

Point of view: posterior cervical lamino-foraminotomy—safe, viable and cost effective non-fusion technique

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Cervical radiculopathy is a well-known cause for significant neck pain and disability, with a reported annual incidence of 83.2 cases per 100,000 population (1). Although a majority of patients recover with non-operative management, surgical intervention may eventually be needed in those who respond poorly to conservative treatment or develop neuro-deficit (2).

The gold standard surgical management for cervical disc herniation is anterior cervical discectomy and fusion (ACDF) (3). However, it is not fraught without complications that include pseudo-arthrosis, graft dislodgement, graft failure, donor site morbidity and re-operations (4). Accelerated degeneration of the segments adjacent to the fused vertebrae (adjacent segment disease) consequent to possible altered biomechanics and loss of motion at these levels have also been major concerns following this procedure, which has led to the options of non-fusion modalities of surgery especially in younger individuals (5).

Among the various non-fusion, motion-preserving alternatives which have been described, anterior cervical disc arthroplasty (CDA) has been growing in popularity (6). Recent studies comparing CDA with ACDF have demonstrated superiority of the former procedure in terms of overall success, better neck disability index scores, neurological success, implant/surgery-related serious adverse events, secondary procedure, functional outcomes, patient satisfaction and superior adjacent segment degeneration (6). Although the clinical outcomes with CDA are encouraging, this new technology is also associated with an expanding list of novel complications. Complications including implant wear and tear or failure, failed kinematics, segmental kyphosis, infection, neurological injury, component

dislodgement, implant subsidence, heterotopic ossification, osteolysis, cascade of inflammatory reactions to implant debris and metallosis are known to be associated with CDA (7). Further, patients with inflammatory arthritis, diffuse idiopathic skeletal hyperostosis (DISH), ossified posterior longitudinal ligament (OPLL) or severe spondylosis with bridging osteophytes, significant (>50%) disc height loss, osteoporosis, pregnant females, segmental instability, multilevel disease, posterior facet arthrosis or <2 degree motion are not good candidates for disc replacement (7).

With the above context, we would like to point out the advantages of posterior cervical lamino-foraminotomy (PCF). Sometimes described as “Frykholm” procedure (8), this relatively simple surgical technique can serve as an excellent alternative technique to CDA. Terai *et al.* (9) reported clinical details of their 15-year experience of 846 operated radiculopathy cases, of whom good pain relief was obtained in 96% of patients. They reported that PCF had advantages over ACDF, in terms of lower complication rates and more effective pain relief. Kumar *et al.* (8) described a good outcome in his series of 89 patients (between 1983 and 1999) who underwent PCF following cervical radiculopathy secondary to compressing osteophytes. A recent retrospective analysis by Terai *et al.* (9) described tandem keyhole foraminotomy (TKF) as a safe and effective procedure in contiguous 2-level cervical disc herniation.

We believe that the ideal situations suited for the minimally-invasive posterior cervical foraminotomy (PCF) include lateral cervical stenoses and multi-level cervical compressions without any evidence of instability or kyphosis (9). Although initially indicated for osteophytes

or hard disc bulges, PCF yields good results in soft disc herniations too (9). A posterior approach in such situations also precludes the approach-related complications associated with anterior cervical surgery including major visceral and vascular injuries, involving carotid artery, esophagus, trachea, sympathetic chain, recurrent laryngeal nerve and post-operative hematoma (4).

One of the major issues where PCF certainly carries an edge over CDA is a significant reduction of the overall costs involved (single level anterior cervical surgeries cost \$10,078, as against an expenditure of \$3,570 in PCF: a cost-difference of \$6,508) (10). In the current era of cost effectiveness, we urge that PCF definitely deserves to be considered as a viable alternative motion-preserving surgical modality.

Since this minimally-invasive procedure obviates the need for fusion or instrumentation, various implant-related adversities known to be associated with CDA may be avoided (9) and possibly some unknown risks given the unavailability of long term data. It is in fact an effective surgical option with osteoporotic and inflammatory spine when the quality of bone does not provide an optimal milieu for hardware (7). The overall re-operation rate for PCF has been reported to be between 3% by Hendersen *et al.* to 9.9% by Bydon *et al.* (6.6% at the index level versus 3.3% at other levels) (11). This is midway between 2.9% revision rates as observed in CDA and 14.5% in ACDF at five years (12).

PCF as a procedure does however has its own pitfalls. It may not be ideally indicated for central disc herniations, where anterior discectomies definitely work much better for single-level pathologies (8). They need to be avoided, when obvious evidence of instability, cervical kyphosis or axial neck pain exist. The procedure does have certain complications including violation of posterior musculature, dural or root injuries, epidural bleeding and need for significant root retraction to access the prolapsed disc (8). But in typical cases where specifically indicated, PCF seems to hold an edge over CDA as a cost-effective and safe non-fusion surgery.

To conclude, there is no definitive best single, scientific option for treatment of cervical radiculopathy necessitating surgical intervention. In carefully selected patients with normal cervical lordosis, this would be a more 'natural' technique of motion preservation.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

References

1. Radhakrishnan K, Litchy WJ, O'Fallon WM, et al. Epidemiology of cervical radiculopathy. A population-based study from Rochester, Minnesota, 1976 through 1990. *Brain* 1994;117:325-35.
2. Persson LC, Carlsson CA, Carlsson JY. Long-lasting cervical radicular pain managed with surgery, physiotherapy, or a cervical collar. A prospective, randomized study. *Spine (Phila Pa 1976)* 1997;22:751-8.
3. Wright IP, Eisenstein SM. Anterior cervical discectomy and fusion without instrumentation. *Spine (Phila Pa 1976)* 2007;32:772-4; discussion 775.
4. Fountas KN, Kapsalaki EZ, Nikolakakos LG, et al. Anterior cervical discectomy and fusion associated complications. *Spine (Phila Pa 1976)* 2007;32:2310-7.
5. Ren C, Song Y, Xue Y, et al. Mid- to long-term outcomes after cervical disc arthroplasty compared with anterior discectomy and fusion: a systematic review and meta-analysis of randomized controlled trials. *Eur Spine J* 2014;23:1115-23.
6. Hu Y, Lv G, Ren S, et al. Mid- to Long-Term Outcomes of Cervical Disc Arthroplasty versus Anterior Cervical Discectomy and Fusion for Treatment of Symptomatic Cervical Disc Disease: A Systematic Review and Meta-Analysis of Eight Prospective Randomized Controlled Trials. *PLoS One* 2016;11:e0149312.
7. Moatz B, Tortolani PJ. Cervical disc arthroplasty: Pros and cons. *Surg Neurol Int* 2012;3:S216-24.
8. Kumar GR, Maurice-Williams RS, Bradford R. Cervical foraminotomy: an effective treatment for cervical spondylotic radiculopathy. *Br J Neurosurg* 1998;12:563-8.
9. Terai H, Suzuki A, Toyoda H, et al. Tandem keyhole foraminotomy in the treatment of cervical radiculopathy: retrospective review of 35 cases. *J Orthop Surg Res* 2014;9:38.
10. Tumialán LM, Ponton RP, Gluf WM. Management of unilateral cervical radiculopathy in the military: the cost effectiveness of posterior cervical foraminotomy compared with anterior cervical discectomy and fusion. *Neurosurg Focus* 2010;28:E17.
11. Bydon M, Mathios D, Macki M, et al. Long-term patient outcomes after posterior cervical foraminotomy: an

analysis of 151 cases. *J Neurosurg Spine* 2014;21:727-31.
12. Delamarter RB, Zigler J. Five-year reoperation rates, cervical total disc replacement versus fusion, results of a

prospective randomized clinical trial. *Spine (Phila Pa 1976)* 2013;38:711-7.

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