Indian Journal of Orthopaedics Surgery 2020;6(3):235–241

Content available at: https://www.ipinnovative.com/open-access-journals

Indian Journal of Orthopaedics Surgery

Journal homepage: www.ipinnovative.com

Original Research Article

Functional outcome of Destandau technique of endoscopic discectomy for symptomatic lumbar disc herniation

Mahadeo M Ghuge[1,*], Sanjeev M Bhandari[1,2]

[1] *Dept. of Orthopaedics, Dr. V. M. Government Medical College, Solapur, Maharashtra, India*
[2] *Bhandari Hospital, Solapur, Maharashtra, India*

ARTICLE INFO

Article history:
Received 12-08-2020
Accepted 18-08-2020
Available online 19-09-2020

Keywords:
Herniated lumbar disc
Destandau technique
Endoscopic discectomy
Minimally invasive surgery

ABSTRACT

Background: Endoscopic spine techniques impart minimum approach related disruption of normal anatomy and provide excellent visualisation and magnification of tissues. The purpose of the study is to evaluate the functional outcome and possible complications of Destandau technique of posterior lumbar discectomy.

Materials and Methods: One hundred and five patients were operated for lumbar disc herniation by using Destandau technique of lumbar discectomy from July 2012 to January 2019. Minimum follow-up was 12 months and maximum was 7 years. Results were evaluated by Visual Analog Scale (VAS) and Oswestry Disability Index (ODI) scores and MacNab's criteria.

Results: Based on MacNab's criteria, 87 patients (82.85%) had excellent results, 6 patients had good and 12 patients had fair results. Average VAS score for leg pain was improved from 8.3 (range 7-10; SD 1.10) to 0.8(range 0-3; SD 0.86) and average ODI score from 69.65 (range 60-78; SD 5.5) to 4.51 (range 0-12) at one year follow-up. Eighty eight percent patients were able to join sedentary work at 3 weeks, with restrictions to avoid heavy manual work till 6 weeks. The complication rate was 18% which included dural tears (3.8%), recurrent disc (3.8%), discitis (1.9%), transient neuralgia (7.61%) and superficial infection (0.9%).

Conclusion: Destandau technique of endoscopic lumbar discectomy is a safe, effective, minimally invasive procedure and reduces the approach related morbidity. It also allows early postoperative rehabilitation and faster return to work. Proper training and experience is vital to overcome the steep learning curve.

1. Introduction

Surgery for lumbar disc herniation can be classified into two broad categories- open discectomy versus minimally invasive surgery. The concept of minimally invasive surgery for lumbar disc herniation is to address the disc pathology without producing iatrogenic access-related morbidity. There are again two different modalities for this minimal access lumbar disc surgery – Microscopic and Endoscopic.

Various endoscopic lumbar discectomy techniques impart minimal approach related disruption of non-pathological spinal anatomy, while at the same time maximising the surgical visualisation of the pathological tissue.[1,2] The obvious advantages of endoscopic surgery are small incision, minimum blood loss, less tissue trauma, improved visibility, decreased need for postoperative analgesics and earlier return to activities and work.[3–5]

Different endoscopic discectomy techniques[6–9] have been developed over last four decades, approaching the disc herniation from posterior, posterolateral (i.e. transforaminal) or even lateral portals. In early 1990, Sir Jean Destandau from Bourdeaux, France developed a posterior interlaminar endoscopic discectomy technique with unique instruments, for surgical management of lumbar disc herniation.[9–11]

The purpose of our study is to evaluate the functional outcome and possible complications of Destandau

* *Corresponding author.*
E-mail address: drmmghuge@gmail.com (M. M. Ghuge).

https://doi.org/10.18231/j.ijos.2020.044

technique of endoscopic lumbar discectomy.

2. Materials and Methods

In this prospective study since 2012, one hundred and five patients having prolapsed lumbar intervertebral disc with radiculopathy, who met the following inclusion and exclusion criteria and followed up for minimum one year were included. They were operated with endoscopic lumbar discectomy using Destandau technique at two different hospitals.

2.1. Inclusion criteria were as follows: Patients having

1. Unilateral central or paracentral intracanalicular disc herniation confirmed by MRI.
2. Lower limb radicular symptoms in corresponding dermatomal distribution, with failed conservative treatment for at least 6 weeks.
3. Positive nerve root tension signs- straight leg raising (SLR) test or femoral stretch test
4. Progressive neurological deficit in some patients with positive clinico-radiological correlation

2.2. Exclusion criteria were as follows

1. Demonstrable instability, spondylolysis or listhesis
2. Cauda equine syndrome
3. Negative clinical and radiological correlation
4. Extraforaminal disc herniation
5. Previous lumbar spine surgery

2.3. Preoperative radiological evaluation

All patients were evaluated with anteroposterior, dynamic standing lateral flexion-extension radiographs of lumbosacral spine and MRI lumbosacral spine with screening of whole spine.

2.4. Surgical procedure

We used Destandau endospine system, which consists of outer endospine tube, trocar and working insert. The working insert has four ports. One 4mm port is for 0 degree endoscope, second 4mm port is for suction cannula, third 8mm working port which is at 12 degree inclination to telescope port is for instruments and fourth port is for nerve root retractor. Twelve degree inclination of the working portal with telescope portal helps in keeping tips of working instruments always under vision. The outer tube has ratchets to adjust the depth of operating insert within the outer tube. This adjustable telescopic locking system can increase the magnification as per need.

The procedure was performed under general anaesthesia. The position used was either prone position on a special table with hips and knees in about 100^0-110^0 flexion or modified knee-chest position with trapezoidal chest support to open up the interlaminar space and the abdomen was kept completely free to reduce extradural venous congestion and bleeding. Under fluoroscopic control, using a special marker in the set, involved disc level and its sagittal inclination was marked (Figure 1 a). After skin preparation and draping, 15-18 mm skin incision was made according to skin marking on the involved side just lateral to spinous process and aponeurosis was incised. With the help of sharp osteotome from the instrument set, the paravertebral muscles were elevated subperiosteally from the spinous process and lamina to expose the interlaminar window and medial facet. The endospine tube with trocar was docked over interlaminar window in the predetermined sagittal inclination of the disc space (Figure 1 b). Trocar was removed, the field was cleared of protruding soft tissues and working insert was fitted in the endospine tube. Endoscope and suction were placed in respective portals (Figure 1 c). Any remaining muscle tissue bulging in the tube was removed till the interlaminar window was clearly visible. A small laminotomy was performed by resecting the inferior margin of superior lamina in cephalad direction and then medial part of inferior facet laterally using 3 mm. angled 45^0 Kerrison punch, till the superior attachment of ligamentum flavum to its undersurface was detached (Figure 1 d). It was followed by excision of ligamentum flavum in caudal direction, using 3 mm. 90^0 Kerrison punch, to expose the dural tube and traversing nerve root under the endoscopic vision. If herniation was paracentral, the nerve root was gently retracted medially either with the in-built root retractor or using pattis, while in cases where the herniation was in the axilla of the traversing root, patti was used to gently push the root laterally. In case of contained discs, annulotomy was done using the spatula or 11 no. blade and loose disc fragments were removed with disc forceps. The sequestered disc was gently removed by teasing it out with nerve hook and then grabbing it with disc forceps (Figure 1 e). Once satisfactory nerve root decompression was confirmed by its free movement, haemostasis was achieved with bipolar cautery and small gelfoam piece was put in the defect after removing the endospine tube, aponurosis was closed and skin was sutured (Figure 1 f). A water impermeable dressing was applied.

Next day morning, the patient was allowed to get out of bed and walk to the washroom. Neurological examination and SLR were performed to rule out any deficit (Figure 2) and patients were discharged in 2 to 5 days depending upon pain. Patients were advised to follow up regularly at 3 weeks, 6 weeks and then at 3, 6 and 12 months post-operatively. All the patients were followed up for minimum of 12 months - the maximum follow-up is of 7 years.

2.5. Functional assessment

The severity of leg pain was evaluated using the 10 point Visual Analogue Scale (VAS) score one day preoperatively

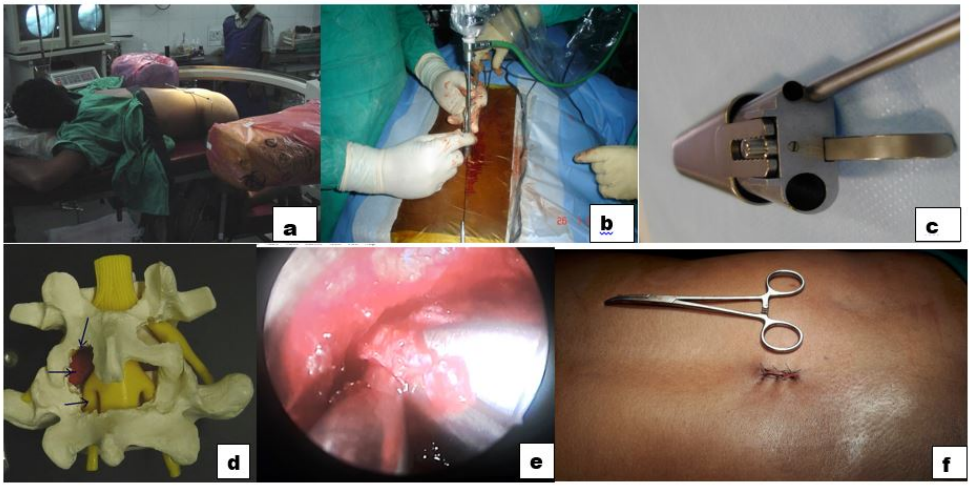

Fig. 1: (a): Patient position and localisation of involved disc level under c arm with the help of *special localiser*; **(b):** docking of tube and endoscope; **(c):** endospine inner and outer tube with four ports and ratchet; **(d):** bone model showing amount of laminotomy (thin arrows); **(e):** endoscopic view of disc fragment being removed; **(f):** length of incision with stitches in situ

and then at first postoperative day, 3 weeks, 6weeks and 3, 6 and 12 months postoperatively. Back pain and patient's daily living ability were assessed by Oswestry Disability Index (ODI) score.

In a retrospective assessment, at final one year follow-up, the clinical efficacy of the procedure was evaluated as excellent, good, fair and poor according to MacNab criteria. [12] (Table 1)

The radiological assessment was done with anteroposterior and lateral flexion, extension x-rays of lumbosacral spine done six weeks postoperatively and at final 12 months follow-up to rule out iatrogenic lumbar instability. During the follow-up, all complications were recorded and managed appropriately.

Table 1: MacNab criteria [12]

Grade	Criteria
Excellent	No pain, no restriction of activity
Good	Occasional back pain or leg pain not interfering with the patient's ability to do his normal work, or to enjoy leisure activities.
Fair	Improved functional capacity, but handicapped by intermittent pain of sufficient severity to curtail or modify work or leisure activities.
Poor	No improvement or insufficient improvement to enable increase in activities; further operative intervention required.

2.6. Statistical analysis

Data was analysed by statistical software, SPSS, Version 16 for repeated measures ANOVA test. The level of significance was set at $p<0.05$.

3. Results

There were seventy-two male (68.57%) and thirty-three female (31.42%) patients - male to female ratio was 2.2:1. The average age of patients was 38 years (range 18-50 years; Standard Deviation SD 8.7). SLR was positive in 100 cases (95.23%), femoral stretch test was positive in 5 cases (4.76%), ankle reflex was absent in 27 cases (25.71%), sensory deficit was observed in 58 cases (55.23%) and motor involvement was seen in 7 cases (6.66%). Motor involvement included patients with grade 3 power in EHL (n=5), grade 4 power at ankle (n=1) and grade 4 power at quadriceps (n=1). The distribution of disc involvement was- 63 at L4-L5 level (60%), 37 at L5-S1 level (35.27%), 4 at L3-L4 level (3.8%) and 1 at L2-L3 level (0.95%). Out of 105, there were 55 contained (52.38%), 46 extruded (43.80%) and 04 sequestrated (3.8%) intracanal disc herniations. Seventy six (72.38%) were left sided and twenty nine (27.61%) were right sided disc herniations.

The mean follow up was 3 years (range 1 to 7 years). The mean duration of operation was 60 min (range 40-90min). Right handed surgeons usually face technical difficulties in approaching right paracentral disc herniation in the

Fig. 2: (a,b): Sagittal and axial T2 Weighted MRI images showing left paracentral sequestrated disc herniation at L4-5 Level; **(c):** endoscopic view of disc fragment; **(d):** Disc material removed; **(e-g):** comfortable patient on second postoperative day

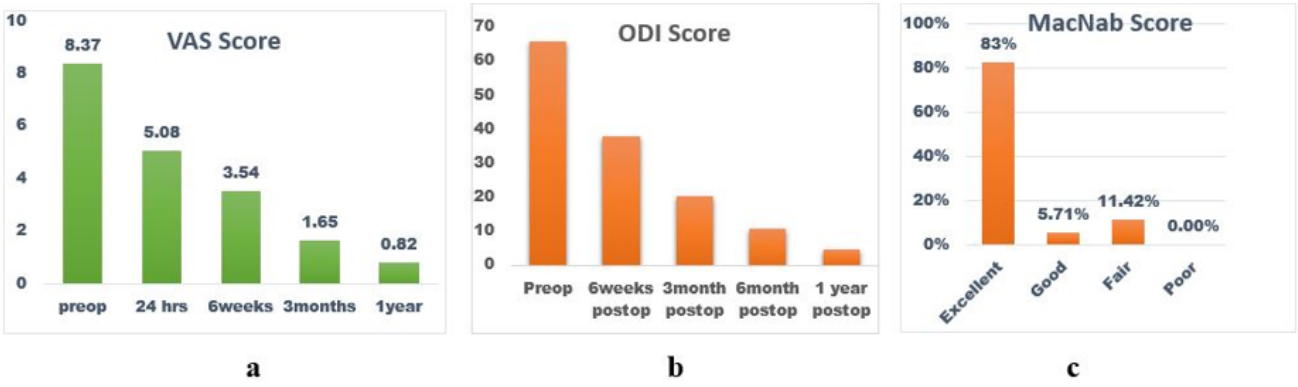

Fig. 3: (a): Visual Analogue Scale Score, **(b):** Oswestry Disability Index Score, **(c):** MacNab Score

beginning, thus leading to slightly increased operative time. The average blood loss was 50ml (range 30-150ml). The operative time was longer and the blood loss was at higher range during early stage of the study. However after gaining the experience, time taken for surgery was less than the mean duration and blood loss was also less.

Four patients (3.80%) had intraoperative dural tears, which were managed by watertight muscle fascia and skin closure. These patients were observed for dural leaks during postoperative period. There was no evidence of dural leak in any of them. All four dural tears occurred in axillary disc herniation where there was tenting of dura and nerve root at the recess. Two patients (1.90%) had postoperative discitis. These patients had sudden onset severe back pain between first and second week of surgery after initial recovery. The pain was so severe that these patients were not able to turn in bed and sleep at night. Instead of declining trend, ESR and C-reactive protein showed rising trend in these patients and cell count was higher. Diagnosis of discitis was made on clinical ground only. These patients were managed by strict bed rest and broad-spectrum intravenous antibiotics for three weeks, followed by oral antibiotics for further three weeks. All these patients responded well to antibiotics and no further intervention was required. Both these lesions healed by radiological fusion at the end of one year.

Recurrent disc herniation involving the same site and side occurred in 3.8% (n=4) cases. Two patients had recurrence of disc within 3 months of operation. The remaining two patients were manual labourer and one had recurrence of disc at 1year 8 months and another had it at 2 years and 6 months after index operation. The recurrence in these patients was confirmed by contrast MRI and managed by the Destandau technique without any complications. Superficial wound infection occurred in one patient (0.9%). It was managed by dressing and antibiotics and it healed within a week. Eight patients (7.6%) had transient radicular pain and paraesthesia in the symptomatic leg, which improved over a period of three to six weeks. Table 2 shows the complications of Destandau technique observed during the study.

Table 2: Complications of Destandau technique

Complications	Frequency (n)	Percentage
Dural tear	04	3.8%
Discitis	02	1.9%
Recurrence	04	3.8%
Wound infection	01	0.95%
Transient neuralgia	08	7.6%

The VAS score for low back and leg pain dropped from 8.3 (range 7-10; SD 1.10) before operation to 5.0 ($p<0.01$) immediately after operation and to 0.8 (range 0-3; SD 0.86) ($p<0.01$) at one year (Figure 3 a). The repeated measures ANOVA indicated a significant effect i.e. Wilk's Lambda=0.20, $F(4,101)=1.250E3$, $p<0.01$. Post hoc comparison among the groups showed that each pairwise difference was statistically significant, $p<0.01$. There was significant improvement in leg pain and back pain over a period of time. Preoperative mean ODI score was 69.65 (range 60-78; SD 5.5) which was significantly reduced to average of 4.51 (range 0-12; SD 4.0) ($p<0.01$) (Figure 3 b). The repeated measures ANOVA indicated a significant effect i.e. Wilk's Lambda=0.006, $F(4,101)=4.351E3$, $p<0.01$. There was significant improvement in disability. Seven patients (6.66%) who had motor involvement at presentation included 5 patients with grade 3 power in EHL, 1 patient with grade 4 power in ankle and another with grade 4 power at quadriceps. Except the one with grade 4 power at ankle, all other patients regained their original power over a period of 9 to 12 months. According to MacNab criteria, 87 patients (82.85%) had excellent outcome, 06 patients (5.71%) had good outcome and 12 patients (11.42%) had fair outcome (Figure 3 c). The percentage of poor result was zero. Eighty eight percent patients (n=93) joined sedentary work at 3 weeks, while heavy manual labour and sporting activities were allowed after 6 weeks.

4. Discussion

The basic principle of discectomy for lumbar disc herniation, performed by various techniques, is to relieve herniation-induced nerve root compression. A proper technique should give satisfactory outcome, produce no or minimum morbidity and must be cost effective. Mixter and Barr,[13] in 1934, first reported classic laminectomy and discectomy as an operative technique in the management of prolapsed intervertebral disc. In retrospective analysis of long term outcomes of standard discectomy for lumbar disc herniation, Yerimitsu et al[14] found that 76.5% of the patients had some residual back pain, which was severe in 12.7% of the cases.

Introduction of microscopic disc surgery by Casper[15] and Yesargil[16] added refinements in approach enabling minimum anatomic damage. Microscope assisted discectomies reported good results between 80-100%.[16,17] A prospective randomised controlled study (RCT) comparing full endoscopic (interlaminar as well as transforaminal) lumbar discectomy versus conventional microsurgical technique by Ruetten et al[1] reported equal clinical results of full endoscopic technique and microsurgical technique. The study also reported significantly reduced postoperative pain and work disability in full endoscopic group and increased rate of non-serious complications in microscopic group. Sir Jean Destandau from France, in early 1993, developed a posterior interlaminar endoscopic discectomy technique, with unique instruments, for surgical management of lumbar disc herniation.[9–11]

We compared our results with studies evaluating Destandau technique of lumbar discectomy.[10,18–21] According to MacNab criteria we had 82.85% excellent, 5.71% good and 11.42% fair outcome. Kaushal et al[18](n=300) had 90% excellent to good results, 08% fair and 02% poor results. Dey et al[19] (n=614) presented excellent results in 78.01% patients good results in 17.9% patients. Our results are comparable with both these studies utilising the same modified MacNab criteria. Our results are also comparable with the results presented by Destandau et al[10] and Patond et al[20] who showed 90.5% and 80.95% excellent results respectively. But both these studies graded their results based on Prolo's criteria. The VAS score for leg pain in present study was significantly improved from preoperative average of 8.3 to 0.8 at final 1 year follow-up. Dey et al[19] reported similar improvement in VAS score from 7.8 to 2 in a year. In the present study, ODI score was reduced significantly from 69.65 to 4.51. Dey et al[19] reported improvement in ODI score from 64 to 14.

Complications reported in different series are dural tear, discitis, transient paresthesia or neuralgia, recurrence, root injury and wound infection. The complication rate in our series was 18%. Out of 105 patients, 3.8% patients (n=4) had dural tear, 3.8% patients (n=4) had recurrence of herniation, 7.61% patients (n=8) had transient neuralgia, 1.9% patients (n=2) had discitis and 0.9% patients (n=1) had superficial wound infection. In a series of 199 patients, Destandau et al[10] reported 0.69% incidence of dural tear. Incidence of dural tear reported by Kaushal et al,[18] Dey et al,[19] Patond et al[20] was 5%, 0.6% and 4.76% respectively. Recurrence rate in present study was higher than the recurrence rate found in the studies conducted by Destandau et al[10] (ie 2.78%) and Day et al[19](ie 0.3%), but was lower than that found in Kaushal et al[18] study (ie 5.0%). Incidence of discitis was noted in every series. In the present study, it was 1.90%, while Destandau et al,[10] Kaushal et al[18] and Patond et al[20]found 0.5%, 5% and 4.5% incidence respectively. Prolonged operative time and technical difficulties in initial cases were the main reasons of these complications in our study.

The patient's ability to return to work is one of the most important parameters of success of any operative procedure. In present study 88 % patients were able to resume sedentary work between 2-3 weeks of surgery with restriction to avoid heavy manual work for minimum 6 weeks. Following microdiscectomy, Bookwalter et al[22] reported that 40% of their patients returned to work within 5 weeks, while Caspar et al[23] reported mean return to work time of 18.6 weeks.

The procedures like endoscopic discectomy, microdiscectomy and classic open discectomy have the same overall outcomes, but endoscopic discectomy has advantages of small incision, well-illuminated magnified view, less blood loss, less postoperative pain and analgesics, early ambulation, early return to work and thus less overall cost of treatment.[1,20] Destandau endoscopic discectomy technique with all these advantages mentioned above, in addition to simple instrumentation, is obviously the procedure of choice.[24] Of course there is a steep learning curve, but proper training and cadaveric workshops under expert guidance is the key to success.

5. Conclusion

Destandau endoscopic lumbar discectomy provides good illumination, excellent visualisation and magnification for the surgeon through a smaller incision, all of which help to minimise procedure related morbidity and prevent serious complications. Short operative time and hospital stay, decreased need of analgesics and early return to work make the procedure cost effective. The only downside is the steep learning curve to improve triangulation, depth perception and hand eye coordination.

6. Source of Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

7. Consent Participate

Informed Consent to participate in the study was taken from all patients.

8. Conflicts of Interests

No funds were received in support of this study. No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this study.

References

1. Ruetten S, Komp M, Merk H, Godolias G. Full-endoscopic interlaminar and transforaminal lumbar discectomy versus conventional microsurgical technique: A prospective, randomized, controlled study. *Spine*. 2008;33:931–9.
2. Yue JJ, Long W. Full Endoscopic Spinal Surgery Techniques: Advancements, Indications, and Outcomes. *Int J Spine Surg*. 2015;9:17.
3. Jhala A, Mistry M. Endoscopic lumbar discectomy: Experience of first 100 cases. *Indian J Orthop*. 2010;44(2):184–90.
4. Chen HC, Lee CH, Wei L, Lui TN, Lin TJ. Comparison of percutaneous endoscopic lumbar discectomy and open lumbar surgery for adjacent segment degeneration and recurrent disc herniation. *Neurol Res Int*. 2015;doi:10.1155/2015/791943.
5. Schaller B. Failed back surgery syndrome: the role of symptomatic segmental single-level instability after lumbar microdiscectomy. *Eur Spine J*. 2004;13(3):193–8.
6. Yeung AT, Yeung CA. Advances in endoscopic disc and spine surgery: foraminal approach. *Surg Technol Int*. 2003;11:255–63.
7. O'Toole JE, Eichholz KM, Fessler RG. Minimally invasive far lateral microendoscopic discectomy for extraforaminal disc herniation at the lumbosacral junction: cadaveric dissection and technical case report. *Spine J*. 2007;7(4):414–21.
8. Brayda-Bruno M, Cinnella P. Posterior endoscopic discectomy (and other procedures). *Eur Spine J*. 2000;9(S1):S024–9.

9. Destandau Jean Endoscopically-assisted treatment of lumbar disc prolapse - Endoscopic microdiscectomy. Endo-Press; 2003.
10. Destandau J. Aspects techniques de la chirurgie endoscopique des hernies discales foraminales lombaires. A propos de 191 cas [Technical features of endoscopic surgery for lumbar disc herniation: 191 patients. *Neurochirurgie*. 2004;50(1):6–10.
11. Destandau J. A special device for endoscopic surgery of lumbar disc herniation. *Neurol Res*. 1999;21(1):39–42.
12. Macnab I. Negative disc exploration. An analysis of the causes of nerve-root involvement in sixty-eight patients. *J Bone Joint Surg Am*. 1971;53(5):891–903.
13. Mixter WJ, Barr JS. Rupture of the Intervertebral Disc with Involvement of the Spinal Canal. *N Engl J Med*. 1934;211(5):210–5.
14. Yorimitsu E, Chiba K, Toyama Y, Hirabayashi K. Long-Term Outcomes of Standard Discectomy for Lumbar Disc Herniation. *Spine*. 2001;26:652–7.
15. Wullenweber CW. A new surgical procedure for lumbar disc herniation causing less tissue damage through a microsurgical approach. In: Brock R, Hamer M, Klinger J, Spoerri M, editors. Lumbar disc adult hydrocephalus. Berlin: Springer; 1977. p. 74–80.
16. Yasargil MG, Klinger M. Microsurgical operation of herniated lumbar disc. In: Wullenweber R, Brock M, Hamer J, Klinger M, Spoerri O, editors. Lumbar disc adult hydrocephalus. Berlin: Springer; 1977. p. 81.
17. Ebeling U, Reichenberg W, Reulen HJ. Results of microsurgical lumbar discectomy. *Acta Neurochirurgica*. 1986;81(1-2):45–52.
18. Kaushal M, Sen R. Posterior endoscopic discectomy: Results in 300 patients. *Indian J Orthop*. 2012;46(1):81–5.
19. Dey PC, Nanda SN. Functional Outcome after Endoscopic Lumbar Discectomy by Destandau's Technique: A Prospective Study of 614 Patients. *Asian Spine J*. 2019;13(5):786–92.
20. Bhaisare R, Kamble B, Patond K. Long-Term Results of Endoscopic Lumbar Discectomy by "Destandau's Technique". *Asian Spine J*. 2016;10(2):289–97.
21. Mostofi K, Khouzani RK. Preliminary results of lumbar disk herniation surgery by Endoscopic Destandau Method. *J Clin Orthop Trauma*. 2018;9(1):S149–51.
22. Bookwalter JW, Busch MD, Nicely D. Ambulatory surgery is safe and effective in radicular disc disease. *Spine*. 1976;19(5):526–30.
23. Caspar W, Campbell B, Barbier DD, Kretschmmer R, Gotfried Y. The Caspar Microsurgical Discectomy and Comparison with a Conventional Standard Lumbar Disc Procedure. *Neurosurg*. 1991;28(1):78–87.
24. Katayama Y, Matsuyama Y, Yoshihara H. Comparison of surgical outcomes between macro discectomy and micro discectomy for lumbar disc herniation: a prospective randomized study with surgery performed by the same spine surgeon. *J Spinal Disord Tech*. 2006;19(5):344–7.

Author biography

Mahadeo M Ghuge Assistant Professor

Sanjeev M Bhandari Associate Professor

Cite this article: Ghuge MM, Bhandari SM. Functional outcome of Destandau technique of endoscopic discectomy for symptomatic lumbar disc herniation. *Indian J Orthop Surg* 2020;6(3):235-241.