Summary and conclusion

One of the most challenging areas of diagnosis is acquiring and interpreting medical images in the patient who has undergone surgery for spinal degenerative disease. This may have involved partial or complete laminectomy; discectomy; intervertebral bony fusion; or spinal instrumentation. The imaging findings may be either of an expected or unexpected nature. In some instances, the treated tissues may be left with benign scarring; in other cases, there may be a recurrence of disease or the appearance of a different type of disease process engendered by the surgical procedure. Still in other situations, the observation may represent a true acute-subacute complication of the operation. All of these possibilities complicate medical image analysis **(Van Goethem 2006).**

The development of intravenously (i.v.) administrated paramagnetic MR imaging contrast agents has materially assisted the diagnostic sensitivity and specificity of MR imaging in the evaluation of FBSS because of improvement in differential contrast enhancement afforded by these agents **(Jinkins et al, 2001).**

Selective fat suppression technique has been used in the evaluation of postoperative patients. The addition of fat-suppression to gadolinium enhanced T 1 -weighted images improves the visualization of enhancing scar and distinguishing it from recurrent herniated disc. Some authors recommended the combination of unenhanced and Gd-enhanced T1 weighted images with fat-suppression for routine examination of the postoperative lumbar spine **(Ross 1997).**

MR myelography confirms the diagnosis of thecal compression and/or amputation of nerve roots sheaths. It is useful in migrated disc herniation or in abnormal origin of nerve roots. More over it allowed full and panoramic visualization of the subarachnoid space and excellent definition of the thecal sac, nerve roots and nerve root sheaths **(Scarbino et al., 1996).**

The interpretation of images of the lumbosacral spine acquired in the immediate postoperative period i.e., initial 6 to 8 post surgical weeks, should be undertaken with caution. Normal postoperative changes occur in the structure and the soft tissues, and vary in part depending on the type and extent of surgery and the time elapsed since the surgical procedure**(Van Goethem et al., 1996).**

Consequently, the clinical picture still remains the major indicator recurrent surgery in the early postoperative period **(Swartz and Trost 2003).**

According to **Jinkins et a1 in 2001, and Lisa et al in 2004** the major identifiable causes of FBSS in patients operated for lumbar disc herniation include clinically relevant epidural fibrosis (i.e . , fibrosis causing perineural constriction, tethering of the nerve root, and so forth); recurrent or residual disc herniation; postoperative spinal infection; sterile arachnoiditis; post surgical pseudomeningocele formation; and foramina1 or spinal stenosis that may pre-exist or follow the spinal surgery. The three most common causes are 2ry lateral spinal stenosis (60-70%), epidural fibrosis (18%) and recurrent disc herniation (12- 16%), **(Rao et al., 1997).**

In the postoperative population, **the differentiation of recurrent disc herniation from scar tissue** is critical because re-operation on a scar may lead to a poor surgical result with more scar tissue, whereas removal of recurrent or residual disc herniation can be beneficial. Radiologically, the most important and difficult challenge in postoperative lumbar spinal imaging is to distinguish an epidural scar frorn recurrent or residual herniated disc material **(Lisa et al., 2004).**

In accordance with **Van Goethem in 2006** the important criteria for the evaluation of scar versus disc in the postoperative patients can be summarized as follows:

1. Scar tissue enhances immediately after injection, irrespective of the time since surgery.
2. Disc material does not enhance immediately after injection.
3. Disc is a smoothly marginated, polypoid, anterior epidural mass.
4. Scar can occasionally have mass effect and may be contiguous with the disc space.

Jinkins et al in 2001 found that, spinal stenosis of the central portion or lateral recess or the central spinal canal, and one or more of neural foramina may be a cause of the FBSS. These forms of spinal stenosis may predate or follow spinal surgery. When the stenosis follows surgery, it may present years after the operation, as a result of continuing spinal degeneration. Also, in case following spinal fusion, accelerated degeneration

of adjacent spinal segments may occur because of the increased stresses placed on them.

Dominik and Marius in 2000 have shown that the dimensions of the neural foramina are position dependant and the concept of dynamic foramina1 stenosis may be valid, so positional MR images may add additional information when this diagnosis is suspected.

Chronic adhesive arachnoiditis is considered as an important cause of recurrent pain and disability after extradural lumbar disc surgery in 6-16% of post surgical patients.

Contrast enhancement of the thickened meningeal scarring and underlying intrathecal roots may or may not be observed **(Shafaie et al., 1997).**

Postoperative hematoma is better seen by MRI which shows mixed blood breakdown products and is more sensitive than CT for the detection of the location and extent of the haematoma **(Jinkins et al., 2001).**

Postoperative infection is an uncommon but important cause of low back symptoms following lumbar spinal surgery, which usually presents as vertebral osteomyelitis with adjacent intervertebral disc involvement or formation of an epidural abscess.

The use of Gd-DTPA can improve even further the ability of MRI to display spinal infection; viable inflammatory tissue will enhance on T1-W after Gd-DTPA injection due to the presence of extensive vascularization. **(Djukic et al, 1990).**

According to **According to Dagirmanjian et al., 1996** the following triad of findings is strongly suggestive of postoperative discitis:-
1. Low disc to end plate signal on TI.
2. High disc to end plate signal on T2.
3. Disc and end plate enhancement with gadolinium.

Post surgical pseudomeningocele formation results either from intra-operative dural tear or from a persistent opening in the dura following intradural surgery. The term pseudomeningocele is used because it is not a true arachnoid-lined sac. MRI in these patients will show a rounded area of

CSF signal intensity posterior to the thecal sac at the site of previous laminectomy. Fluid-fluid levels may be seen in these collections because of layering of debris or blood products **(Jinkins et al, 2001).**

Segmental instability from excessive posterior element surgical resection or postoperative facet fracture in the absence of successful surgical fusion may reveal a change in bony spinal relationships on MR imaging. It may be associated with stenosis of the central spinal canal and spinal neural foramina with symptomatic spinal cord compression or entrapment of nerve roots, respectively **(Jinkins et al, 2001).**

Pseudoarthrosis A common cause of postoperative low back pain is abnormal mobility of the vertebra due to incomplete fusion (pseudoarthrosis), Which results in persistence of lumbar instability. **(Parizel et al., 1996)**

Conclusions:

1- Enhanced MRI with its superior soft tissue resolution and excellent tissue characterization is the investigation of choice that can accurately diagnose most of the causes of FBSS as it is needed to reach accurate diagnosis and differentiation of recurrent disc herniation from epidural fibrosis and/or the presence of both. Also, it gives accurate, sensitive and early diagnosis of postoperative discitis and infection and can differentiate it from degenerative disc disease and neoplasm. Moreover, MRI study can diagnose postoperative arachnoiditis, bony stenosis as well as iatrogenic pseudomeningocele.

2- The clinical picture still remains the major indicator for recurrent surgery, and therefore it is recommended that radiologists who interpret medical images of the postoperative spine should understand the expected post-surgical findings in order to be able to detect any complication f the surgical procedure and to assist the surgeon in achieving the most effective treatment.

3-It is important for the clinician to inform the radiologist performing the examination about the type of surgical procedure(s) and the current clinical syndrome. These may affect the imaging strategy, and are important when interpreting the images and in the consideration of supplementary imaging.

4- The use of the fat-suppression technique results in increased relative intensity and homogeneity of contrast enhancement .associated with sites of epidural fibrosis.

5- Conventional recumbent MRI is obviously inadequate for a complete and thorough evaluation of the spinal column and its contents, as the human condition includes both weight bearing body positioning, as well as complex kinetic maneuvers. In the absence of the positional/kinetic MRI, it is recommended to study all FBSS patients with plain x-rays with stress views to detect minor degrees of segmental instability.