Fully Endoscopic Bimanual Resection of Intraparenchymal Tumours: Safe and Feasible

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Introduction

Endoscopic resection of intraparenchymal tumors has rarely been reported. We present our prospective study on the feasibility and safety of a fully endoscopic, minimally invasive, non-tubular technique to resect intraparenchymal brain tumors.

Patient population

Over an 18 month period (December 2011-May 2013), 37 fully endoscopic intraparenchymal tumor resections were carried out on 35 patients (19F:16M). Post-operative MR imaging or CT was performed to assess for residual tumor.

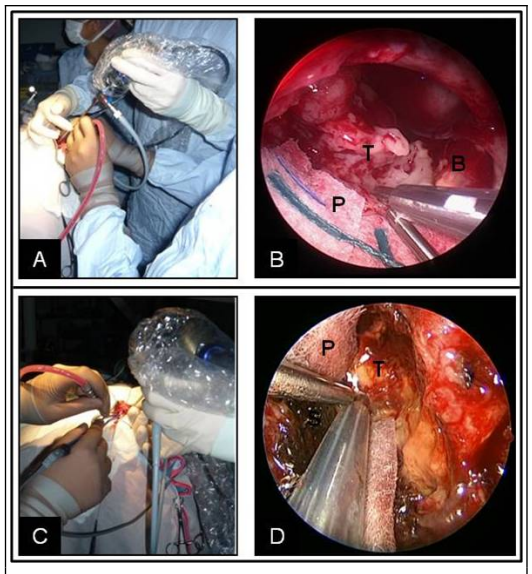
Mean patient age was 52 years (range: 23 - 74). 30 tumors were supra-tentorial (16 frontal, 10 temporal, 2 occipital, 1 parietal and 1 parafalcine) and 7 infra-tentorial.

Surgical technique

Image guidance was used to plan a 3cm scalp incision, a 2–2.5cm craniotomy and a 1-1.5cm corticotomy in a non-eloquent gyrus. An image guided access corridor was created down to the tumor and lined with surgical patties.

A 30° high definition Karl Storz endoscope was used. Bimanual resection commenced at the most superficial and accessible part of the tumor and where possible the plane between tumor and brain identified. A malleable suction catheter and curved ultrasonic surgical aspirator was used for the majority of resection.

The access corridor was maximised by positioning the 30° endoscope at the opposite side of the corridor to the operating surgeon as demonstrated below.



A) and B) operator using ultra-sonic aspirator and suction, working inferiorly at 6 o'clock with assistant holding camera at 12 o'clock, light angled vertically down; C) and D) operator working laterally at 9 o'clock with assistant holding camera at 3 o'clock, light angled horizontally to left. (T=tumor, B=normal brain, P=pattie, S=surgical)

The 30° angulation of the endoscopic view, the substantially enhanced illumination from the divergent endoscopic light source and the slight curve on the instruments allowed visualization and resection of a large tumor cavity through a very small cortical tract.

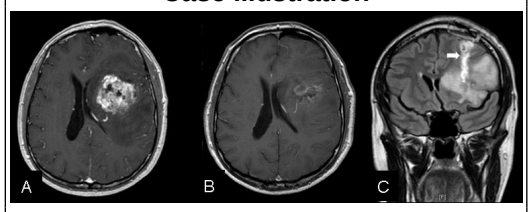
Results

Histopathological diagnosis, resection achieved and complications are illustrated below.

Pathology	Number of cases	Resection (%)		30 day post-op deficit/mortality/ complication
Metastasis	11	Total Near-total Sub-total	9 (82) 2 (18) 0 (0)	0 deficit 0 mortality 1 CSF rhinorrhea 1 deep wound infection
WHO grade IV (GBM)	14	Total Near-total Sub-total	2 (14) 8 (57) 4 (29)	0 deficit 0 mortality 1 superficial infection
WHO grade II - III	7	Total Near-total Sub-total	1 (14) 4 (57) 2 (29)	1 hemiparesis 0 mortality 1 deep wound infection
Meningioma	3	Total Near-total Sub-total	1 (33) 1 (33) 1 (33)	0 deficit 0 mortality 0 complication
Haemangioblastoma	2	Total Near-total Sub-total	2 (100) 0 (0) 0 (0)	0 deficit 0 mortality 0 complication
TOTAL	**37**	**Total** **Near-total** **Sub-total**	**15 (40.5)** **15 (40.5)** **7 (18.9)**	**1 deficit** **0 mortality** **4 complications**

54% of patients were discharged by day 2 post-operatively and 76% of patients had been discharged by day 4 post-operatively.

Case illustration

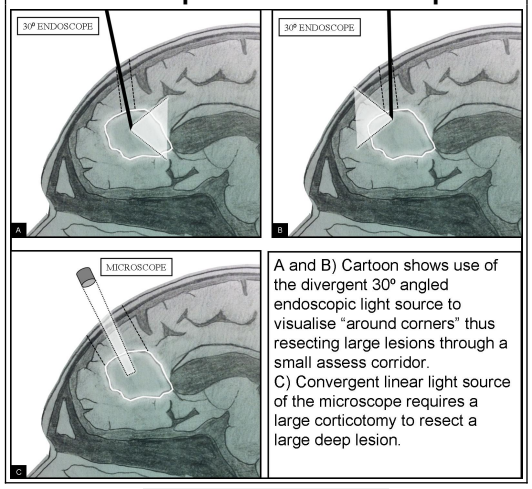


Pre-operative (A) and post-operative (B and C) T1 with gadolinium MRI showing near total resection of left deep frontal GBM. Arrow depicts surgical access corridor.

Discussion

This single centre prospective series shows that fully endoscopic resection of intraparenchymal brain tumors is safe and feasible with good tumor resection and a low complication rate.

Endoscope versus microscope



A and B) Cartoon shows use of the divergent 30° angled endoscopic light source to visualise "around corners" thus resecting large lesions through a small assess corridor.
C) Convergent linear light source of the microscope requires a large corticotomy to resect a large deep lesion.

Movie

The technique is unique compared to microscopic and other reported endoscopic techniques due to the lack of a rigid access corridor and the utillization of the 30° endoscope to allow maximal tumor resection through a minimally invasive technique.

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