

Percutaneous Endoscopic Cervical Discectomy with insertion of Platelet Rich Fibrin (Derwan) plug

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Abstract

Background: The forward tilt of the head results in an increasing eccentric loading of the spine. World over we are likely to see therefore an increasing incidence of failure of the disc causing radicular pain at a younger age. Also decrease in fitness & poor muscular control may contribute to multifactorial genesis of spinal disc disease disorders. Whereas most of these would respond to conservative treatment & postural training, for the non responders who are treated surgically, we need to be able to develop a reliable, surgical modality of treatment which is targeted, causes minimum long term morbidity & can be performed with minimum hospitalisation especially in the younger age group.

PECD is a minimally invasive treatment modality for radicular pain caused by a soft cervical disc herniation through a 5mm incision under local anaesthesia.

Many in vitro studies have shown the regenerative potential of PRF. We hypothesised that the use of PRF, promoting annular healing reduces post operative radicular pain by plugging local inflammation can induce the possible regeneration of intervertebral disc followed by PECD.

At our hospital over the last 2 years we have been combining the two. This is the first reported use of PRF in spine surgery & Endoscopic spine surgery. The DERVAN plug or modified PRF plug is also perfectly suited for insertion through the 2.5 mm cannula of endoscopic spine surgery.

Materials & Methods: 5 consecutively treated patients with soft cervical disc herniation with unilateral radiculopathy by PECD with insertion of Platelet rich fibrin plug (Derwan plug) over a period of 2 years wherein a follow up MRI was possible and available are being reported. Inclusion and exclusion criteria are fulfilled as described below. PECD enables removal of offending fragment under vision with irrigation which along with Platelet rich fibrin plug helps to reduce inflammation with few complications. All patients followed minimum for 6 months with Visual Analogue Score (VAS) and Neck Disability Index (NDI) and a follow up MRI.

Results: All treated patients have good outcome in terms of pain relief (VAS) and functional recovery (NDI). The follow up MRIs were encouraging in terms of disc height, hydration annular healing and endplate changes.

Conclusions: Unique combination of percutaneous endoscopic cervical discectomy and insertion of PRF plug (Derwan plug) may offer a way forward to avoid fusion and preserve segmental motion. This in turn would prevent the adjacent segment degeneration and avoid the risk related to hardware (non union, pseudoarthrosis) especially in younger patients with maintained disc architecture.

Key-words: PECD, minimally invasive spine surgery, cervical radiculopathy, Soft disc herniation, decompression.

Foot note: PECD= Percutaneous Endoscopic Cervical Discectomy, VAS= Visual Analog Score, NDI = Neck Disability Index.

Introduction

Stookey first described clinical symptoms and anatomical location of cervical disc herniation [1]. Cervical disc herniation presents in form of headache, neck pain, unilateral or bilateral arm pain (radiculopathy) or motor and sensory deficit [2]. Symptomatology of cervical disc herniation is due to mechanical compression and chemical irritation of nerve roots [3]. Mechanical

compression (herniated fragment) can be diagnosed by imaging study (MRI or CT scan) and chemical irritation by clinical examination by locating dermatomal distribution of pain [2,3,4]. Majority of patients responds well with conservative treatment and remaining patients requires some form of intervention [2].

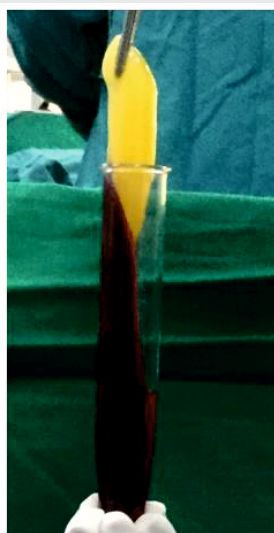
Cervical disc herniation may be soft disc herniation or hard disc herniation. Hard herniation is due to collagenisation and subsequent osteophyte formation [2,5]. Current treatment options are anterior cervical discectomy only, anterior cervical discectomy with fusion (ACDF) mainly for soft herniation [6,7].

Percutaneous Endoscopic Cervical Discectomy (PECD) is a stitchless procedure performed under local anaesthesia providing relief from radicular pain. It is performed under local anaesthesia in an awake state improving patient safety. However for some time in the immediate post

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Photograph 1: Dervan Plug (PRF plug) after the centrifugation of 3000 r.p.m. for 10 mins followed by the 10 mins of standing time in centrifuge is ready for insertion



Photograph 2: Preoperative Magnetic Resonance Image of Cervical Spine of 42 years old patient shows degenerative changes in the disc at C5-C6 level



Photograph 3: Post operative MRI of cervical spine of same patient after 12 months of PECD followed by the use of Dervan Plug (PRF plug) shows regeneration of soft tissue and healing of the ruptured annulus of the same disc at C5-C6 level

operative period, there may be radicular pain due to increase in local inflammation from the intervention [8].

Through a fortuitous association with my colleague who was using the platelet rich fibrin (PRF) to accelerate healing in sports injuries led to the present novel practice [9]; in the beginning with the idea that a fibrin mesh around the root on completing the procedure of PECD would decrease early postoperative discomfort by keeping away the RBCs (Red blood cells) from the root and later in the hope that it would stimulate local healing [10-12].

PRF is an autologous derivative of platelet concentrates. Fibrin is an activated molecule of fibrinogen. This autologous derivative releases number of cytokines and growth factor accelerates the collagen system and promotes the local healing. PRF enhances the cell proliferation of different cells like fibroblast, adipocytes, osteoblasts, keratinocytes. The strong organisation of the fibrin mesh, great concentration of leucocytes, slow release of growth factor this synergic effect enhances the healing of soft tissue and hard tissue [10,13,14,18,19,23]. The initial experience with the use of the PRF was very encouraging in terms of the speed of patients recovery (pain, spasm and function) to the extent that it became standard practice at our hospital over the last 2 years. In the first few months a standardised protocol and equipment to obtain a reasonable quality plug was evolved.

There is no report in literature that has shown the use of Platelet rich fibrin (PRF) in cervical spine surgery

[15,16,17]. However from in-vitro studies & other work in dentistry etc [18,19,20], it was expected to be the perfect bio composite to enhance healing, increase infection resistance & provide substrate for exiting root protection.

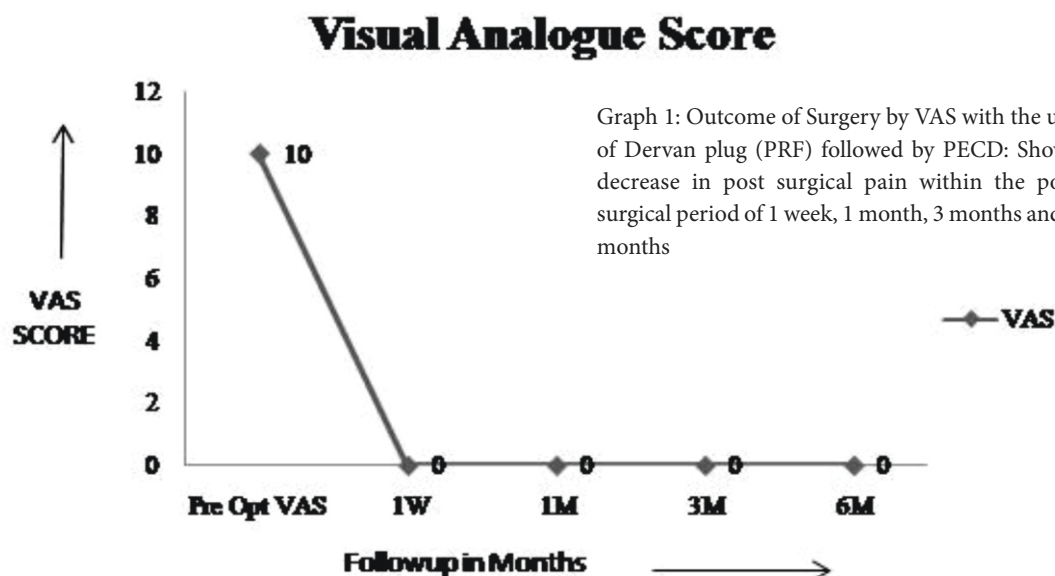
To the best of our knowledge, this study is the first in literature of in vivo use of PRF following cervical discectomy and shares our experience since last 12 months in the use of a PRF plug (known as Dervan Plug) in inducing healing of the torn annulus and degenerate nucleus pulposus.

Material and Methods

5 patients who underwent PECD with the insertion of Dervan plug at our hospital with a minimum follow-up of 12 months and who were amenable to a postoperative MRI form the subjects of this study.

Percutaneous Endoscopic Cervical Discectomy procedure is performed in a supine position with neck extended by placing pillow under shoulders and a soft silicon ring placed below the head to prevent rotation of the head. Shoulders are pulled by applying adhesive tape to visualise lower cervical spine. The neck is then painted with iodine solution and draped with sterile sheets [8].

Under C-arm guidance the needle was inserted medial to the anterior border of sternocleidomastoid between carotid sheath and midline viscera from the opposite side of the herniation. With the use of three fingers the space between the carotid sheath and midline viscera is opened to feel the cervical vertebra with the middle



finger. After infiltration with local anaesthetic (1:1 mix of 0.5% Lignocaine and 0.5% Bupivacaine total of about 10 mls) the needle is inserted into the centre of desired disc space under C-arm guidance. A guide wire was then passed, over which dilators were inserted. Working sheath of desire shape was then passed over dilator and position was confirmed under C-arm. Dilator was then removed once the position of dilators and working sheath was appropriate (with respect to the fragment) under the C-arm [8].

Endoscope (Karl Storz, Germany) with working channel of 2.5mm introduced and fragment was identified. Fragmentectomy was done with different types of grasper. If fragment cannot be grasped with the forceps then hook can be used to tease the fragment and allows easy removal with the grasper. Hook was also used to palpate the nerve root and confirm the complete removal of offending fragments. Fresh epidural bleeding, palpation and visualisation of nerve root and subsidence of pain are the signs of complete removal of the fragment [8].

Blood is rapidly (before clotting cascade is triggered i.e. less than a minute) transferred to a suitable plain glass tube with a cap (Micro-Aid) and centrifuged at 3000 rpm for 10 minutes (REMI R-303). Thereafter a standing time in the centrifuge of about 10 minutes is allowed [10-16]. Using sterile precautions the tube is then uncapped by the circulating theatre personnel and the plug is lifted from the tube and is ready for insertion (Photograph 1) [10-16].

At the end of the procedure the Dervan plug is placed in the cannula and by using the dilator/ obturator pushed into the disc at the mouth of the annulus. Patients are mobilised after 2 hours and discharged from the hospital

on the same /next day with cervical soft collar.

Outcome was measured using the VAS scale and the Neck Disability Index (NDI) [4,6]. Clinical records were scanned for any unusual or adverse events. Post operative MRI was evaluated for disc height, hydration, annular healing, endplate changes and any kyphosis (Table 1) [5,21].

Results

VAS score showed a consistent decrease as shown in (Graph 1). NDI showed reduced neck disability form 100% to 0% in the postsurgical period recorded at 1 month, 3 months and 6 months (Graph 2). Out of 5 patients we were able to get the post operative MRI scan in 4 patients at minimum 6 months and 12 months post surgery. There was regeneration of soft tissue and healing of the ruptured annulus in the post operative MRI as compared to pre operative MRI scans (Photograph 2,3). No complications were observed in any of the patient because of the use of Dervan plug (PRF) followed by the percutaneous endoscopic cervical discectomy. PECD has its own advantages but the use of Dervan plug as a bioactive healant may have the added benefits of disc regeneration, healing [11,13,23] and reducing long term morbidity & pain.

Discussion

Herniated discs lead often to symptomatic radiculopathy. Percutaneous Endoscopic Cervical Discectomy (PECD) procedure is successively proven treatment for soft disc herniation [6,7,8].

This particular procedure has many advantages such as local anaesthesia, awake patient procedure & feedback,

Table 1: Evaluation of post-operative MRI, Abbreviation: No – no of patient, DOPr – Duration between preoperative MRI and Surgery, DOPo – Duration between post-operative MRI and Surgery, Pre-op – Preoperative, Post op- Post operative, HIZ – High intensity zone annular tear present, H – Healed annular

| No | Disc Level | Patient Age/ Sex | DOPr | DOPo | Disc height In mm | | Annular Healing(HIZ) P/H | | End plate changes (Modic type) | |
|----|------------|--|------------|------|----------------------|------------|--------------------------------|---------|-----------------------------------|---------|
| | | | | | Pre op | Post op | Pre op | Post op | Pre op | Post op |
| 1 | C5-C6 | 48/M | One Day | 7 M | 5 | 5 | P | H | Absent | Absent |
| 2 | C5-C6 | 42/F (age at the time of surgery) | One Day | 24 M | 6 | 5 | P | H | Absent | Absent |
| 3 | C6-C7 | 56/F | One Day | 7 M | 4 | 4 | P | H | Absent | Absent |
| 4 | C5-C6 | 25/M | One Day | 9 M | 6 | 6 | P | H | Type3 | Type3 |

OPD procedure, using a small 5 mms incision and successfully approaching and removing the herniated disc fragment by leaving minimum footprint [7,8].

On this background platelet rich fibrin plug displayed very useful in vivo characteristics to accelerate healing of tissues. It was firstly introduced by Choukren et.al. in year 2001 in dentistry that PRF enhances the bone matrix formation in implantation [19,20,21].

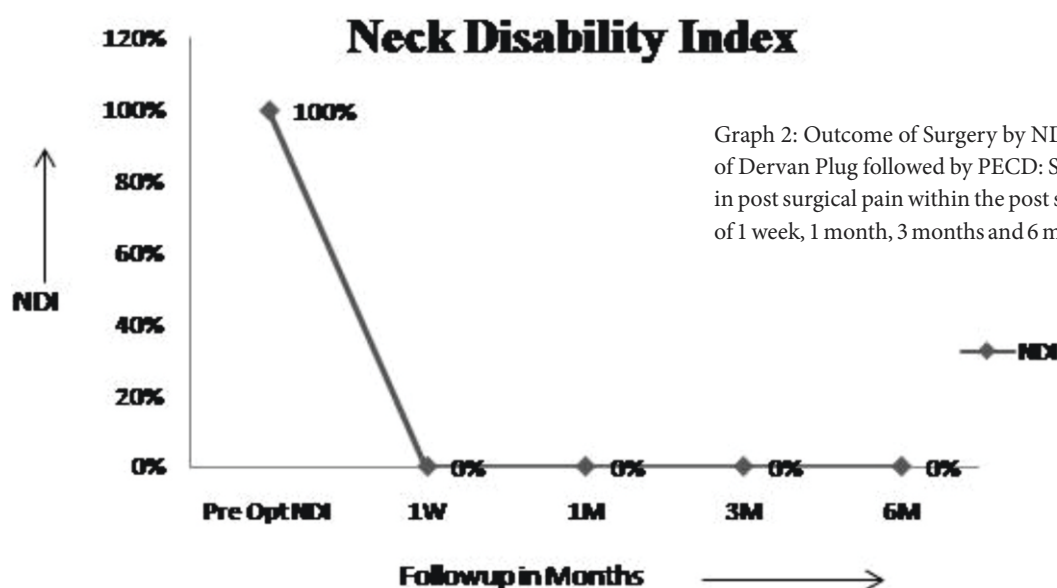
In Vitro studies evidence emphasized that it is expected to orchestrate and accelerate local healing of tissue [13,18,24].

The procedure is very economic. simple and reliable in

terms of cost of preparation. The portable centrifuge costing about Rs 5000 and glass test tubes about Rs 15 make the procedure very cost effective [16].

It is a speedy, safe and very credible method of getting a bioactive plug for healing of the annulus.

In this small series the changes on MRI strongly suggest that the promise of PRF as a orchestrator of healer of a damaged disc in in vitro studies may also hold true in vivo.



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