.

***Postoperative Epidural Fibrosis* (PEF)**

Criteria for epidural fibrosis definition encompassed iso- to hypo intensity linked to intervertebral discs on T1-weighted MRI scans, substituting the epidural fat intensity [Figure 4]. Epidural fibrosis was homogeneous. The amount of peridural scarring usually graded on a scale of 0 to 4 in each level according to the method of Ross et al. [11-14]. In this system, scale 0 is no scarring, scale 1 is a quadrant with 0% to 25% scar fill, scale 2 is 25% to 50%, scale 3 is 50% to 75%, and scale 4 is 75% to 100%, respectively. The association among the nerve root changes of PEF and clinical symptoms was also assessed. Both epidural fibrosis alterations and disc protrusions may demonstrate mass effect, particularly in early phases of tissue granulation formation. Aging of the epidural fibrosis may lead to retraction of the dura in the direction of the scar side of. Epidural fibrosis shows immediate enhancement after the injection of contrast material, in compare to recurrent disc herniation, which shows latency up to 20 min post contrast injection [11].

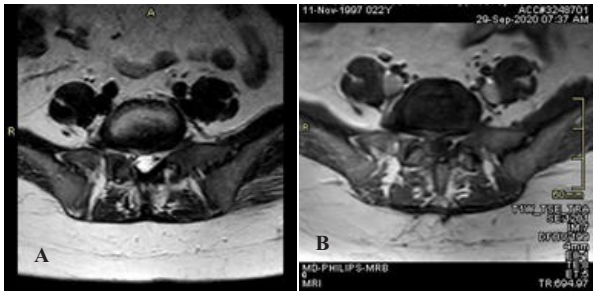

Figure. IV: a) Axial T2WI: laminectomy at the level of L4-5 with ill-defined intermediate signal lesion in the RT anterior epidural space compressing the RT enlarged hyperintense L5 traversing nerve root, b) Axial T1WI post-contrast shows the lesion exhibits intermediate homogenous enhancement suggesting postoperative fibrosis encasing the right aspect of the thecal sac and compressing the right traversing nerve root. No evidence of recurrent disc.

Recurrent Disc Herniation (RDH)

Recurrent disc herniation was defined radiologically as a focal low signal intensity mass at the operative site on T1-weighted image with no central enhancement, which was contiguous with the paternal disc unless sequestrated. Recurrent disc herniation degree was classified as protrusion, extrusion, and sequestered disc conferring to the American Society for Neuroradiology terminology [14-17]. In case scenario postoperative epidural fibrosis was combined with recurrent disc herniation, the case was enrolled into the RDH group [Figure 5].

Patients' demographical data were collected (viz., sex, age, duration of symptoms, medical history, and social history). All patients were operated on by one neurosurgeon (Al. R) with the same technique. The surgeon was completely aware about the full previous history and the present , but the assistant neurosurgeons who was responsible for follow up and analysis of the data was completely blind to the group.

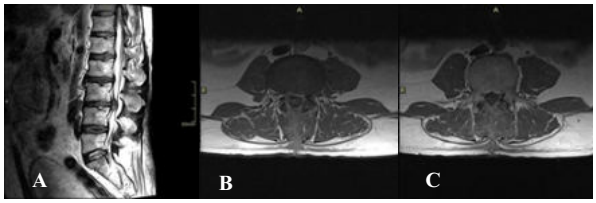

Figure. V: a) sagittal T2WI: Post- operative changes at the level of L3-4; with recurrent right paracentral disc protrusion, b) axial T1WI post contrast shows right paracentral non-enhancing recurrent disc compressing right nerve root at the RT lateral recess, with circumferential rim of enhancing adhesions extending posteriorly, c)axial T1WI at a lower level: focal enhancement in the center of the thecal sac indicating post-operative nerve roots enhancement.

STATISTICALANALYSIS

For statistical analysis, patients' data was registered and kept on Microsoft Excel 2010 Spreadsheets. We extracted the relevant information and analyzed it on SPSS version 23.0. Data are reported as median (and ranges) or mean values +/- standard deviation. The intraclass correlation coefficient was used to determine the interobserver agreements for both neuroradiologists on MRI observations. To compare clinical outcomes in the different periods, we conducted an unpaired sample t-test using Excel 2010 for 2 scenarios: pre-operation vs. 3- months post-operation, pre-operation vs. 6-months post- operation. An unpaired student's t-test was used to compare between groups. Statistically significant value was documented at $p<0.05$.

RESULTS

The study final population included 71-males and 52-females, with 178-disc levels operated, who met the inclusion/exclusion criteria, male-to-female ratio was 1.37:1. Age wise distribution of patients was between 26 and 57 years , while median age of was 47.31±6.7years. Statistically, study showed no significant difference between the two gender groups recruited for the analysis in terms of: mean age; levels operated; body mass index; preoperative VAS(back pain); preoperative VAS(Leg pain); mean follow up duration, smoking history (Table1). Male and female patients had comparable VAS scores preoperatively.

Clinically, the mean symptom duration was 4.4□±□3.28 months. The average postoperative follow-up duration was 8.21±2.34 months. Early complications in the scale of days postoperatively encountered such as seroma or hematomas, and infection within the postoperative site, were skipped from this article. Interobserver reliability for MRI of parameters measurements by both radiologists was generally excellent (intraclass correlation coefficients ≥0.81). No mortality related to surgery reported.

Table 1: Patient demographical data and characteristics.

Parameter	Males	females	p value
Number of patients	71	52	0.663
Levels (1 level/ 2 levels)	104 (38/33	74 (30/22)	0.224
Average Age (years)	43.11±4.7	51.22±7.27	0.93
BMI*	28.1±3.2	27.2±3.6	0.07
Preoperative VAS(back pain)	6.48±2.77	6.24±2.84	0.36
Preoperative VAS(Leg pain)	7.21± 2.31	6.48±2.78	0.66
Mean follow up duration (months)	9.22±2.68	7.34±3.6	0.95
History of smoking	23	15	0.225
History of trauma	9	6	0.448
*BMI = body mass index			

Table II: The average visual analogue scale (VAS) of leg pain

	Pre-operative	3-months	6-months
Average VAS males	7.21± 2.31	1.63 ± 1.21	0.95 ± 1.09
Average VAS females	6.48±2.78	2.18 ± 1.25	1.36 ± 1.25
p value	0.66	0.33	0.226

Table III: The complications encountered during the study period

P value	Overall %	Male Patients(n)	Female Patients (n)	Complication
NS	16.29%	16	13	Disc recurrence
NS	38.76%	41	28	Epidural Fibrosis
NS	20.78%	20	17	Pathological NRE
NS	58.43%	49	55	NRT
NS~ non-significant				

DISCUSSION

Conventional and microscopic surgeries of the lumbar spine are becoming progressively more common with a wide spectrum of surgical options available[4,5]. In up to 40% of postoperative clinical presentations the main complaint is endured back or leg pain, in the majority of patients it is a mixed pain, this pain shows an element of the preexisting suffered chronic pain that had been treated with conventional analgesics regimen or narcotics beside the long-term consumption of analgesics which alters pain perception in these patients thereby complicating pain management [5,18-20]. Knowledge of radiological examination results following surgery requires of both the normal provoked changes due to soft tissue disturbance and direct nerve root handling in the postoperative spine

and the possible unwanted complications. Postoperative complications have been reported in up to 15-30% of patients [21]. These postoperative unwanted complications can be acute or late after surgery, causing worsening or no resolution of the symptoms that led to the primary surgery. Nowadays, efforts are steered toward the differentiation between these complications from the category of failed back syndrome. Essential step prior to the postoperative radiological examination, to consider time elapsed since surgery, the primary cause led to surgery, the surgical technique utilized, and current presentation. These aspects will determine the imaging modality to be conclusive, and the protocol to be followed for radiological assessment[22].

Normal radiological findings in postoperative course: In our center , open microscopic inter-laminar approach for lumbar disc herniation is the most frequently adopted approach for surgical management for lumbar disc herniation with laminectomy and discectomy (partial removal of herniated material and/or native disc) [4]. The most frequently observed findings on postoperative radiological screening are asymmetrical demonstration of muscles and fat ,edematous subcutaneous tissue as well as small seromas. These findings over the first 8-weeks will fade progressively, although, they may show some posterior mass effect on the thecal sac [4,5,23]. However, we perform MRI during the first 8-weeks postoperatively if the patient develops moderate to severe low back pain. Post contrast images will demonstrate the homogeneous enhancement of this healing process and granulation tissue formation, which refines the detected mass effect [Figure 6].In contrast, vertebral endplates may show edematous changes and enhancement, this observed in 19% of patients between 6 and 18 months postoperatively [24-27]. In our study, only 123- patients showed postoperative clinical symptomatology. While, in the operated 178-disc levels, we found various abnormal radiological alterations (Table. 2).

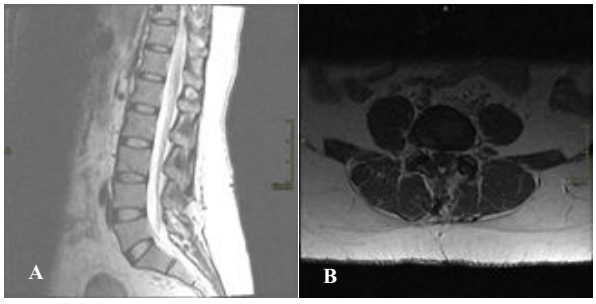

Figure. VI: a) Sagittal T2WI shows postoperative changes at the level of L4-5 with no evidence of recurrent disc. b) Axial T1 post contrast demonstrates focal area of enhancing adhesions in the left anterior epidural space compressing the posterior aspect of the left traversing nerve root.

AB *Abnormal radiological findings in postoperative lumbar spine*
Recurrent disc herniations, reported in 3-20% of cases post lumbar discectomy in many reviews [4,6,16,28-32]. clinically defined as recurrence within a 6-month after a pain-free period postoperatively. MRI scanning with contrast is the modality of choice because of the contrast resolution [Figure VII]. As documented, contrast infusion is the corner stone in distinguishing recurrent disc herniation from epidural fibrosis, with disc herniations demonstrating early central nonenhancement and peripheral enhancement due to granulation tissue or dilated epidural venous plexus, whereas fibrosis demonstrates diffuse enhancement [14-17]. In our study, results were in line with literature, as our analysis revealed 16.29% recurrence rate of symptomatic cases admitted and 4.68% of all patients operated during the study period, with no predominance of any gender.

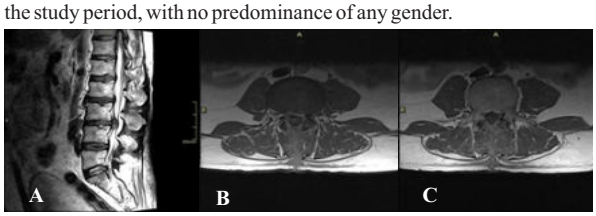

Figure. VII: a)sagittal T2WI: Post- operative changes at the level of L3-4; with recurrent right paracentral disc protrusion, b) axial T1WIpost contrast shows right paracentral non-enhancing recurrent disc compressing right nerve root at the RT lateral recess, with circumferential rim of enhancing adhesions extending posteriorly, c) axial T1WI at a lower level: focal enhancement in the center of the thecal sac indicating post-operative nerve roots enhancement.

Nerve roots enhancement documented in 20-62% of patients in literature[33-36]. Though, nerve root enhancement within 3-6 weeks postoperatively enrolls under normal findings, which will disappear gradually [Figure II].Contrarywise, any enhancement observed after six weeks is considered pathological. This review concluded that 20.78% of study population developed NRE , which was linked with the clinical presentation, the typical radicular pain distribution, and if dermatomal deficits present ,as well as loss of muscles reflex.

Nerve roots thickening has commonly been believed that nerve root thickening separately has no diagnostic value [9,34,35]. though the combination of nerve root thickening plus nerve root enhancement link up with recurrent clinical symptoms, chiefly when combined with RDH [8,33]. In this review, NRT encompassed in 58.43% of disc levels screened, from these only 67- disc levels showed good association with clinical symptoms (P 0 .001), among these disc levels with nerve root thickening, only 23- levels were associated with pathological NRE, and 50-disc were combined with pathologic epidural fibrosis features showed significant implication with symptoms.

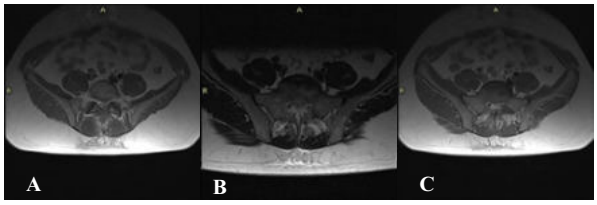

Figure VIII: a) Axial T1WI post-contrast at the level of L5-S1 shows minimal left anterior epidural enhancing adhesions compressing left S1 nerve root. b & c) Axial T2WI and axial T1WI post-contrast demonstrate mild thickening with central T2 hyperintensity along with focal heterogenous enhancement of the left epidural S1 nerve root.

Postoperative epidural fibrosis although, scar tissue formation is a physiological consequence to any surgical interference in reaction to the surgical violation. Epidural fibrosis considered the abnormal formation of scare in the epidural region, the processes of postoperative epidural adhesions development are still ambiguous. Epidural fibrosis has been described in 24–38% of patients with failed back surgery syndrome [36-38]. Our analysis showed postoperative scaring in 38.76% of all disc levels scanned. However, isolated postoperative epidural fibrosis had minimal clinical effect. On the contrary, a combination of findings were associated with more severe clinical symptomatology.

A few studies have addressed the nerve root markers on postoperative MR imaging or the relationships between such signs and clinical consequences, and their results are still ambiguous[1,7-9,34-39]. In this study we investigated the association between nerve root, disc space alterations, and epidural fibrosis formation in correlation to the postoperative clinical presentation such as residual or recurrent sciatica after lumbar disc surgery with use of contrast-enhanced MR imaging [Figure XI]. Though, most of the previously conducted studies were on a low-field-strength magnet, with none of them achieved on a 3T unit as our study does. This analysis is limited by few factors, the absence of comparison between pre-operative and postoperative imaging and by failure to use asymptomatic patients as control subjects. Also, not all the patients had EMG correlation. Furthermore, this study encountered some limitations, the relatively small sample size and the short follow-up periods, which might limit the comparability and long-term outcomes. Socio-economic variables that might affect the study results, were not incorporated in this study.

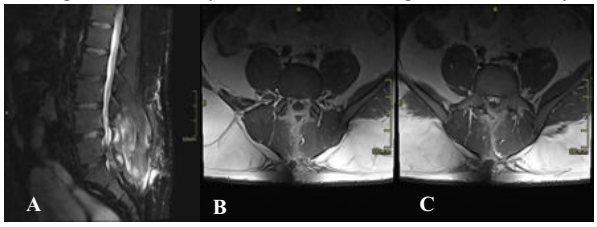

Figure. XI: a) Sagittal STAIR demonstrates postoperative changes at the level of L4-5 ,Small hyperintense lesion at the site of the

laminectomy indicates localized collection, b) Axial T1WI post contrast shows circumferential enhancing tissue surrounding the thecal sac representing post- operative epidural fibrosis. There is focal enhancement of the thickened left epidural L5 nerve root. Two peripherally enhanced localized collections at the site of laminectomy not causing mass effect upon the thecal sac, c) Axial T1WI post contrast at a lower level, there is a faint enhancement in the S1,S2 traversing nerve roots within the thecal sac.

CONCLUSION

The clinical importance of postoperative nerve root alterations is still being debated.

The coexistence of the clinical triad of nerve root thickening, enhancement, associated with epidural fibrosis in patients with recurrent sciatica plus disc herniation in patients screened postoperatively may induce additional surgical treatment in patients with failed-back surgical syndrome. However, the study had a small sample and did not assess the long-term alterations.

This study showed that radiological assessment of postoperative lumbar spine is an everyday practice of all radiology departments. Detailed knowledge regarding the various surgical procedures and instrumentation used, the normal course of the postoperative changes, and potential complications is essential for proper conclusive evaluation. The overall agreement in the literature is that post contrast MRI is the gold standard in postoperative evaluation.

Future work: We need a prospective standardized interval evaluations MR imaging and a larger population.

Acknowledgments: None

Conflicts of interest: The author certify that he has no affiliation with or any direct or indirect involvement in any organization or entity with any financial interest, or non-financial interest in the subject matter or materials discussed in this manuscript.

Funding: Authors disclose no external funding sources.

REFERENCES

1- Babar S, Saifuddin A. MRI of the post-discectomy lumbar spine. Clin Radiol. 2002 ;57(11): 969-81.
2- Willems P. Decision making in surgical treatment of chronic low back pain: the performance of prognostic tests to select patients for lumbar spinal fusion. Acta Orthop Suppl. 2013 ;84(349):1-35.
3- Rankine JJ. The postoperative spine. Semin Musculoskelet Radiol. 2014;18(3):300-8.
4- Al Shurbaji AA, Said AS, Al Qroom RY, Abu Salma ZA. Surgery for lumbar disc herniation, Demographic data and Analysis of Complications at King Hussein Medical City. JRMS March 2017; 24(1):55-58.
5- Herrera Herrera I, Moreno de la Presa R, González Gutiérrez R, Bárcena Ruiz E, García Benassi JM. Evaluation of the postoperative lumbar spine. Radiologia. 2013;55(1):12-23.
6- Malhotra A, Kalra VB, Wu X, Grant R, Bronen RA, Abbed KM. Imaging of lumbar spinal surgery complications. Insights Imaging. 2015;6(6):579-590. doi:10.1007/s13244-015-0435-8
7- Grane P. The postoperative lumbar spine. A radiological investigation of the lumbar spine after discectomy using MR imaging and CT. Acta Radiol Suppl. 1998;414:1-23.
8- Grane P, Lindqvist M. Evaluation of the post-operative lumbar spine with MR imaging. The role of contrast enhancement and thickening in nerve roots. Acta Radiol. 1997 ;38(6) : 1035-42.
9- Grane P, Tullberg T, Rydberg J, Lindgren L. Postoperative lumbar MR imaging with contrast enhancement. Comparison between symptomatic and asymptomatic patients. Acta Radiol. 1996 ;37(3):366-72.
10- Dina TS, Boden SD, Davis DO. Lumbar spine after surgery for herniated disk: imaging findings in the early postoperative period. AJR Am J Roentgenol. 1995;164(3):665-71.
11- Mohi Eldin MM, Abdel Razek NM. Epidural fibrosis after lumbar disc surgery: Prevention and outcome evaluation. Asian Spine J. 2015;9:370–85.
12- Ross JS, Robertson JT, Frederickson RC, et al. Association between peridural scar and recurrent radicular pain after lumbar discectomy: magnetic resonance evaluation. ADCON-L European Study Group. Neurosurgery. 1996;38:855–861.
13- Ross JS, Obuchowski N, Zepp R. The postoperative lumbar spine: Evaluation of epidural scar over a 1-year period. AJNR Am J Neuroradiol. 1998;19:183–6.
14- Ross JS. MR imaging of the postoperative lumbar spine. Magn Reson Imaging Clin N Am. 1999;7:513–524.
15- Cinotti G, Roysam GS, Eisenstein SM, Postacchini F. Ipsilateral recurrent disc herniation: a prospective, controlled study. J Bone Joint Surg Br. 1998;80:825–832.
16- Suk KS, Lee HM, Moon SH, Kim NH. Recurrent lumbar disc herniation: result of operative management. Spine (Phila Pa 1976) 2001;26:672–676.
17- Kim MS, Park KW, Hwang C, Lee YK, Koo KH, Chang BS, et al. Recurrence rate of lumbar disc herniation after open discectomy in active young men. Spine. 2009 ;34(1):24–29.
18- Makhamreh B, Jraisat I, Shamoun E, Allouzi R, Abu Kaff M, Abu Salma , Alqroom R. Magnesium sulphate an angelic allay alleviating postoperative spinal surgery pain. IJSR.2020;11(9):1-3.
19- Bhaskar SB, Bajwa SS. Pharmaco genomics and anaesthesia: Mysteries, correlations and facts. Indian J Anaesth. 2013;57:336–7.
20- Loftus RW, Yeager MP, Clark JA, Brown JR, Abdu WA, Sengupta DK, et al. Intraoperative ketamine reduces perioperative opiate consumption in opiate-dependent patients with chronic back pain undergoing back surgery. Anesthesiology. 2010;113:639–46 .
21- Sarrazin JL. Imagerie du rachis lombaire opéré. J Radiol. 2003;84:251-2.
22- Jinkins JR, Van Goethem JW. The postsurgical lumbosacral spine. Magnetic resonance imaging evaluation following intervertebral disk surgery, surgical decompression, intervertebral bony fusion, and spinal instrumentation. Radiol Clin North Am. 2001;39:1-29.
23- Barrera MC, Alústiza JM, Gervás C, Recondo JA, Villanúa JA, Salvador E. Post-operative lumbar spine: comparative study of TSE T2 and turbo-FLAIR sequences vs. contrast-enhanced SE T1. Clin Radiol. 2001;56:133-7.
24- Grand CM, Bank WO, Balériaux D, Matos C, Levivier M, Brotchi J. Gadolinium enhancement of vertebral endplates following lumbar disc surgery. Neuroradiology. 1993;35:503-5.
25- Slone RM, MacMillan M, Montgomery WJ. Spinal fixation. Part Complications of spinal instrumentation. Radiographics.1993;13:797-816.
26- Berquist TH. Imaging of the postoperative spine. Radiol Clin North Am. 2006;44:407-18.
27- Naama O, Quamous O, Elasri CA, Boulahroud O, Belfkih H, Akhaddar A, et al.Textiloma: an uncommon complication of posterior lumbar surgery. J Neuroradiol. 2010;37:131-4.
28- Willson MC, Ross JS. Postoperative spine complications. Neuroimaging Clin N Am. 2014;24(2):305–326.
29- Suk KS, Lee HM, Moon SH, Kim NH: Recurrent lumbar disc herniation: results of operative management. Spine 2001, 15:672-6.
30- Mobbs RJ, Newcombe RL, Chandran KN. Lumbar discectomy and the diabetic patient: incidence and outcome. J ClinNeurosci2001;8:10–13.
31- Swartz KR, Trost GR. Recurrent lumbar disc herniation. Neurosurg Focus 2003;15:10.
32- Suk KS, Lee HM, Moon SH, Kim NH: Recurrent lumbar disc herniation: results of operative management. Spine 2001, 15:6726.
33- Lee YS, Choi ES, Song CJ. Symptomatic nerve root changes on contrast-enhanced MR imaging after surgery for lumbar disk herniation. AJNR Am J Neuroradiol. 2009;30 (5): 1062-7.
34- Nygaard OP, Jacobsen EA, Solberg T, et al. Nerve root signs on postoperative lumbar MR imaging. A prospective cohort study with contrast enhanced MRI in symptomatic and asymptomatic patients one year after microdiscectomy. Acta Neurochir (Wien) 1999;141:619–22.
35- Yukawa Y, Kato F, Kajino G, et al. Serial gadolinium-enhanced MR imaging after lumbar disc resection: observation of the affected root. J Spinal Disord 1997;10:404–09.
36- Andersson GB. Epidemiological features of chronic low-back pain. Lancet. 1999;354(9178):581-5.
37- Erdyneev KC, Sorokovikov VA, Larionov SN. The postoperative scar-adhesive epiduritis (review). Bull. VSNC SO RAMN. 2011;77:243-46.
38- Rönnberg K, Lind B, Zoega B, Gadeholt-Göthlin G, Halldin K, Gellerstedt M, et al. Peridural scar and its relation to clinical outcome: a randomised study on surgically treated lumbar disc herniation patients. Eur Spine J. 2008;17(12):1714-20.
39- Jinkins JR, Osborn AG, Garrett D, et al. Spinal nerve enhancement with Gd-DTPA: MR correlation with the postoperative lumbosacral spine. AJNR Am J Neuroradiol 1993;14:383–94.