

# Platelet Rich Plasma in the Management of Recurrent Lumbar Disc Surgery; A Study of Ten Cases

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## Abstract

*Low back pain (LBP) is a very common entity, now regarded as the first cause of disability worldwide. Intervertebral disc (IVD) degeneration leads to posterior rupture annulus fibrosus (AF) with extrusion of Central Nucleus pulposus (NP) through the injured area which has little potential to repair as it has no blood supply and causes mechanical pressure and inflammatory changes in the nerve root causing LBP. Autologous platelet rich plasma (PRP) contain concentrate blood that contain a natural concentration of autologous growth factors and cytokines and currently widely used in the clinical setting for tissue regeneration and repair. PRP had great potential to stimulate cell proliferation and metabolic activity of IVD effectively restoring structural change, improving matrix integrity, IVD regeneration, reducing discogenic back pain.*

*Our Study of 10 cases, where repeat or re-exploration surgery (after primary PLID Surgery, fenestration and discectomy) was done, where removal of recurrent disc 5, release of epidural fibrosis and perineural scarring 4 and surgical debridement for discitis 1 was done. In addition, PRP was given in the disc space & around the nerve root which provides lots of growth factor, cytokines which helps in disc regeneration and prevent adhesion & fibrosis. These dual actions enhance symptomatic recovery of all cases.*

*Large scale studies may be required to confirm the clinical evidence of PRP for the treatment of discogenic LBP*

*Key words: Failed Back Surgery Syndrome, Repeat spinal surgery, platelet rich plasma*

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## Introduction:

LBP have a lifetime prevalence of 60-80% among global population, making it one of the most common health complaints<sup>1</sup>. About 10% of individuals suffering from LBP have symptoms that persist for longer than 3 months<sup>2</sup>. Consequence of the large number of patients of LBP undergone surgical treatment and subsequently incidence of Failed Back Surgery Syndrome (FBSS) are increasing and creating a chronic problem in the community. Follett and Dirks describe as the "Surgical end stage after one or several

interventions on the lumbar neuroaxis indicated to relieve lower back pain, radicular pain or combination of both without effect"<sup>3</sup>. More functional definition is "When the outcome of lumbar spinal surgery does not meet the pre-surgical expectations of the patient and surgeon"<sup>4</sup>.

Failed back surgery syndrome/ Post surgical spine syndrome/ Post discectomy syndrome; persisting pain despite surgical intervention or pain appearing after surgical intervention in the same topographical

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location. This pain may originate after surgery or surgery may exacerbate or insufficiently ameliorate pre-existing pain.

The progression of IVD degeneration leads to rupture, tear / cleft formation within IVD. Because lack of blood supply has little potential to self-repair. 39% of LBP due to disc disruption<sup>5</sup>. On the other hand AF tear in the posteriorly in high intensity zone (HIZ) developed 28-59%. symptomatic LBP<sup>6</sup>. Peng et al<sup>7,8</sup> described formation of vascularized granulation tissue from the NP to the outer AF in which immunoreactive nerve fibers were identified, Tumour Necrosis Factor (TNF) & CD 68 positive cell was found in HIZ which develops specific signal for inflammation and pain in IVD. Disc rupture not only induce inflammatory tissue reactions but also nociceptive nerve growth around tissue scar that would be associated recurrent discogenic pain.

Exact mechanism of IVD degeneration remain unknown. Progression decreases in proteoglycan and collagen II with subsequent dehydration & increase collagen I leading to fibrosis. Pro inflammatory cytokine such as IL-1, TNF-. Significantly affect matrix homeostasis during IVD degeneration & production of NO (Nitric Oxide), Matrix metalloprotein (MMP) finally distribution of both AF & NP tissues.

Painful discs have revealed the function of a zone of vascularized granulation tissue extending from Nucleus Pulposus to the outer part of the Annulus fibrosus and growth of nerve deep into the AF & NP<sup>9</sup>. Raj et al<sup>10</sup> and Siman et al<sup>11</sup> ; describe discogenic pain treatment mostly focus on surgical procedure, disc replacement and decompression, epidural fibrosis, perineural scar tissue removal & removal of recurrent herniated disc. Direct injections of PRP contain growth factors which clinically proper improvement in regeneration of AF & NP.

### Epidemiology

In lumbar fusion surgery failure rate was estimated to be 10-46%<sup>12-16</sup> but FBSS is continually increasing in fusion surgery but it may be less incidence in case of PLID surgery. Post lumbar discectomy patient have overall recurrence rate of 5-25% within 5 years<sup>17,18</sup>. Only >50% of primary spinal surgery are successful, but no more than 30%, 15% and 5% patients experience a successful outcome after 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> surgery respectively<sup>19</sup>.

The Prevalence of LBP was higher among females than male across all age groups and was relatively

high during adolescence. Several epidemiological studies have shown that the prevalence of LBP was economic impact<sup>20</sup>. LBP is now regarded as the first case of disability worldwide<sup>21</sup>.

### Management

i)Conservative: Physical Therapy, ii)Behavioral Therapy: Council, iii)Pharmacological: Anti-convulsant drugs improves neuropathic pain, Gabapentin/Pregabalin, most popular NSAID, Opioids and Spinal cord stimulation.

Repeat Surgery: Choosing the might appropriate management modality should be based on type and pattern of pain syndrome i.e. those suffering Axial or mechanical pain and radicular and neuropathic pain. Those who have developed progressive neurological deficit associated with bowel/bladder dysfunctions, cauda equina syndrome, intolerable chronic axial or radicular pain that interfere daily activities along with the documents observed in plain & contrast MRI showing epidural fibrosis, perineural scar tissue and recurrent disc herniation will help a lot to decide repeat surgical intervention.

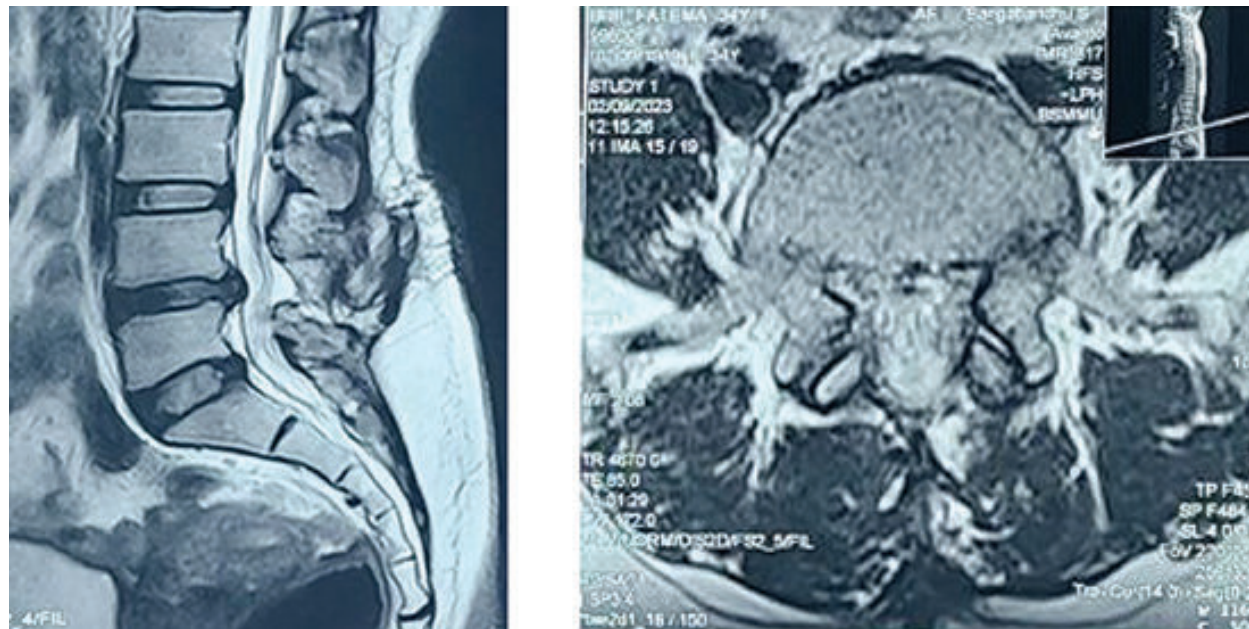
In our study during repetition of surgical intervention, we will remove the residual or recurrent prolapsed disc material, releasing fibrosis, perineural scarring and making the nerve root free.

In addition to all these procedures, we administered PRP at the site of disc surgery and nerve root area to relief pain, regeneration of healing and prevent further scarring & keep the nerve root free & easily mobile and pain free.

### Methodology & Result

10 Patients undergone repeat surgery after primary lumbar disc surgery with symptoms of axial or radicular pain. Cauda equina syndrome with evidence of bowel or bladder dysfunction, new neurological deficit with or without any evidence of infection from Jan 2018 to Jan 2024. Among all these cases, 5 patients were recurrent disc herniation, 4 were due to epidural fibrosis & perineural scar tissue, 1 was post operative discitis.

All these patients were evaluation done adequately. Three months physiotherapy, behavioral therapy, Pharmacological Therapy adequately tried but satisfactory results were not achieved. Then discussion of re-exploration or repeat surgery has been planned. In addition to repeat surgery, we planned to administer PRP along with repeat surgery with the



**Figure 1:** MRI of Lumbo-sacral Spine T2 weighted Image showing recurrent disc

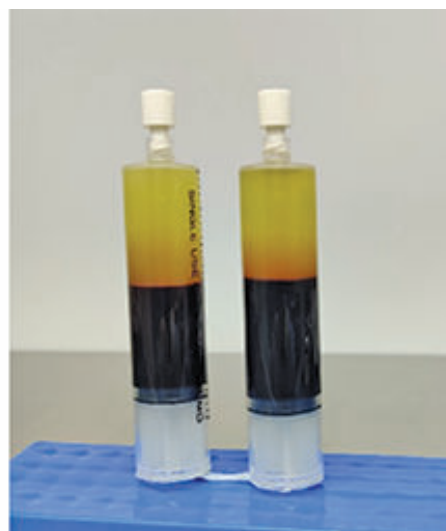
aim to reduce inflammatory activity, neurolysis, regeneration and ultimately reformation of disc and reduction pain and stability of the spine.

Majority cases, minimum pain reduction, at least 50% without any aids in different pain score with in 10 days.

**Table-I**

*Distribution of patients undergone repeat surgery, n=10*

Causes	Number	Findings	Follow ups
Recurrent Disc	5	Huge disc materials causing nerve root compression	3 mons.
Epidural fibrosis/ perineural scar tissue	4	Extensive fibrosis	3 mons.
Low grade discitis	1	Microbiologically proven infection	>6 mons.



**Figure 2 :** Method of Collection & Preparation of PRP



**Discussion:**

Recurrent disc pain may originate after surgery or surgery may exacerbate or insufficiently ameliorate pre-existing pain.

Factors leading to FBSS:

Patient Factors: Psychological wellbeing, Smokers, Co-morbidities, obesity, Worker pension compensation

Operative Factors: Inappropriate surgical Choice, Wrong level decompression, Axial or mechanical pain unlikely lead to satisfactory relief, New segmental instability, Interbody fusion by bone graft/ implants causes neural impingement.

Post operative Factors: Haematoma, Infections, Pseudo meningocele, Nerve injury, Transitional Syndrome due to segmental stress

Assessment of the patient from history like autonomic (bowel/bladder) dysfunction, new neurological disturbance, infection etc. Physical examination and investigations like plain

erect radiograph with lateral dynamic view (Extension/Flexion). Multiaxial CT Scan of spine to show facet arthropathy and MRI imaging can detect degenerative disc diseases ( recurrence, residual disc, nerve root compression, infection etc.) with spondylolisthesis and with Gadolinium contrast enhancement can distinguish epidural fibrosis, perineural scar tissue and recurrence disc herniation as a source of pain.

In our clinical studies we have applied auxiliary to re-exploration of the wound, removal of the disc, adhesiolysis, surgical debridement and toileting. After completing all this events, 10 patients applied PRP in the disc area and in around the nerve root and epidural space which provides more effective relief of discogenic low back pain. Interestingly, such type of clinical studies yet not available anywhere but long-term case control study can be done. The clinical studies alone PRP therapy for discogenic LBP reported good result as because safety, efficacy, cost effectiveness way of application, availability, finally it was autologous and antibacterial also.

PRP reduces the intensity of pain and thereby return the individual to normal physical activity. Number of injection (single/multiple), volume of PRP (1-5 ml), initial whole blood volume(9-20 ml) and follow up periods from 3-6 months.

How PRP helps reduction of pain and spinal stability are as follows

PRP: Autologous blood with platelet concentration obtained by centrifugation process which separates the liquid and solid compartment of blood. PRP injections having attention as a treatment methods Musculo skeletal & discogenic pain & potentially enhance soft tissue healing. Thus research & aims to show light on the use of PRP for treating discogenic LBP by reviewing the current chemical evidence in human applications.

PRP is postulated to promote endogenous healing process by recruitment, proliferation & differentiation of cells by releasing number of growth factors & protein release from platelet. Platelet contain antibacterial protein and are capable of migrating to site of injury.

GF (Growth Factor) release by platelet includes-Vascular Endothelial Growth Factor(VEGF), Epidermal Growth Factor(EGF), Transforming Growth Factor beta 1 (TGFb1), Platelet derived Growth Factor (PDGF), Hepatocyte GF, Insulin-like Growth Factor 1 (IGF-1), Fibroblast Growth Factor (FGF) & Connective Tissue Growth Factor (CTGF) help in tissue proliferation.

**Conclusion:**

The decision to perform surgery in patient with predominantly axial pain with considering other neurological deficits and plain & contrast MRI should be made with the understanding that patient will respond to surgical re-exploration. The importance of a competent multidisciplinary team in FBSS cannot be overstated. Engagement between physician, psychologist, physiotherapist, cellular-therapist and allied surgical skill professional is essential in improving outcomes for patient with FBSS.

Considering the remarkable progress made already in the surgical management of discogenic pain, early imaging technique for discussion of re-exploration in FBSS and application of Autologous PRP in the disc space perineural and epidural space provides a powerful adjunct therapy for the treatment of discogenic back pain.

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