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Original Article

Anaesthesia Section

Efficacy of Platelet Rich Plasma via Lumbar Epidural Route in Chronic Prolapsed Intervertebral Disc Patients-A Pilot Study

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ABSTRACT

Introduction: Lumbar radiculopathy is a major health problem often treated by surgery or guided lumbar epidural steroids for pain relief. We have used Platelet Rich Plasma (PRP) a novel therapeutic tool of autologous nature that has emerged strongly in recent years to treat patients of prolapsed intervertebral disc.

Aim: To evaluate the efficacy of PRP via interlaminar epidural route in treatment of pain in patients with prolapsed inter vertebral disc.

Materials and Methods: Ten patients were injected with five ml of autologous platelet rich plasma under fluoroscopic guidance via interlaminar lumbar epidural injection into area of affected nerve root. They were followed using VAS (Visual Analogue Scale), SLRT (Straight Leg Raising Test) and MODQ (Modified Oswestry Disability Questionnaire) for clinical improvement.

Results: Patients who had received epidural injections of autologous PRP showed improvements in their scores of evaluation tools. Improvement was sustained during the 3 month study period and was not associated with any complications.

Conclusion: Autologous PRP can be considered as a good alternative to epidural steroids and surgery in management of patients with chronic prolapsed intervertebral disc.

Keywords: Autologous platelet rich plasma, Fluoroscopy, Interlaminar

INTRODUCTION

Low back pain has become a major public health issue for people under 45 years. It has become one of the main reasons for limiting of physical activities and is spreading in epidemic proportions [1]. Risk factors for developing spine pain may be physical, socio-economical, poor medical health, psychological state, occupational and environmental. These all factors contribute to the risk for experiencing the back pain [2].

Origin of low back pain may be from spinal ligaments, spinal nerve roots, the vertebral periosteum, facet joints, the paravertebral musculature and annulus fibrosus [1].

Most common process is age related degenerative processes in the vertebral discs and facet joints. In patients with Prolapsed Intervertebral Disc (PIVD), there is acute disc herniation which causes mechanical compression of the nerve within the intervertebral foramina and an inflammatory response which causes swelling and direct neuronal activity [1].

The treatment varies from conservative to surgical. Different modes of conservative management include rest, analgesics, traction, spinal manipulation and psychological evaluation. Others may require surgery for low back pain and even after that there may not be complete relief (failed back syndrome) [2].

There has been a widespread use of epidural injections with steroids for the purpose of pain relief. Risk factors for the procedure include infection, paralysis and spinal headache, haemorrhage or haematoma. Septic and aseptic meningitis as well as spinal cord embolisms have been documented due to steroid use [3]. Apart from reducing the hypoglycaemic effect of insulin and interfering with blood glucose control in diabetic patients, severe cases of cushing syndrome, adrenal suppression and myopathy have been reported with steroid use [4]. Till now only steroids in combination with opioids and local anaesthetics has been an option to reduce the pain by reducing inflammation via epidural route. That too, pain relief has been usually temporary and varied lasting for 1 week or upto 1 year.

Platelet Rich Plasma (PRP) is a novel therapeutic tool of autologous nature that has emerged strongly in recent years due to successful therapeutic use in elite athletes [5]. Famous professional football players, Tiger Woods and Rafael Nadal attribute, in part, their "miraculous" recoveries to the employment of this enigmatic treatment dubbed as the "PRP phenomenon." Use of PRP treatment is quite common in rheumatology, orthopaedics and sports medicine congresses. Despite the controversy surrounding it the treatment is effective and there is apparent lack of side effects [6]. Mostly PRP has been used for chronic tendinopathy and enthesopathy, including knee osteoarthritis. It has become a very important tool for use of pain physician because of low cost, ease of use and its apparent safety [7]. In spine PRP has been applied to intervertebral discs, facet joints, ligaments and for radiculopathies.

A large number of publications for PRP in field of orthopaedics and sports medicine has been focused on tendon injuries including patellar tendinosis (jumper's knee), lateral epicondylosis (tennis elbow), Achilles tendinopathy, osteoarthritis, plantar fasciitis, anterior cruciate ligament and rotator cuff arthroscopic repair [7,8].

Since Himalayan Institute of Medical Sciences is a tertiary care centre, a large number of patients present to the outpatient department with complaints of chronic low back pain due to intervertebral disc prolapse. Many of them have not responded to conventional oral, local medications and also do not prefer surgery due to lack of finances or apprehension or had failed back surgeries. Such patients are referred to us for epidural analgesia.

Very few studies [3,9] are available on the use of PRP in lumbar epidural space but considering its vast potential, safety and encouraging results it was decided to use it as a modality for pain relief in such patients as an alternative to steroids.

MATERIALS AND METHODS

The pilot study was carried out in the Department of Anesthesiology, Himalayan Institute of Medical Sciences, Swami Ram Nagar,

Dehradun over a period of 6 months between October 2015 and March 2016 with due approval of ethics committee. This study included patients with findings of lumber disc herniation/prolapse in MRI, of either sex with age less than 65 years, having complaints of backache ± radiculopathy for more than 4 weeks duration with a positive Straight Leg Raising Test (SLRT) and not responding to the conventional treatment.

Patients presenting for epidural analgesia between October 2015 and March 2016. Exclusion criteria included patient refusal, sepsis at site of injection, any spinal deformity or fracture, raised intracranial pressure, bowel bladder involvement, coagulation disorders, fever, sepsis and use of corticosteroids by mouth or intravenous within two weeks of PRP procedure.

After fulfilling the criteria, patients were explained in detail about the treatment modality & a written informed consent was taken. Diagnostic work up included complete haemogram with ESR, coagulation profile, blood sugar, X-Ray Spine (AP and lateral view). Patients were kept nil per oral 4 hours before the procedure. Baseline Visual Analogue Scale (VAS) score [2], Modified Oswestry Disability Questionnaire (MODQ) [2], SLRT [1] and neurological examination of lower limb prior to the procedure was recorded. PRP was prepared under aseptic condition from patient own blood. About 100ml of patients own blood was taken which was centrifuged and 5ml of platelet rich plasma was prepared in blood bank.

Under strict aseptic precautions a single injection of five ml autologous PRP was administered in the epidural space via interlaminar approach with 18G tuohys needle using fluoroscopic guidance. After the procedure haemodynamic parameters were monitored and recorded every 5 minutes for 30 minutes and also for any possible complications.

Patients were evaluated after 1 hour of procedure and discharged with advice to avoid too much bending, lifting heavy weight or walking long distances and told to follow-up at 3 week and 3 month. VAS score, MODQ and SLRT were noted at all times. Neurological examination of lower limb was also done which included motor examination in form tone, power, reflexes and sensory examination.

RESULTS

It was seen in our study that 10 patients who underwent autologous PRP injection via lumbar epidural showed a gradual improvement of symptoms in terms of VAS scores, MODQ index and SLRT. This gradual improvement of symptoms was sustained through a period of 3 months till the patients were followed up. Apart from one patient whose VAS score was 5, rest of them showed improvement and their VAS SCORE was 4 or less than 4 at three months. For most of the patients MODQ score was less than 30% and SLRT improved to >70 at three months. It showed that the gradual improvement seen was sustained till the follow-up period of 3 months. There were no complications seen and patients were able to do their daily activities without use of pain medications [Table/Fig-1-3].

Patient No.	Pre-procedure	After 1 hour	On follow-up 3 weeks	On follow-up 3 months
1	5	4	4	4
2	6	6	3	3
3	8	7	5	4
4	5	5	4	4
5	5	5	3	3
6	7	7	5	4
7	5	4	4	4
8	6	6	4	3
9	8	8	4	3
10	6	6	5	5

[Table/Fig-1]: Visual analogue scale scores.

Patient No.	Pre procedure	After 1 hour	On follow-up 3 weeks	On follow-up 3 months
1	54%	53%	44%	38%
2	40%	28%	15%	15%
3	64%	64%	50%	45%
4	48%	48%	24%	28%
5	42%	42%	18%	18%
6	40%	40%	32%	28%
7	54%	54%	38%	40%
8	64%	64%	40%	24%
9	38%	38%	24%	15%
10	48%	48%	42%	44%

[Table/Fig-2]: Modified oswestry disability questionnaire score.
0% to 20% - minimal disability; 21% to 40% - moderate disability; 41% to 60% -severe disability; 61% to 80% - crippled; 81% to 100% - bed bound.

Patient No.	Pre procedure	After 1 hour	On follow-up 3 weeks	On follow-up 3 months
1	35-70	35-70	>70	>70
2	35-70	35-70	35-70	>70
3	<35	<35	35-70	35-70
4	35-70	35-70	35-70	35-70
5	<35	< 35	>70	>70
6	<35	< 35	35-70	35-70
7	35-70	< 35	35-70	>70
8	<35	< 35	35-70	35-70
9	<35	< 35	35-70	>70
10	35-70	35-70	35-70	35-70

[Table/Fig-3]: Straight leg raising test scores.
Pain upto 35 degree is diagnostic of PIVD; 35 – 70 degree is suggestive of disc prolapsed; Pain beyond 70 degree is equivocal.

DISCUSSION

Our results are consistent with study done by Akeda et al., [9]. They injected PRP into the discs of patients having chronic low back pain and Degenerative Disc Disease in one or more lumbar segments. Improvement was seen in VAS scores from 7.1±1.2 to 1.8 ± 2.0, $p<0.01$ and it was sustained over a period of 6 months [9].

Similarly Bodor et al., reported positive effects to single intradiscal PRP which were sustained for a period of 6-12 months in almost 2/3rd of patients. Half of them had "excellent" and half "good" response on the basis of pain resolution and ability to return to activities of daily living and exercise [10].

In an interesting case Lemper et al., administered PRP epidurally for pain management where in the patient being treated for cervical and lumbar pain became pregnant and thus became a preferable candidate for PRP injection over epidural steroid [3].

PRP is defined as a sequestration and concentration of platelets within the plasma fraction of autologous blood. The rationale behind the use of PRP is the deliver a high concentrations of growth factors and cytokines which can improve the healing process [3].

Each platelet contains 50 to 80 alpha granules which have more than 30 bioactive proteins. These proteins play an essential role in haemostasis and hard and soft tissue healing. Platelet counts of 150,000 to 300,000/microL are considered normal [3].

Alpha granules contain numerous proteins and peptides that help in cellular migration and growth including platelet derived growth factor (PDGF), transforming growth factor (TGF-beta), insulin-like growth factor (IGF), vascular endothelial growth factor (VEGF),

epidermal growth factor (EGF), platelet factor 4, interleukin-1 (IL-1), platelet derived angiogenesis factor, platelet derived endothelial growth factor, epithelial cell growth factor, osteocalcin, osteonectin, fibrinogen, vitronectin, fibronectin and thrombospondin. PRP count of 1,000,000 microL is regarded as the benchmark for PRP. PRP causes a three to five fold increase in platelet concentration over baseline and exogenous delivery of activated PRP leads to platelet aggregation and clotting after approximately 10 minutes and within 1 hour approximately 95% of the alpha granule contents have been secreted [3]. The motive behind use of PRP is to increase the concentration of activated platelets at the site of chronic injury which restarts the inflammatory phase, leading to healing [3].

Tolbert et al., described a 3 patient case series in which ultrasound-guided approach was used. Both hypertonic dextrose and PRP were injected to the facet joint capsules, the sacroiliac ligaments and joint and the caudal epidural space [11].

Takeuchi et al., conducted a study related to role of PRP in axonal growth in spinal cord tissues [12]. Anjayani et al., found that perineural PRP injection around the peripheral nerves of leprosy patients with peripheral neuropathy had a positive effect on sensory function at two weeks post-injection [13]. Doss et al., reported a case showing efficacy of ultrasound- guided PRP to the distal branches of the trigeminal nerve in a patient with trigeminal neuralgia, showing that PRP played a role in myelination and potentially modulated neuronal activity [14]. A large number of patients with radiculopathy wanted alternative non-surgical treatments after failing traditional conservative measures at the spine division of physical medicine and rehabilitation clinic. Thirty of these patients received epidural PRP via the caudal or lumbar transforaminal route with volumes ranging from 2-3cc of PRP into the foramen to 6-8cc into the caudal canal. There were no complications or increases in pain [8].

Bret Ferree has used PRP to replace the blood patch used to heal the dural rent causing Cerebrospinal fluid (CSF) leak and sometimes refractory post dural puncture headache [15].

In our tecchnique we have used interlaminar approach for injecting PRP in epidural space which involves passage of a needle through ligamentum flavum. Interlaminar epidural injections have been studied extensively regarding their role in radicular pain due to disk herniation, pain due to spinal stenosis, axial back pain in the absence of disk herniation and failed back surgery syndrome. Advantages include the increased likelihood that injected PRP will reach adjacent spinal levels, the ability to treat bilateral pain and the need for a lower volume of PRP. There appears to be a good evidence for the treatment of radicular pain due to disk herniation and somewhat weaker evidence for treatment of spinal stenosis, discogenic pain and postsurgical pain with this technique [4].

LIMITATION

The limitations of ongoing study include the gradual improvement of pain symptoms. Patients in acute pain may not get immediate effect and may need to be supplemented with pain killers for a few days post PRP injection. Second limitation is more of subjective in nature as many patients are hesitant in nature to donate their own blood. Patients need to be counseled properly pre-procedurally about benefits.

CONCLUSION

This pilot study suggests a definitive role for PRP via lumbar epidural injection for chronic prolapsed intervertebral disc patients. This needs to be further validated by doing more research by randomized controlled trials which we are doing currently.

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