O-029

CONE-BEAM COMPUTED TOMOGRAPHY FUSION TECHNIQUE FOR VASCULAR ASSESSMENT OF DEEP- SEATED HYPERVASCULAR INTRACRANIAL TUMORS

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Objective Cone-beam computed tomography (CBCT) images for intracranial tumors provide detailed vascular information and locational relationship with surrounding bony structures. However, the vasculature visualized in a single 3DRA is limited to one arterial system territory, even though deep-seated lesions, such as the skull base meningiomas, are often supplied by multiple arterial systems. Feeders from the internal carotid artery (ICA) or vertebral artery (VA) system need to be more carefully observed than those from the external carotid artery (ECA) system because they branch from vessels supplying eloquent neural tissues and their embolization is associated with high procedural risks. We report the use of the CBCT fusion technique for pre-embolization and pre-surgical vascular assessment of skull base meningiomas.

Methods Eleven patients with deep-seated hypervascular lesions (9 petroclival or tentorial meningiomas, 1 occipital hemangioblastoma, and 1 cavernous sinus hemangioma) supplied by multiple arterial systems were preoperatively evaluated using CBCT fusion imaging. Fusion images were reconstructed from three-dimensional rotational angiography with contrast injections from the ICA and ECA in six cases, vertebral artery VA and ECA in four cases, and ICA and VA in one case. Slab maximum intensity projection images with multiplanar reconstruction were used for vascular assessment of each tumor.

Results The feeding pedicles and tumor stains from two arterial systems were differentiated by separate colors. The courses and territories of the ICA dural feeders or ICA/VA pial feeders were easily distinguished from the ECA dural feeders. Anastomosis between thin feeders from different arterial systems could be detected. 'Mixed stain,' the stain with both

colors, was observed in some tumor compartments, suggesting dual supply from two arterial systems and the presence of peritumoral anastomoses. These information helped select a suitable operative approach and plan an effective and safe embolization strategy. Six patients underwent preoperative embolization without complications, while others underwent surgery without embolization.

Conclusions CBCT fusion images clearly visualized the thin feeders from each arterial system, the vascular compartments within the tumor, and possible peritumoral anastomoses. This technique provides a substantial contribution to both the pre-operative embolization and surgical resection of skull base meningiomas.

Disclosures K. Yoshida: None. T. Akiyama: None.

O-030

SUPER-SELECTIVE MIDDLE MENINGEAL ARTERY EMBOLIZATION FOR CHRONIC SUBDURAL HEMATOMA USING N-BCA WITH THE SUGAR PUSH TECHNIQUE: SINGLE CENTER EXPERIENCE OF 61 CONSECUTIVE PATIENTS

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Background Middle meningeal artery (MMA) embolization has emerged as a promising treatment modality for patients with chronic subdural hematoma (SDH). Onyx, particles, or coils are the most used embolic materials. Therefore, the safety and efficacy of n-butyl cyanoacrylate (n-BCA) embolization in these patients are not fully understood. We present the technical feasibility and efficacy of n-BCA embolization in the largest consecutive cohort to date.

Methods This study is a retrospective analysis of a prospectively maintained database of consecutive patients with chronic or recurrent SDH treated with MMA embolization using diluted n-BCA with the 'Sugar-Rush' technique. Briefly, a 2.1

Abstract O-029 Figure 1

Fr microcatheter was used to selectively catheterize the distal frontal and posterior branches of the MMA. A 5-Fr intermediate catheter was advanced proximal to the origin of the MMA in the internal maxillary artery and used for Dextrose 5% (Sugar- Rush) injection via a 60 ml syringe while the primary operator was injecting n-BCA through the microcatheter. Complete obliteration of frontal and posterior branch of the MMA and lack of SDH recurrence in 3-6 months follow up CT scan were defined as efficacy outcomes. Cranial nerve palsy, vision loss, transient neurologic deficit and stroke were defined as safety outcomes.

Results A total of 61 patients were identified with a mean ($\pm$ SD) age of 62.5 ± 9 . Seventy eight percent of the patients were male. Median (IQR) NIHSS score was 1 (3), 67% of the patients had midline shift and 36% had bilateral SDH. Forty nine percent of the patients had craniotomy, burr hole or Subdural Evacuating Port System (SEPS) placement prior to embolization. The embolization was performed under MAC anesthesia in 39 (64%) patients and radial access in 29 (48%) patients. In 6 patients (10%), coil embolization of the origin of the frontal or posterior branch was performed as super-selective catheterization of the branch was unsuccessful due to tortuous anatomy. Complete obliteration of frontal and posterior branches was achieved in 100% of the cases. In 25% of the patients, n-BCA penetrated the contralateral side. Follow up CT scan at 3-months and 6-months were available in 91% of the patients. Recurrent SDH was seen in only 1 patient on the side contralateral to treatment. No incidence of cranial nerve palsy, vision loss, or stroke occurred. One patient suffered a transient neurological deficit.

Conclusion MMA embolization using diluted n-BCA with concomitant Dextrose 5% injection (Sugar-Rush) is associated with a high degree of distal penetration and complete branch occlusion and minimal risk of cranial nerve palsy or other thrombo-embolic complications. Clinical trials are warranted to compare long-term efficacy of this procedure with standard of care management.

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O-031

30-DAY EMERGENCY DEPARTMENT UTILIZATION FOR CHRONIC SUBDURAL HEMATOMAS FOLLOWING SURGICAL EVACUATION WITH AND WITHOUT MIDDLE MENINGEAL ARTERY EMBOLIZATION

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Background Middle meningeal artery (MMA) embolization for chronic subdural hematomas (cSDHs) has been found to be associated with fewer treatment failures compared to surgical evacuation. The present study compares 30-day emergency department (ED) utilization for patients with cSDHs with and without adjunctive MMA embolization.

Methods All patients who presented with a cSDH to a quaternary center from January 1st, 2018 to December 31, 2020 were retrospectively reviewed. Patients were separated into two cohorts: surgery alone and combined surgery with MMA

embolization. The surgery only cohort comprised of patients who presented during the first two years of the cohort. The combined surgery and MMA embolization cohort comprised of all patients with a combined treatment during the entire three-year study period. Patients in the combined cohort comprised of planned combined therapies, as well as patients who failed surgery and required MMA embolization. Primary outcome compared was 30-day ED presentation and readmission. Patients with bilateral treatment were analyzed for admission cSDH size.

Results Of the 137 patients who met the study criteria, 28 patients (20%) had combined MMA embolization and surgery. In the 28 combined patients, 15 (54%) were planned MMA embolization and 13 (46%) were due to surgical failure. There was no difference between the two cohorts in mean age, gender, admission Glasgow Coma Score (GCS), discharge GCS, comorbidities, or previous trauma. The mean cSDH size on presentation in the surgery alone cohort (N=123, 20.5mm, sD 6.9) was comparable to the combined group (N=32, 18.7mm, sD 4.5) ($p=0.16$). A significant higher percentage of patients in the surgery alone (N=32, 29%) cohort presented within 30-days to the ED compared to combined MMA embolization with surgery (N=2, 7%) ($p=0.02$). There was no significant difference in readmission rates between the surgery alone (N=16, 15%) and combined cohort (N=1, 4%) ($p=0.11$). Nine patients (8%) in the surgery alone cohort were readmitted due to significant reaccumulation/residual compared to only one patient (4%) in the combined group ($p=0.4$).

Abstract O-031 Table 1 Demographics and characteristics of chronic subdural hematoma patients with surgery versus combined MMA embolization and surgery

Characteristic	MMA Embolization (N=28)	Surgery (N=109)	p Value
Age (yr), mean (SD)	71 (10.2)	70 (12.8)	0.86
Male sex	21 (75)	81 (74)	0.94
GCS Presentation	14 (2.6)	14 (2.2)	0.77
GCS Discharge	14 (2.3)	14 (2.1)	0.70
Comorbid condition			
Hypertension	16 (57)	54 (50)	0.47
Diabetes	8 (29)	27 (25)	0.68
CAD	12 (43)	36 (33)	0.33
Liver disease	1 (4)	3 (3)	0.82
Alcohol abuse	1 (4)	14 (13)	0.16
CVA	2 (7)	10 (9)	0.73
Coagulopathy	3 (11)	4 (4)	0.13
Previous trauma	17 (61)	78 (72)	0.27

Abstract O-031 Table 2 30-Day emergency department presentations and readmissions for chronic subdural hematoma patients with surgery versus combined MMA embolization and surgery

Characteristic	MMA Embolization (N=28)	Surgery (N=109)	p Value
ED Presentations	2 (7)	32 (29)	0.02
Readmissions	1 (4)	16 (15)	0.11