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Introduction

Pediatric choroid plexus tumors are highly vascular tumors. Aggressive surgical resection is warranted as complete removal can be curative, however, blood loss in small pediatric patients can be a limiting. Preoperative embolization can drastically reduce operative blood loss and make complete surgical resection safer. Here we describe our experience with preoperative embolization and review the relevant literature.

Methods

Three cases of symptomatic pediatric choroid plexus tumors treated by preoperative embolization followed by immediate surgical resection are described. A PUBMED search was undertaken to identify similarly treated patients.

IMRIS Operative Theater



Integrated OR, MRI and Biplane Angio

Embolization from the Anterior Choroidal Artery

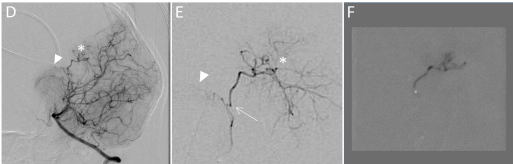
A

B

C

Anterior choroidal artery embolization must be distal to the plexal point. A. Preop angio. B. Glue cast penetrating tumor. C. Post embolization with decreased tumor blush. Arrow: plexal point, asterisk: tumor.

Embolization from Posterior Choroidal Artery



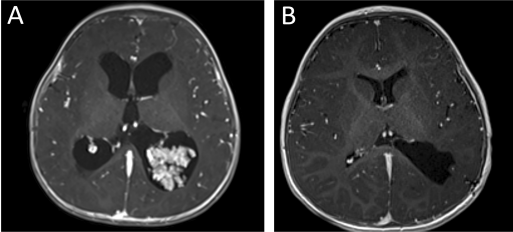
D. Preoperative vertebral artery angiogram. E. Selective posterior choroidal artery injection demonstrating thalamic perforators arising prior to the vessel's entry into the ventricle. F. Glue cast filling tumor. Posterior choroidal artery embolization. Arrow denotes entry of posterior choroidal artery into the ventricle. Asterisk denotes tumor blush. Arrowhead denotes thalamic perforators off posteriorchoroidal artery.

Results

Three children (median age 9 months) presented with either seizure or decreased mental status. MRI showed homogeneously enhancing lateral ventricular masses (257ml average volume). Acetazolamide and decadron were started; in one case, a preoperative EVD was needed. Cerebral angiography demonstrated the vascular supply with contributions from anterior and posterior choroidal artery branches. The predominant feeder was selectively catheterized and the tumor embolized with NB

CA glue. In each case, the tumor blush was reduced by greater than 80%. Gross total resection was immediately performed through a superior parietal lobule approach. Embolization reduced the average blood loss to 22% of the total estimated blood volume. One patient suffered a small thalamic stroke without clinical consequences. No other complications occurred.

Choroid Plexus Tumor Resection



A. Preoperative axial MPRAGE MRI of left atrial choroid plexus tumor. B. Postoperative axial MPRAGE MRI of the same patient.

Tumor / Case Characteristics

Patient Demographics									
Patient	Age (yr)	Gender	Side	Tumor Dimensions (cm)	Appx Volume (cm ³)	Major feeding artery	Blood loss (ml)	Est. total blood volume (ml)	% Blood loss
1	0.33	M	L	3.4 x 2.9 x 3.8	39.6	lateral posterior choroid**	200	525	38.1
2	4	F	L	5.0 x 4.7 x 4.3	52.9	anterior choroidal	250	1328	18.8
3	0.75	M	R	2.7 x 4.1 x 4.1	23.8	anterior choroidal	150	880	17.9
Average	1.69				32.1		200	898	24.9

Tumor dimensions measured by determining longest AP, ML, and SI axis on MPRAGE MRI sequences. Approximate tumor volume calculated using ellipsoid model. Major feeding arteriesdetermined via diagnostic subtraction angiography. Blood loss determined from intraoperative anesthesia record. Estimated total blood volume calculated using World Health Organization metricsfor pediatric blood volume (75 mL/kg for children age 3 months to 10 years). **Post glue embolization, the anteriorly-directed branches of the left lateral posterior choroidal were not well visualized.This was likely due to small amount of glue reflux along the distal microcatheter tip. Post-op MRI revelaed small left thalamic stroke, which ultimately ended up being clinically insignificant.

Conclusions

Complete surgical resection of choroid plexus tumors is an essential step in management. Preoperative embolization effectively decreases intraoperative blood loss, but must be performed with care. The deep (and more surgically inaccessible) vascular pedicle is supplied by the anterior choroidal artery. Embolization must occur distal to the plexal point and important contributors to the internal capsule, thalamus, and lateral midbrain. Posterior choroidal artery embolization should only be performed from an intraventricular location to avoid thalamic contributors.

References

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