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Short Communication

Starting Deep Brain Stimulation in Nepal: Initial Experience and Result

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ABSTRACT

Objective: to see the initial experience of DBS in Parkinson's disease and compare our result with the current literature
Method: All the cases of Parkinson's disease who underwent DBS till 2015 were included in this study. We used ZD Fisher frame and fused MRI and CT scan images for the localization of the targets. The standard functional targets were used and reverified with the Schaltenbrand Atlas and intraoperative neurophysiologic monitoring. The patients' preoperative scores like UPDRS, Hoehn and Yahr Staging and Schwab and England Activities of Daily Living Scale was compared during the follow up. We also compared if there was any changes in the dosing of syndopa after DBS.
Result: All four cases improved in terms of the UPDRS with increase in on time. All cases had decrease in dose of syndopa except in one case of Gpi DBS who had no change in medications. None of the cases had postoperative complications.
Conclusion: DBS is a promising treatment for advanced Parkinson's disease but it is very expensive. Proper patient selection is a must for its success.

Keywords: Deep brain stimulation (DBS), Parkinson's disease.

INTRODUCTION

Deep brain stimulation (DBS) has already been a known treatment modality for intractable Parkinson's disease (PD). The two main targets for DBS are Globus Pallidus Internus (GPi) and Subthalamic nuclei (STN) for PD. It is a procedure in which chronic high frequency stimulation is delivered to these targets by using stereotactically implanted brain electrode connected with the pulse generator which is implanted into the chest. [1] It was introduced in 1980s in Europe for treatment of PD. The exact mechanism of DBS is complex and poorly understood. At typical stimulation parameters tissues within 2-3 mm of the stimulating electrode is likely to be affected and this stimulation can either activate or inactivate cells or axons by depolarization or depolarization blockade. Furthermore the neurotransmitter and fibre activation also may be important mechanism for DBS. [2]

MATERIALS AND METHODS

We have started DBS treatment in Annapurna Neurological Institute and Allied Sciences since 2014. Altogether four cases of DBS have been performed so far. Two cases had placement of DBS electrode in the GPi and two had in STN. All patients underwent brain MRI (1.5 tesla, Siemens) with 2 mm slices without spacing and AC-PC line identified. Then the imaging was

transferred in DICOM CD. Patients were kept on stereotactic frame (ZD Fisher) under local anesthesia. Then 16 slice CT scan, Siemens) was taken (2 mm slices with minimum spacing) with the frame in situ and image recovered in a DICOM CD. Finally, these images were transferred into the workstation where the fusion software was present and these two images were fused. The area of GPi or STN was identified anatomically and reverified with the imaging.

Two burr holes were created 4 cm lateral to midline and 1 cm in front of coronal suture under local anesthesia and dura was coagulated and cut. Then the DBS electrodes were inserted in GPi/STN. It was confirmed with the c-arm as well. Microelectrode recording (MER) was also used for STN nucleus. Continuous monitoring of the motor symptoms, speech and visual symptoms of the patients was done. Then Brio rechargeable IPG (Implantable Pulse Generator) was inserted subcutaneously in infraclavicular region and connected to the leads in the same setting or the next day under General Anesthesia. The stimulation was carried out slowly.

All the patients were followed up and their UPDRS (Unified Parkinson's Disease Rating Score), Modified Hoehn and Yahr Staging and Schwab and England Activities of Daily Living Scale was compared. Their IPG Parameters were also noted. The changes in the medications specially if there is any decrease in the dose of syndopa was also noted.

CASE SERIES

Case1: He is a 64 years old male actor who had history of slowness of movement on right side of the body since five years. He was a syndopa responder with on/off phenomenon present. His Modified Hoehn and Yahr Staging was stage 1. His Schwab and England Activities of Daily Living Scale was 90%. His UPDRS score was 20/176. He was on Syndopa 330mg per day and Amantrel. The surgery performed is Left Gpi DBS. Post Surgery there was no complication and he was discharged on third postoperative day. His Modified Hoehn and Yahr Staging is stage 0. His Schwab and England Activities of Daily Living Scale is 100%. His UPDRS score is 2/176(90% decrease). He is on regular follow up since 15 months. He is now on syndopa plus 220mg and Amantrel. His current battery parameter is: current 2.5mA, Pulse width 62usec, frequency 150hz on left side.

Case 2: He is a 52 years old male who had a history of rigidity since five years. He is also a syndopa responder with on/off phenomenon present. His Modified Hoehn and Yahr Staging was stage 4. His Schwab and England Activities of Daily Living Scale was 40%. His UPDRS score is 78/176. He was on Syndopa 440mg per day and Amantrel. The surgery performed is Bilateral Gpi DBS. Post Surgery there was no complication and he was discharged on third postoperative day. However he developed superficial wound infection which got cured without further complications. His Modified Hoehn and Yahr Staging is stage 3. His Schwab and England Activities of Daily Living Scale is 50%. His UPDRS score is 34/176(51% decrease). He is on regular follow up since 15 months. His medicines have not changed. His current battery parameters is: current 2mA, Pulse width 62usec, frequency 150hz on bilateral region.

Case 3: He is a 42 years old male with young onset Parkinson's Disease .He had a history of right sided tremor since 14 years He is also a syndopa responder with on/off phenomenon present. He developed severe rigidity of the body since 6 years. His Modified Hoehn and Yahr Staging is stage 4. His Schwab and England Activities of Daily Living Scale is 40%. His UPDRS score is 71/176. He is on Syndopa 660 mg per with Amantrel and Pacitane BD.The surgery performed is B/L STN DBS. Post Surgery there was no complication and he was discharged on fourth postoperative day. His Modified Hoehn and Yahr Staging is stage 3. His Schwab and England Activities of Daily Living Scale is 50%. His UPDRS

score is 41/176(42% decrease). He is on regular follow up since 9 months. He is now on syndopa 440 mg per day with same dose of Amantrel and Pacitane. His current battery parameters is: current 2.8mA, Pulse width 75usec, frequency 150hz on left side and bilateral region and right current is 2.7 mA, Pulse width 62 usec with frequency 150 Hz in bipolar mode.

Case 4: She is a 54 years lady who started with left sided hemi parkinsonism with tremor and rigidity since seven years. The symptoms got worse and now she complains of bilateral rigidity more than tremor. She also has on off phenomenon present and is a syndopa responder. Her Modified Hoehn and Yahr Staing is Stage 3. Her Schwab and England Activities of Daily living is 40%. Her UPDRS score is 61/76. Her current medication is tab Syndopa 440 mg and Parkin (profenamine hydrochloride) 2 mg per day. The surery performed is B/L STN DBS. There is no complications during surgery and she is discharged on fourth postoperative day. Post surgery, her Modified Hoehn and Yahr Staging is stage 2. Her Schwab and England Activities of Daily Living Scale is 60%. Her UPDRS score is 33/176(45% decrease). She is on regular follow up since 9 months. She is now on syndopa 330 mg per day with same dose of Pacitane. Her current battery parameters is: current 2.8mA, Pulse width 75usec, frequency 150 Hz on left side and bilateral region and right current is 2.7 mA, Pulse width 62 usec with frequency 150 Hz in bipolar mode. She developed walking claudications and had multiple fall injuries. Her MRI Lumbosacral spine revealed severe spinal canal stenos is at L4-L5 level.

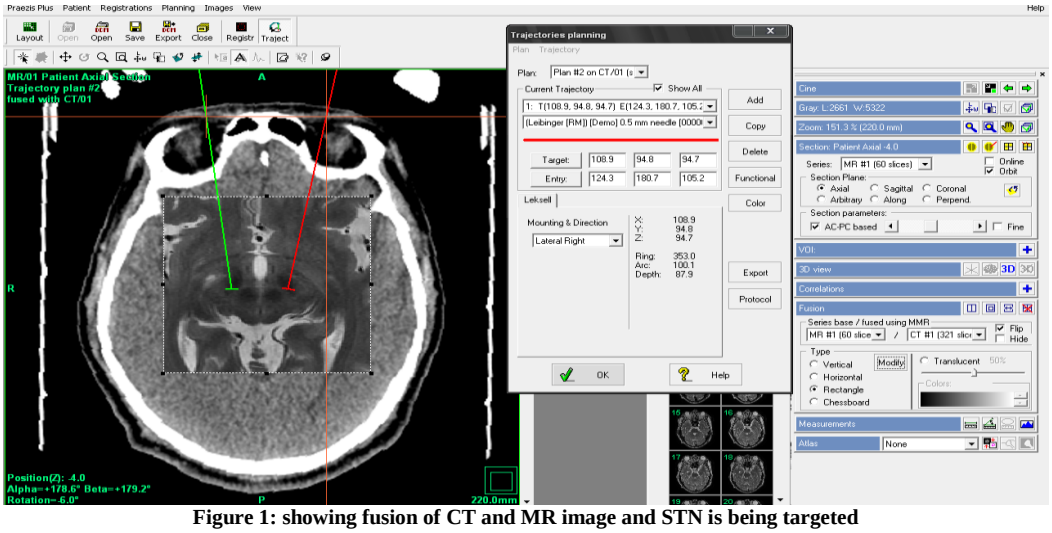

Figure 1: showing fusion of CT and MR image and STN is being targeted

Figure 2: showing placement of C-arm (cross table lateral fluoroscopy) during lead placement

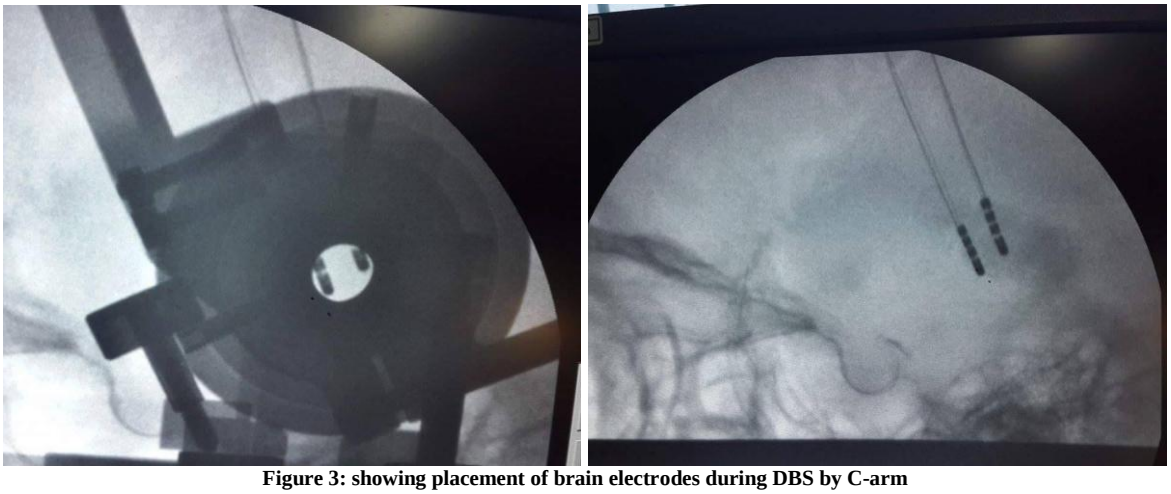

Figure 3: showing placement of brain electrodes during DBS by C-arm

Table 1 showing summary of the cases

Case	Target	Battery Parameters	Change in UPDRS Score (%)	Change in ADL (%)	Medication (dose of syndopa)	Follow up
64 Years, Male	Left GPi	Current 2mA, pulse 62msec, frequency 150Hz on left side((- +00,Bipolar mode)	90	10	Decrease	15 month
52 years, Male	B/L GPi	Current 2mA, pulse 62msec, frequency 150Hz b/L ((- +00, Bipolar mode)	51	25	No change	15 month
45 years, Male	B/L STN	Lt Current 2.8mA, pulse width 75 msec, frequency 150Hz Rt Current 2.7mA, pulse width 62msec, frequency 150Hz (- + 00,Bipolar mode).	42.2	25	Decrease	9 month
54 years, Female	B/L STN	Lt Current 2 mA, pulse width 75 msec, frequency 150Hz(unipolar mode) Rt Current 2.2mA, pulse width 75 msec, frequency 150Hz (-+00, Bipolar mode)	45	50	Decrease	9 month

DISCUSSION

Both GPi and STN DBS is effective in reducing all the cardinal motor signs of PD by reducing dyskinesia, increasing on time and improving the fluctuations in the motor signs. [3] Many studies have shown improvement in Off UPDRS score ranging from 31% to 50%. [4-8] similarly Change in ADL score also ranged from 32% to 50%. [4,6,8] Our improvement was 41-90% in UPDRS score in GPi DBS in 15 month follow up period and 10-25% improvement in ADL score. This result is quite comparable. However the result of DBS varied in long term follow up with little to no benefit afer 1 to 2 years. [7] Some studies have shown maintained benefit up to 4 years. [9,10] However this variability may be due to poor patient selection, improper lead placement or variation in parameter adjustment. Both of our patients with GPi have no change in medication compared to STN DBS patients.

Similarly in case of STN DBS there is 66% improvement in Off UPDRS score in 1 year which got maintained upto 54% in 5 years follow up. [11] Our cases of B/L STN DBS had 42-45% improvement in UPDRS score in 9 month follow up. Both the cases also had reduction in the dose of syndopa.

As it is also mentioned in Literature, there is significant reduction in dopaminergic medications in case of STN DBS and hence also reduces the medications related adverse effect. [12-15]

In one of the meta-analysis of the outcome of the STN DBS it revealed that the average reduction in L-dopa equivalents following surgery was 55.9 %. [16] One case of STN DBS had fluctuation in his mood with depressive episodes as well. The patient frequently cries and also laughs at the same time. It is believed that rapid changes of stimulation parameters may induce affective phenomenon like mirthful laughter or pathological crying. [17,18] The

psychiatric complication is described to be more in STN-DBS than in GPi DBS. [19]

None of our cases had complications during the procedure except for one case of superficial skin infection which got cured with medications. The infections or skin erosion rates are relatively common (1-15%) and the literature has reported the complications like hemorrhage (0.7-3.1%) and even death (1-2%). [20]

Typical stimulation parameters for chronic DBS are monopolar stimulation, voltage 2.5-3.5V, impulse duration 60-90 ms and frequency 130-180 Hz. [2] All our cases had similar parameters except for the bipolar mode in all cases as shown in the table.

One of our cases (case three) developed walking claudication and multiple fall injury. The patient party thought that it was related to DBS. But her MRI LS Spine revealed severe spinal canal stenosis in L4-L5 level and her symptoms may be due to this pathology rather than DBS itself.

CONCLUSION

Deep brain stimulation surgery, although has just started in our country, definitely has promising result for patients with Parkinson's disease. Affordability is one important concern that hampers for widespread acceptance and affirmation of these novel and sophisticated surgical procedures. However, with these early yet encouraging results have already made some efforts to create a new benchmark and together this will certainly attain even greater heights. Good change in UDPRS scale, ADL score and decrease in drug requirement and overall better quality of life for the patients ensures successful outcome of deep brain stimulation surgery.

REFERENCES

1. Isabelle M Germano, Donald J weosz, Adam Silver. Surgical techniques for stereotactic implants of deep brain stimulators. Seminars in Neurosurgery Volume number 2,2001.
2. Limousin PL, Krack P, Pollack P, et al. Electric stimulation of the subthalamic nucleus in advanced Parkinson's disease. N Engl Med 1998; 339:1105-1111.
3. Deep brain stimulation of the subthalamic nucleus or the pars interna of the globus pallidus in Parkinsons Disease. N Engl J M 2001; 345(13):956-63.
4. Ghika J, Et al. Efficiency and safety of Bilateral contemporaneous pallidal stimulation (deep brain stimulation) in levodopa responsive patients with Parkinson's disease with severe motor fluctuations: a 2 year follow up review. J Neurosurg 1998;89(5):713-18.
5. Burchiel, KJ, et al.Comparison of pallidal and subthalamic nucleus deep brain stimulation for advanced Parkinson's disease: results of randomized, blinded pilot study : Neurosurgery 1999; 45(6):1375-82; discussion 1382-4.
6. Kumar R, et al. Deep brain stimulation for the globus pallidus pars interna in advanced Parkinson's disease. Neurology 2000:55(12 Suppl 6): S34-9
7. Volkmann J, et al. Long term results of bilateral pallidal stimulation in Parkinson's disease. Ann Neurol 2004;55(6):871-5
8. Loher TJ, et al. Long term Pallidal deep brain stimulation in patients with advanced Parkinson's disease: 1 year follow up study. J Neurosurg 2002;96(5):844-53
9. Rodrigues JP, et al. Globus pallidus stimulation in advanced Parkinson's disease. J clin Neuroscience 2007;14 (3):208-15
10. Rodrigues JP et al. Globus pallidus stimulation improves both motor and nonmotor aspects of quality of life in advanced Parkinson's disease. Mov Disord 2007; 22(13): 1866-70.
11. Krack, P, Batir A., Van Blercom, N., Chabardes, S., Fraix, V., Ardouin, C.et al. Five years follow up of bilateral stimulation of sub thalamic nucleus in advanced Parkinson's disease. N Engl J Med; 2003; 349:1925-34.
12. Benabid AL, Pollak P, Gross C, et al. Acute and long term effects of sub thalamic nucleus stimulation in

Parkinson's disease, Sterotact Funct Neurosurg, 1994;62:76-84.
13. Limousin P, Pollak P, Benazzouz A, et al., Effect of parkinsonian signs and symptoms of bilateral subthalamic nucleus stimulation, *Lancet*, 1995;345:91–5.
14. Limousin P, Krack P, Pollak P, et al., Electrical stimulation of the sub thalamic nucleus in advanced Parkinson's disease, *N Engl J Med*, 1998;339:1105-11.
15. Krack P, Limousin P, Benabid AL, Pollak P, Chronic stimulation of sub thalamic nucleus improves levodopa-induced dyskinesias in Parkinson's disease, *Lancet*, 1997;350:1676
16. Kleiner-Fisman G, Herzog J, Fisman DN, et al., Subthalamic nucleus deep brain stimulation: summary and meta-analysis of outcomes, *Mov Disord*, 2006;21(Suppl. 14):S290-304
17. Wojtecki, L., Nickel, J., Timmermann, L., Maarouf, M., Su¨dmeyer, M., Schneider, F. et al. (2007) Pathological crying induced by deep brain stimulation. Mov Disord 22: 1314_1316.
18. Krack, P., Kumar, R., Ardouin, C., Dowsey, P.L., McVicker, J.M., Benabid, A.L. et al. (2001) Mirthful laughter induced by subthalamic nucleus stimulation. Mov Disord 16: 867_875.
19. Rodriguez-Oroz, M.C., Obeso, J.A., Lang, A., Houeto, J.L., Pollak, P. and Rehncrona, S. (2005) Bilateral deep brain stimulation in Parkinson's disease: a multicentre study with 4 years follow-up. Brain 128: 2240_2249.
20. Groiss SJ, Wojtecki L, Südmeyer M, Schnitzler A. Deep brain stimulation in Parkinson's disease. Ther Adv Neurol Disord. 2009 Nov; 2(6):20-8.

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