Simultaneous bilateral MER-guided Stereotactic implantation of deep brain stimulation electrodes.

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Introduction

Bilateral DBS has become one of the most important neurosurgical techniques for the treatment of many movement disorders and neuropsychiatric diseases. In recent years, many efforts have been made in order to improve safety, accuracy and comfort for the patient treated by DBS. A cardinal fact is that currently the surgical step-by-step procedure involves two unilateral sequential hemispherical implants what increases surgical time and also CSF leak increasing the risk of brain shifting. In this case series we performed bilateral, simultaneous implant of deep brain electrodes, as a strategy to shorten surgical procedure avoiding major brain shift. The aim of this work was to demonstrate technique feasibility and advantages of performing bilateral simultaneous electrodes implant from a case series of 16 patients with Parkinson´s disease.

Methods

Two half-arcs were mounted simultaneous on a Micromar® stereotactic frame allowing simultaneous bilateral access. After two simultaneous precoronal approaches, one to five cannulas were introduced through two microdrives until 10 mm before target, microrecording was performed simultaneously at every 0.5-mm until target. The number of tracks used for macroelectrode insertion ranged from 1 to 3 (median 1)

Conclusions

Bilateral simultaneous implant of deep brain electrodes had the advantage of considerable time saving, simultaneous micro electrode recording and reducing the impact of brain shifting in the target position in bilateral procedures.

and the macroelectrode in track eliciting the best clinical outcome was subsequently replaced by a permanent electrode (Medtronic® type 3389). Immediately after the procedure, the position of each permanent electrode was verified by orthogonal X-ray images.

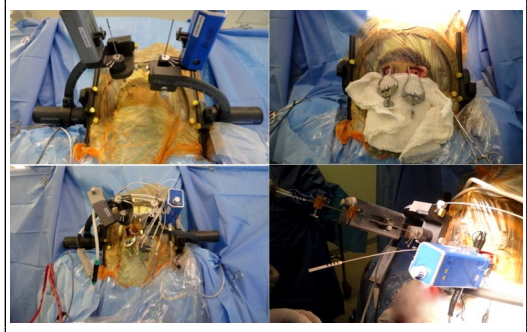
Results

No dislocation higher than 1-mm was found in any patient. The procedure presented major advantages over traditional unilateral individual consecutive approach, such as: real time recorded bilateral neuronal activity, high accuracy between planning and definitive electrode positioning. Overall a reduction of 40% in operating time was achieved with a median intracranial surgical time of 2 hours 23 minutes (SD +/- 22 min). Also, in this initial experience the authors felt that even if brain shift occurs the DBS target is less affected because the insertion of tubes are performed in the very first minute after the dural opening in both sides simultaneously.

Learning Objectives

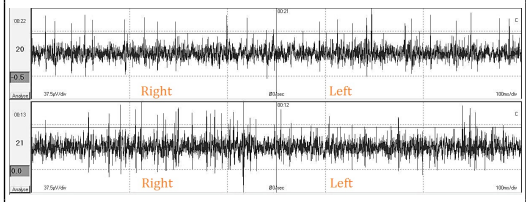
To our knowdlege is the largest reported series of bilateral simultaneous implant of electrodes, at the conclusion of the session participants should be interested in trying this alternative surgical approach.

Bilateral simultaneous DBS



Stepwise of the procedure. Permanent quadripolar DBS electrodes (model 3387; Medtronic, Inc., Minneapolis, MN) were implanted in the STN bilaterally in all patients using stereotactic image guidance (computed tomography/magnetic resonance imaging [MRI] fusion), intraoperative impedance measurements, and macrostimulation. The planning system used was MNPS (Mevis Informática Médica LTDA, Brazil). Two half -arcs were mounted simultaneous on the Micromar® stereotactic frame allowing simultaneous bilateral access. After two simultaneous precoronal approaches, one to five cannulas were introduced through two microdrives until 10 mm before target, microrecording was performed simultaneously at every 0.5-mm until target.

Bilateral Simultaneous MER



Print screen image showing, bilateral simultaneous real time central microelectrode recording, showing STN activity on target, on the right and left side.

Patients Datas

Patient	Gender	Age	Target	Total Time
1	F	69	STN	2h15´
2	F	53	GPi	2h33´
3	M	64	GPi	2h45´
4	F	49	STN	2h40´
5	M	49	STN	2h37´
6	F	64	GPi	2h21´
7	M	46	STN	2h19´
8	M	48	GPi	2h36´
9	M	34	STN	2h01´
10	M	52	STN	2h30´
11	F	54	GPi	2h18
12	M	39	STN	2h01
13	M	62	GPi	2h23´
14	F	47	STN	2h48´
15	M	42	GPi	2h07´
16	F	42	STN	2h

Times of Bilateral electrode implantation. Impulse generator implantation time is not included.

References

Franzini A, Messina G, Rizzi M, Cordella R, Mazzone P. Bilateral simultaneous implant of electrodes within the subthalamic nucleus. Feasibility and advantages.Acta Neurochir . 2013 Sep;155(9):1675-6.

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