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Posterior cervical discectomy: An optimally invasive approach to laterally prolapsed cervical disc

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Abstract

Aim: Posterior cervical discectomy is one of the surgical techniques for management of laterally prolapsed cervical disc causing cervical radiculopathy. This method has remained under-utilized in comparison to the classic technique of Anterior Cervical Discectomy and Fusion (ACDF). The study was conducted to evaluate it's feasibility in terms of ease, challenges and short term outcome.

Material and Methods: This is a prospective study conducted over a period of 65 months. Patients visiting to neurosurgery/ orthopedics OPD's with cervical disc diseases and requiring surgery, were further evaluated on the basis of selection criteria for the feasibility of posterior cervical discectomy. Patients meeting the selection criteria were then operated upon by this approach and the outcome was evaluated.

Results: Posterior cervical discectomy is essentially a disc conserving, optimally invasive microscopic technique - best suited for selected subset of patients with laterally prolapsed disc causing radiculopathy. 21 out of 23 patients appreciated the surgical benefit by as early as 48 hours of operation. There were no complications.

Conclusion: Posterior cervical discectomy is an excellent direct approach to the diseased segment provided case selection criteria are properly followed.

Keywords: Cervical disc, Posterior cervical discectomy, Lamino-foraminotomy, Motion preserving cervical disc surgery

Introduction

Cervical disc disease is a prevalent and disabling disorder. Approximately 15 to 20 percent of adult report at least one episode of neck pain during a given year and nearly half of these are required to seek help of health care providers. On an annual basis, it is estimated that 11 to 14% of workers will have some limitation in their activities due to neck pain.(1) Clinical presentation varies from mild neck pain to agonizing radicular pain or even quadriparesis. Though in majority, symptoms resolve by spectrum of conservative treatment modalities, a small percentage will have to undergo surgery.

The Anterior Cervical Discectomy and Fusion (ACDF), first described by Smith and Robinson in 1958(2) has remained the standard technique and is the most common procedure performed world over for this problem. Though the results are unequivocal, the procedure is too invasive for select sub group of patient having very lateral/ foraminal disc protrusions and presenting with only or predominantly radicular symptoms. A posterior rather than anterior approach have been described in these patients. This is a more direct approach dealing only with the offending-extruded disc fragment while leaving behind the remaining intact disc within the disc space thus preserving the disc function over diseased segment. This is in **contrast** to Smith Robinson procedure which leads to segmental loss of motion due to fusion and possibly, enhancement of adjacent level disc degeneration as suggested by some.(3) The posterior approach has largely remained underutilized and therefore in the present study we evaluated this technique in terms of ease, challenges and short term outcome.

Material & Methods

This is a prospective study conducted between January 2010 to May 2015. Patients visiting to neuro surgery/ orthopedics OPD with symptoms of compressive cervical neuropathy were evaluated clinically and radiologically. Of those requiring surgery for disc prolapse, patients were further screened out in whom posterior cervical discectomy was a feasible option. The selection criteria laid down were – 1. Presence of radicular symptoms 2. MRI showing very lateral / foraminal disc protrusion preferably with T2 signals (suggestive of soft disc) (Fig. 1). Patients with radicular symptoms secondary to large discs but having extensions from lateral to central location, patients with root compression due to osteophytes or disco-osteophytic complex and multilevel discs were not included for this procedure. 23 patients met with above criteria and were subjected to posterior cervical discectomy under general anesthesia in prone position.

Surgical Procedure: Disc level, after localization on fluoroscopy is approached by mid line incision. Para-spinal muscle dissection is carried out laterally upto the facet joint - only on the side of disc prolapse. Under microscope, limited micro laminectomy ± partial drilling of pedicle is done (Fig. 3 & 4). Ligamentum flavum is excised and epidural veins are coagulated as

these, at occasions become troublesome source of bleeding. The above procedure gives good exposure of affected nerve root. The extruded disc can now be well appreciated as a bulge at the shoulder of nerve root and is approached from the axilla of nerve. During procedure, only the extruded disc fragments are removed and that is good enough to relieve the symptoms. Post operatively cervical collar is not used as a routine but given only in those patients who were having multi segmental degenerative spine or to those having neck pain with muscle spasm. Patients were evaluated for clinical progress till their hospital stay and subsequently 1, 3, 6 and 12 months interval.

Result

Cases studied: 23
Total cases: 23
Male & Female: 19: 4
Age: 29-64 years
Duration of symptoms: 12days to 7 month
Symptoms: Radicular Pain – all 23
Sensory/Motor dysfunction 14
Associated myelopathy – 2
Cervical level C5 – 6: 15
C4 – 5: 4
C6 – 7: 4

All 23 patients chosen had single level disc prolapse.

12 out of 23 patients (50%) started getting feel of pain relief by as early as 6 hours after the surgery and by 48 hours 21 patients were convinced of surgical benefit. Patients having shorter duration of symptoms were benefited earlier. Of all, 12 patients were free of analgesic requirement by 5th day. By first follow-up 19 patients were satisfactorily relieved of pain. The motor deficits, also started improving gradually. 2 patient developed pain recurrence after initial relief and 2 of 23 patient did not benefit much by the procedure and reason attributable to it was poor case selection. Both patients with pain recurrence responded well to short course of steroid and muscle relaxant based analgesics. We analyzed the reason for surgical failure in 2 cases. In one – the surgery was conducted for large lateral disc fragment which was extending centrally and was clinically associated with radiculo-myelopathy. Though pain decreased post operatively, it was still somewhat agonizing and post-operative scan did show moderate residual disc bulge. Patient was counseled to undergo ACDF in view of clinico-radiological findings but he refused and therefore had to be treated on symptomatic medication. Subsequently, he started showing relief after about 12 weeks. The 2nd case did not benefit much after surgery. This patient had significant myelopathy as well as radiculopathy of 7 months duration induced by bilateral –lateral disc `leading to significant cord compression and T2 signal changes. Patient underwent bilateral key hole foraminotomy/ discectomy while leaving the spinous process intact. Pain relief was mild to moderate only with no benefit in myelopathic symptoms. Post-operative scan, though showing moderate decompression, intra spinal bulge still came from tented annulus. It needs to be observed that in presence of myelomalacia, the symptoms of myelopathy may persist even after adequate decompression. This emphasizes the need for proper case selection.

On first follow-up at 1month, patients were asked to rate the pain relief on a numeric pain rating scale of 0-10.There response transforms into pain relief to the tune of 90-100% in 17 cases (74%) and approximately 70% in 3 patients(13%). Patient with pain recurrence rated pain relief to be approximately 50% while the remaining 2,who were not benefitted by surgery were obviously not assessed by this method.

As regards surgical technique is concerned, it is technically demanding initially but overall, the surgery would be rated as easy. Microscope, drill and fine disc forceps are essential equipment needed for the procedure. After lamino foraminotomy, careful dissection of soft tissue overlying nerve root and lateral edge of thecal sac is essential to expose the targeted surgical site. The disc fragment is essentially assessed through the axilla of nerve root but in some cases with upward migration of disc fragment, extension of laminectomy to cranial side and approaching the disc from shoulder of root is required. In initial few cases, the surgical time was approximately 2 and half hours but with experience, now it gets over by an hour and fifteen minutes or so. The approach is a direct one with short surgical route with very low complication rate. In this study -2 cases had suboptimal result which I attribute to wrong approach selection rather than a true surgical complication. Larger discs with central extension are not suitable for this approach as cord cannot be retracted much. Also heavy built patients with short neck are challenging as epidural veins may be a source of troublesome bleeding in them. We had one such case. Though in present study, only single level disc prolapse were dealt, osteophytes as well as multilevel lateral discs can also be removed through same approach. Overall, results are good and comparable to ACDF even without the need for instrumentation.

Discussion

Disc prolapse, whether cervical or lumbar, is a commonly observed clinical entity occurring in a variety of circumstances – as part of natural disc degeneration or spinal trauma, induced by jerky movements like coughing, sneezing or wrong postural habits etc. Depending upon the level of involvement (in spine), location of disc (central, para-central, lateral, foraminal, or far lateral) and volume of prolapsed disc, patients develop a spectrum of symptoms ranging from simple pain to sensory-motor deficits and is a cause of

presentation to host of care givers – neurosurgeon, neurologists, ortho-paedicians, physiotherapists, chiropractors etc.

Though in majority of cervical disc prolapse, most symptoms are amenable to variety of conservative means, surgery when resorted to, usually has clear cut objectives - relieve the symptoms while restoring the anatomy and physiology. The surgical options are – anterior cervical discectomy alone or combined with fusion and instrumentation, endoscopic discectomy, discectomy with disc replacement and posterior cervical discectomy and most of these have been successful in addressing the problem of radiculopathy or myelopathy.

Of all these, ACDF is the most common procedure performed world over and is used for all types of disc – central, para-central, lateral, and single to multilevel discs and is the gold standard technique. After discoidectomy, a fusion procedure is added using autogenous bone graft or carbon cage which helps in maintaining the height of neural foramina & spinal column while it also prevents the buckling of posterior longitudinal ligament into spinal canal. The procedure, though well able to address all types of disc disease seems to be too invasive a procedure for the management of small disc fragment in situation of very lateral/ foraminal disc prolapse.

Posterior cervical discectomy is an ideal approach in this sub group of patients. This approach to degenerative disc herniation was originally reported by Mixter and Barr, and the keyhole foraminotomy was subsequently popularized by Scoville, Epstein, and Fager, Ducker later coining the term "lamino-foraminotomy.[4] This procedure not only addresses the issue of root compression but also preserves the segmental motion. The narrow space available to remove the disc, does demand the need of a microscope. A small foraminotomy if combined with little drilling of pedicle not only widens the area available for eggressing nerve root but also helps in wider access for removal of offending disc. Essentialy, this results in 360 degree decompression of involved root as anterior offender-disc and posteriorly - the bone, both are removed. However, >50% removal of facet joint is not recommended as this will lead to instability.[4] After root exposure, the assess to prolapsed disc fragment is direct and early as compared to ACDF were the prolapsed portion is assessable only after removal of normal un prolapsed disc. The procedure also circumvents the need for any grafting and instrumentation, and therefore the technical issues in some patients which are inherent to ACDF e.g. occasional injury to esophagus and carotids(leading to Stroke); possibility of graft displacement, screw pull out, inadequate fusion leading to painful pseudo-arthrosis, donor site pain etc. are also bypassed.

Apart from unilateral discs, bilateral same level disc can also be managed through same approach by bilateral foraminotomies while preserving the spine.[5] Discs at more than one level have also been addressed through this approach in selected cases and can be combined with laminectomy or laminoplasty to deal with myelopathy.[6,7,8] Apart from disc, foraminal osteophytes, an important cause of radicular pain can also be successfully managed through this approach.[9] Posterior cervical foraminotomy has also been used as an effective surgical technique in the treatment of recurrent radiculopathy after ACDF.[10] The recurrence of symptoms leading to re-surgery, in a study, was found to be 5 to 10% approximately over a period of 2-3 yrs.[11,12] Bydon M et al, in a followup study of 151 patients reported the recurrence of radicular symptoms in 16% cases by 7.3years and need for re-surgery in 24% patients(this includes both- same index level as well as distant level) after a follow-up period of 10 years. Incidence of re-surgery when compared with ACDF, at the index level of surgery, was nearly same 6.4% vs 4.8% and difference was statistically insignificant.[13] Complication rates are very low-approx. 2.2%[4] and are comparable to that of ACDF. They are predominantly root injury, CSF leak and intracranial hypotension, increased epidural bleed and rarely cord injury.[6,7,8] In our series, we did not face any significant intraoperative or postoperative problems except in one patient with short neck where bleeding from epidural vessels gave some per operative trouble.

Patients having discs beyond the lateral/foraminal zone, multilevel degenerative pathologies are not the candidates for this approach as there is significant limitation to the retraction of cord. This was the reason of poor result in 2 of our cases.

Fremont et al conducted a small prospective study to compare three different technique of cervical discectomy (anterior cervical discectomy without fusion, ACDF and foraminotomy) and concluded that none of the procedure could be considered superior to other.[14]

At this juncture of time when the etiology of adjacent segment disc degeneration cannot be convincingly pointed solely to disc space fusion as done for ACDF, it would be imprudent to say that this motion preserving surgery will prevent early degeneration. Rather it would be apt to say that this is the optimally invasive approach having same goals which an anterior procedure addresses while dealing with lateral/ foraminal pathologies.

Conclusion

The ACDF, the most widely practiced approach to cervical discs, is too invasive to be used for lateral cervical discs in select cases. Posterior discectomy offers optimally invasive, more physiological - motion preserving, implant free, low complication surgery.

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