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Endovascular embolization of vascular tumors

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Introduction

The management of vascular tumors requires a multi-modality approach to treatment based on closeness to basic neurologic and vascular structures. One of treatment methodology to treat vascular tumors incorporates preoperative embolization which is becoming popular due to reduction of intraoperative blood loss and relatively clean operating field while extracting the tumor, thus reducing the operation time and risk involved. Embolization is traditionally done through a trans arterial approach, which has proved successfully in reducing blood loss and surgery time. Endovascular embolization is also a sole treatment for mitigation by diminishing the size the tumor in patients who are considered inoperable.We report our findings of preoperative embolization of head and neck tumors like Juvenile Nasopharyngeal Angiofibroma (JNA), Carotid Body tumor, liver tumors like metastatic tumor, benign tumor- hemangioma and retroperitoneal tumor with PVA particles, gel foam and *glue b*y means of trans arterial route and to measure the effectiveness of this approach and these embolizing materials.

Aim and objective

- To evaluate usefulness of endovascular embolization technique in management of vascular tumors.

Material and methods

Study design: Retrospective observational study

Study setting: Department of interventional Radiology at Sassoon hospital.

Study duration: June 2020 to March 2022

Study population: The study population included all diagnosed vascular tumor cases admitted at department of interventional radiology at Sassoon hospital and referred to interventional radiology department.

Inclusion criteria

1. Patients who are diagnosed with vascular tumors including both benign and malignant.

Exclusion criteria

1. Pregnant patients
2. Patients with H/O allergy
3. Patients with deranged RFT
4. Not willing to participate in study

Sample Size: 21

Sampling technique

Retrospectively reviewed the records of 21 patients.All patients admitted in department of interventional Radiology at Sassoon hospital, who were diagnosed with vascular tumors were included in the study.

Methods of Data Collection

Patient's details likegeneral information, such as age, sex, residential address, and date of admission. Medical history- chief complain, past history, investigation and personal history were collected retrospectively.

A retrospective observational study consisting of 21 patients who presented with vascular tumors was conducted at department of interventional radiology at Sassoon hospital.

Study procedure

This study was conducted in Department of interventional Radiology at Sassoon hospital in patients who satisfied the above said inclusion and exclusion criteria. Patients with clinical /imaging findings suggestive of vascular tumors. Endovascular embolization of vascular tumors was performed.

Embolization technique

There are three major embolization techniques including Trans arterial, direct puncture and a combination of both. Any of these methods can be used and there are no set guidelines on which is more preferable route. In our institute we used the Trans arterial approach as we find it easy, effective with least complications. Trans-arterial embolization was performed under anesthesia and sedation, supervised by an anesthetist. Cardiac monitoring of every patient was done throughout the procedure. Trans-femoral arterial puncture was done in all patients. Based on CT imaging and detailed multiplane angiograms the blood supply of targeted neoplasms was identified. Super selective catheterization of feeding pedicle is done for complete evaluation of individual distal vessels and arterial-venous shunting. Tumor embolization is best performed 1–2 days before surgical resection which takes into account maximal embolization of the impeded vessels, ideal tumor necrosis and tumor softening. The brief span interim likewise prevents possible recanalization of the occluded arteries and formation of additional arterial channels. On the off chance that medical procedure is done sooner than 24 h post-embolization, there isn't sufficient necrosis and devascularization of tumor and there would be no advantage of embolization. Steroids ought to be given for vast tumors at risk of causing mass effect and swelling post-embolization. Both liquid and particulate embolic materials are successful in adequate embolization. We use PVA particles (150–250 μ) for the embolization.

Result and observations

The study group included 21 patients with a mean age of 27 years, range (14–61). (Table 1) lists the essential aspects of each case with regards to their symptoms, diagnosis embolization material used and intraoperative blood loss in operated tumors.

Gender/age	Presentation and symptoms	Tumor	Embolizing material & size of particles	Arterial feeders	Intraoperative blood loss
Male/18yrs	Nasal obstruction, recurrent episodes of epistaxis	JNA	PVA particles (150–250 μ)	IMA	200-300 ml

Male/16yrs	Nasal obstruction, recurrent episodes of epistaxis	JNA	PVA particles (150–250 μ)	IMA	300-500 ml
Male/25yrs	Headache, seizures, diminution of vision.	Occipital vascular tumor	PVA particles (150–250 μ)	Occipital artery	Not operated
Male/15yrs	Nasal obstruction, recurrent episodes of epistaxis	JNA	PVA particles (150–250 μ)	IMA	400-600 ml
Female/48yr	Hypertension with hematuria	Angiomyolipoma	PVA particles (300-500μ)	Renal artery	Not operated
Female/27yr	Irregular menstruation with profuse bleeding	Uterine fibroid	PVA particles (300-500μ)	Uterine artery	100-200 ml
Female/27yr	Hypertension with hoarseness of voice	Carotid body tumor	PVA particles (300-500μ) and coils	ECA	10-30 ml
Female/46yr	Upper right abdominal pain.	Hemangioma	PVA particles (150–250 μ)	Right hepatic artery	Not operative
Male/36yr	Swelling and pain over left arm	Soft tissue sarcoma of left upper limb	PVA particles (150–250 μ)	Brachial artery	500-600 ml
Female/42yr	Upper abdominal pain, jaundice	hemangioma	PVA particles (150–250 μ)	Right hepatic artery	Not operated
Male/ 67yr	Weight loss, Upper abdominal pain, jaundice	Hepato cellular carcinoma	PVA particles (150–250 μ)	Hepatic artery	Not operated
Male/ 27yr	Swelling over left chest wall	GCT involving left chest wall	PVA particles (150–250 μ)	Intercostal arteries	Not operated
Male/ 54yr	Weight loss, Upper abdominal pain, jaundice	Hepato cellular carcinoma	PVA particles (250–300 μ)	Hepatic artery	Not operated
Female/ 60yr	Weight loss, Upper abdominal pain.	Hepato cellular carcinoma	PVA particles (250–300 μ)	Hepatic artery	Not operated
Female/21yr	Heavy vaginal bleed with hemoptysis	Choriocarcinoma	PVA particles (300-500μ)	Uterine artery	Not operated
Male/ 55yr	Lump in abdomen under evaluation	Hepato cellular carcinoma	PVA particles (250–300 μ)	Hepatic artery	Not operated
Male/ 72yr	Weight loss, Upper abdominal pain.	Hepato cellular carcinoma with metastatic lesions.	PVA particles (250–300 μ)	Hepatic artery	Not operated
Male/62yr	Swelling and pain over left thigh	Soft tissue sarcoma of left thigh	PVA particles (150–250 μ)	Femoral artery	500-700ml
Male/ 72yr	Weight loss, abdominal mass.	Retroperitoneal spindle cell tumor	PVA particles (250–300 μ)	Aorta branches.	Not operated
Female/61yr	Upper right abdominal pain.	Hemangioma	PVA particles (150–250 μ)	Right hepatic artery	Not operated
Male/16yrs	Nasal obstruction, recurrent episodes of epistaxis	JNA	PVA particles (150–250 μ)	IMA	400-600ml

All patients underwent trans arterial embolization. Angiography revealed dense capillary blush in all vascular tumors. In early arterial phase vascular tumors showed hypertrophied feeding arteries. In the late stage the tumor had been stained as a blush and lasted up to venous phase. It was shown that JNA was supplied from branches of internal maxillary artery (sphenopalatine and descending palatine branches) in all 4 patients. In single case of JNA there was bilateral supply from both internal maxillary arteries. 3 cases of hemangiomas were getting supply from hepatic arteries. 5 cases of hepatocellular carcinoma were also getting supply from hepatic arteries. One case of occipital vascular tumor was getting supply from occipital artery. One case of

paraganglioma were supplying from External carotid artery. Two cases of soft tissue sarcoma i.e left arm and left thigh tumors recruits its vascular supply from left brachial artery and left femoral artery. Single case of Retroperitoneal liposarcoma was supplying from aorta and its branches.One case of uterine fibroid was getting vascular supply from uterine artery. One case of choriocarcinoma was also getting bloody supply from uterine artery. One case of GCT tumor of left chest wall was getting supply from intercoastal arteries.

The study group included 21 patients

Age	Frequency	Percentage
10-30 years	9	43%
30-60 years	6	28%
Above 60 years	6	29%

The above table shows majority of the cases belonged in 10 to 30 years age group-9(43%)

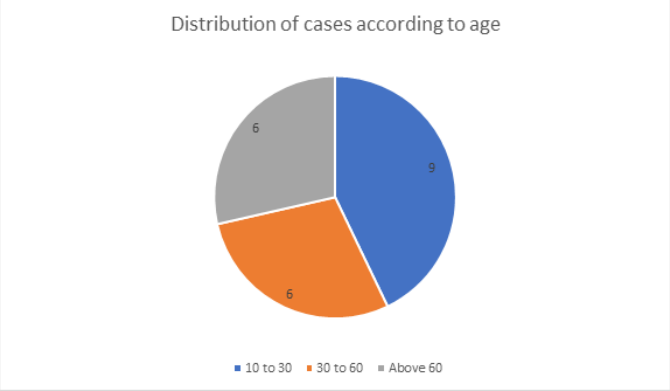


Figure 1: Distribution of cases according to age

The above figure shows majority of the cases belonged in 10 to 30 years age group-9(43%)

Table 2: Distribution according to gender

Gender	Frequency	Percentage
Male	13	62%
Female	8	38%

Most of the patients are Male (62%) followed by female (38%)

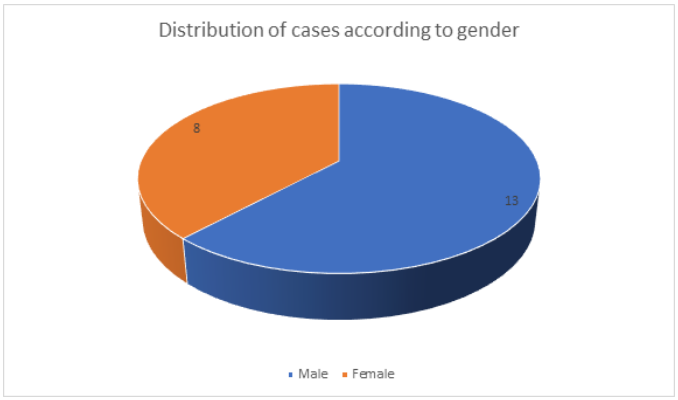


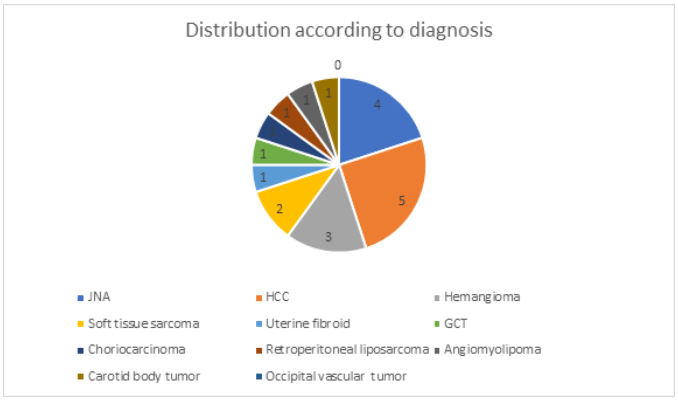
Figure 2: Distribution of cases according to gender

Most of the patients are Male (62%) followed by female (38%)

Table 3: Distribution according to diagnosis

Diagnosis	Frequency	Percentage
JNA	4	20%
Hemangioma	3	15%
HCC	5	25%
Soft tissue sarcoma	2	10%
Occipital tumor	1	5%
Angiomyolipoma	1	5%
Uterine fibroid	1	5%
Choriocarcinoma	1	5%
GCT of chest wall	1	5%
Carotid body tumor	1	5%
Retroperitoneal liposarcoma	1	5%

Figure 3: Distribution according to diagnosis.



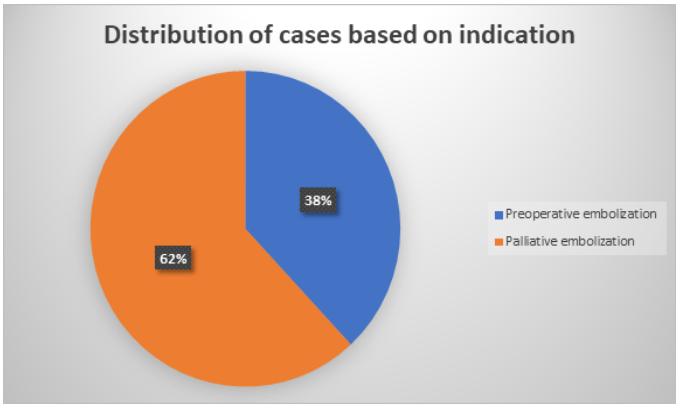
The above figure shows majority of cases underwent embolization were HCC (25%) followed by Juvenile nasopharyngeal angiofibroma (JNA), Hemangioma.

Table 4: Distribution according indication for embolization

Indication	Frequency	Percentage
Preoperative embolization		
1) JNA	4	20%
2) Soft tissue sarcoma	2	10%
3) Uterine fibroid	1	4%
4) Carotid body tumor	1	4%
Subtotal	8	38%
Palliative treatment		
1) HCC	5	25%
2) Hemangioma	3	15%
3) Occipital tumor	1	2.5%
4) Angiomyolipoma	1	2.5%
5) Choriocarcinoma	1	2.5%
6) Retroperitoneal liposarcoma	1	2.5%
7) GCT	1	2%
Subtotal	13	62%

Above table shows 38% cases underwent preoperative embolization and 62% cases underwent palliative embolization.

Figure 4:



Above figure shows 38% cases underwent preoperative embolization and 62% cases underwent palliative embolization.

Images

Figure 5: Pre embolization image of JNA tumor.

Figure 6: Post embolization image of JNA

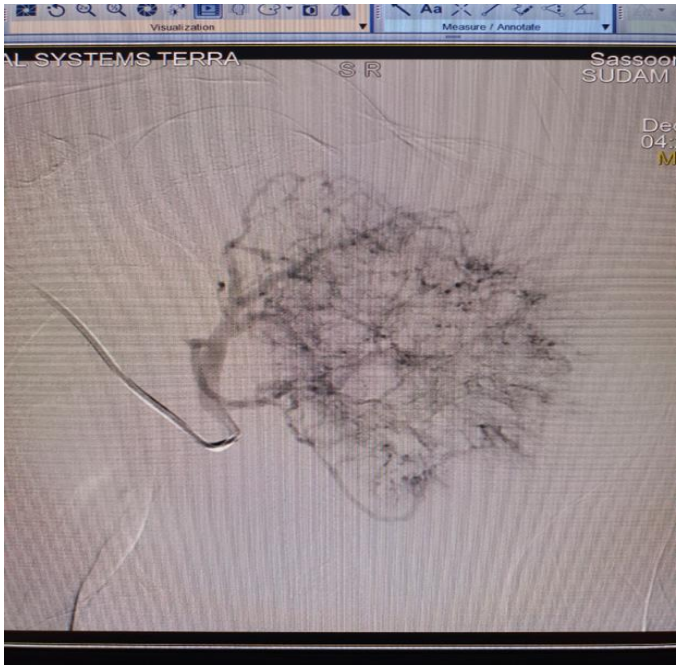


Figure 7: Pre embolization image of left upper limb sarcoma

Figure 8: Post embolization image of left upper limb sarcoma

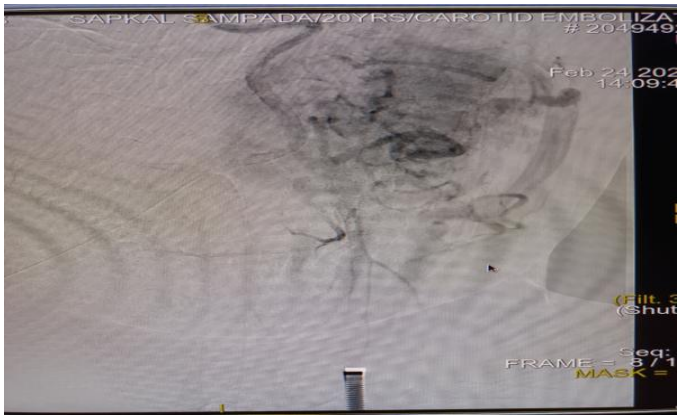


Figure 9: Pre embolization image of left carotid body tumor

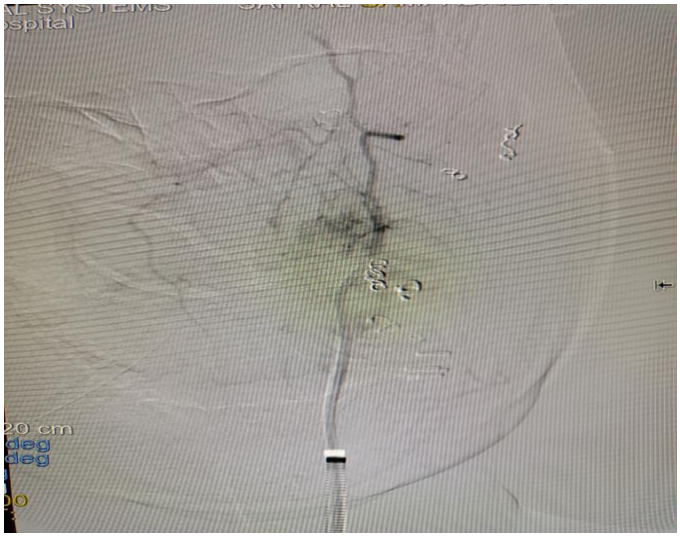


Figure10: Post embolization image of left carotid body tumor

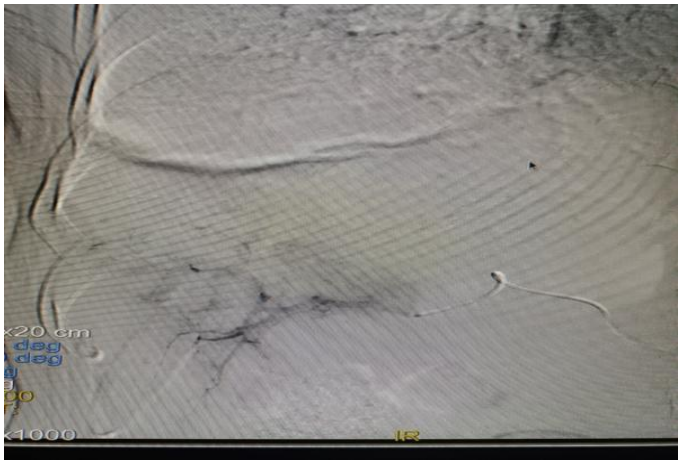


Figure 11: Pre embolization image of hepatic hemangioma

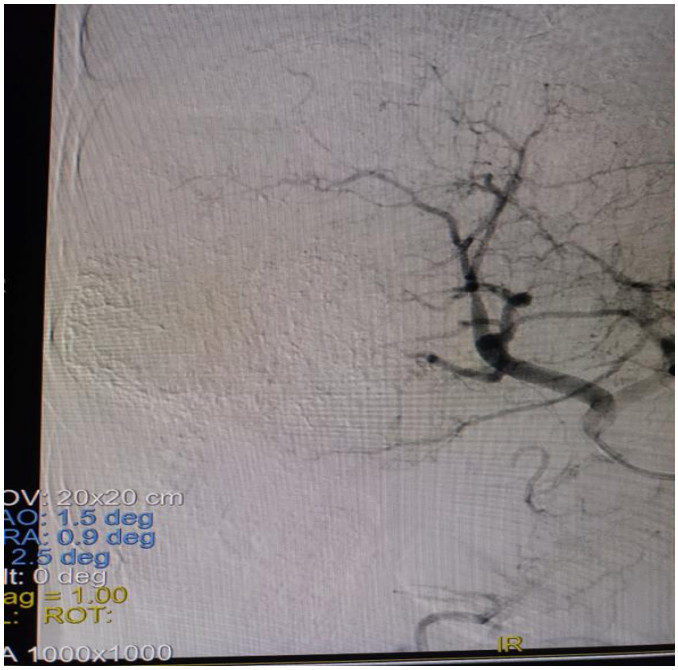


Figure 12: Post embolization image of hepatic hemangioma

Results

Study involved 21 patients with vascular tumors among them 38% (n=8) underwent preoperative embolization. All cases saw successful devascularization achieved by total occlusion of feeders using embolic agents and documented by absence of tumor blush post-embolization. All cases were surgically resected within 1-2 days' post-embolization with reduced intraoperative blood loss. Among 8 preoperative embolization cases, JNA(n=4)cases had mean intraoperative blood loss of 350-500 ml.Earlier studies by TanujThapar,Rahul R Gupta and Prarthna J Jagtap [(1)]showed mean intraoperative blood loss without embolization as1200-1400 ml.Carotid body tumor (n=1)case had intraoperative blood loss of 10-30ml.Earlier studies byKithi S.bellamKonda Msc and NaiemNassiri MD[(2)] showed mean intraoperative blood loss without embolization of carotid body tumor as 300-400ml.Soft tissue sarcoma(n=2)cases had mean blood loss of500-700 ml.Earlier studies byMartin S.Karpeh,MD;ChristopherCaldwell,MD and JERRY J.Gaynor[(3)]showed estimated intraoperative blood loss without embolization of vascular soft tissue tumor as 1L to 1.5L.Uterine fibroid(n=1)casehad intraoperative blood loss of 100-200ml. Earlier studies byES Ginsburg et aal.FertilSteril [(4)] showed estimatedintraoperative blood loss uterine tumor as 350 ml to 1.5L based on the size of the tumors.Thus, preoperative embolization of vascular tumors leads to reduction in intraoperative blood loss up to 70 to 75% in JNA tumors,85-90% in carotid body tumor,70%in soft tissue sarcomas and 65 to 70% in uterine fibroid tumor.

Rest 62%(n=13) underwent palliative embolization of inoperable vascular tumors. There was significant reduction in size of the tumorsupto 80% on follow up CT imaging. Complication of tumor embolization is separated into major and minor categories. Major complications like stroke including ischemia and intracerebral hemorrhage and contrast induced nephropathy. Minor complications include puncture site hematoma, localized pain and fever due to tumor necrosis post-embolization.In our study no significant adverse effect was documented.

Discussion

Preoperative embolization has turned into an imperative assistant to medical procedures, as it encourages the aggregate careful expulsion of these tumors and limits blood loss. Embolizing agents fall under three major categories each with their distinct advantages and disadvantages. Particulars include PVA, microspheres and gel foam. Liquid agents include glue and onyx while the last embolizing agent is coil. Polyvinyl alcohol particles are embolic agents, available in different sizes ranging from 45 μm to >1000 μm. Utilization of PVA particles of 45–150 μm was done initially and if they

were insufficient, they were followed by 150–250 μm for complete tumor embolization. Smaller particles 45–150 μm in filtrate the narrow vascular bed of the tumor and help in the devascularization. These particles frequently DE vascularized to the degree that the tumor experiences necrosis. Bigger particles 150–250 μm embolize little arterioles in the tumor bed, if a dangerous anastomosis is suspected larger particle size can be utilized to counteract incidental embolization of the anastomosing branches.

Microspheres have the same benefits as well as the added advantage of forming minimal clumping but they are fragile in nature. Gel foam is most successful with medium to large vessel occlusion, inexpensive and easy to use. Gel foam is a water insoluble, permeable and flexible agent, that resorbs totally within one and a half months' time. Gluesolidify and occlude rapidly and can flow into complex angioarchitecture, however catheter retainment is a huge risk, similarly onyx has a slower solidification rate but catheter retainment remains a risk. Lastly, coils are precise in deployment and useful in high-flow vessels but coils run the risk of dislodgement and embolization of an undesirable vessel.

Devascularization with trans arterial embolization is exceptionally helpful in head and neck tumors. PVA particles permit moderately distal embolization with impediment at the hair like level and accomplish add up to or close aggregate embolization in cases with noteworthy blood vessel feeders. This technique using PVA particles was observed to be adequate in diminishing intraoperative blood loss. Sometimes palliative embolization is also done in case of bleeding from inoperable tumors.

In this series, we observed no significant adverse events related to intra-arterial embolization with particulate agents, including unwanted migration, parent vessel occlusion, clinical complications or adverse effects. Good angiographic results were achieved in all patients.

Conclusions

Preoperative embolization is a great adjunct therapy for the excision of vascular tumors. Embolization controlled the blood loss during surgery. The tumors were seen to undergo necrosis rapidly post-embolization and optimal results were achieved when surgery was performed 1-2 days after the procedure. And it is also significant palliative treatment in vascular tumors.

References

1. Aiyer R, Gupta RR, Jagtap PJ, Thapar T. Juvenile Nasopharyngeal Angiofibroma: Correlating Histology, Surgical Approach and Blood Loss. Clin Rhinol An Int J 2015; 8 (2):47-52.

2. Kithi S. Bellamkonda Msc and NaiemNassiri MD.Super selective carotid body tumor embolization with platinum.jvscit.org

Karpeh MS, Caldwell C, Gaynor JJ, Hajdu SI, Brennan MF. Vascular Soft-Tissue Sarcomas: An Analysis of Tumor-Related Mortality. Arch Surg.1991;126(12):1474–1481. doi:10.1001/archsurg.1991.01410360044008

3. Ginsburg ES, Benson CB, Garfield JM, Gleason RE, Friedman AJ. The effect of operative technique and uterine size on blood loss during myomectomy: a prospective randomized study. FertilSteril. 1993 Dec;60(6):956-62. PMID: 8243699.

4. Damas celli B., Patelli G., Ticha V., Di Tolla G., Frigerio L. F., Garbagnati F., Lanocita R., Marchianò A., Spreafico C., Matta Velli F., Bruno A., Zunino F. (2007). Feasibility and efficacy of percutaneous transcatheter intraarterial chemotherapy with paclitaxel in albumin nanoparticles for advanced squamous-cell

carcinoma of the oral cavity, oropharynx, and hypopharynx. J. Vasc. Interv. Radiol. 18, 1395–140310.1016/j.jvir.2007.06.009 [PubMed] [CrossRef] [Google Scholar]

5. Davis K. R. (1987). Embolization of epistaxis and juvenile Nasopharyngeal Angiofibromas. AJR Am. J. Roentgenol. 148, 209–218 [PubMed] [Google Scholar]

6. Jha, Roush an et al. "Preoperative embolization of primary bone tumors: A case control study." World journal of radiology vol. 8,4 (2016): 378-89. doi:10.4329/wjr. v8.i4.378

7. Gupta A. K., Purkayastha S., Bodhey N. K., Kapila Moorthy T. R., Kesavadas C. (2007). Preoperative embolization of hyper vascular head and neck tumours. Australas. Radiol. 51, 446–45210.1111/j.1440-1673.2007.01869.x [PubMed] [CrossRef] [Google Scholar]

8. Rilling, William S, and Gene W Chen. "Preoperative embolization." Seminars in interventional radiology vol. 21,1 (2004): 3-9. doi:10.1055/s-2004-831400

9. Topaloğlu, Serdar et al. "Preoperative arterial embolization of large liver hemangiomas." Diagnostic and interventional radiology (Ankara, Turkey) vol. 21,3 (2015): 222-8. doi:10.5152/dir.2014.14270Topaloğlu, Serdar et al. "Preoperative arterial embolization of large liver hemangiomas." Diagnostic and interventional radiology (Ankara, Turkey) vol. 21,3 (2015): 222-8. doi:10.5152/dir.2014.14270

10.Lv X., Li Y., Lv M., Liu A., Zhang J., Wu Z. (2007). Trigeminocardiac reflex in embolization of intracranial Dural arteriovenous fistula. AJNR Am. J. Neuroradiol. 28, 1769–177010.3174/ajnr.A0675 [PMC free article] [PubMed] [CrossRef] [Google Scholar]

11.Marc J. A., Takei Y., Schechter M. M., Hoffman J. C. (1975). Intracranial hemangiopericytomas. Angiography, pathology and differential diagnosis. Am. J. Roentgenol. Radium Ther. Nucl. Med. 125, 823–832 [PubMed] [Google Scholar]

12.National Cancer Institute. (2011). National Cancer Institute [online]. Available at: http:// www. cancer. gov/ cancer topics/ factsheet/Sites-Types/head-and-neck [Accessed June 21].

13.Loffroy, R., Favelier, S., Chevallier, O., Estivalet, L., Genson, P. Y., Pottecher, P., Gehin, S., Krausé, D., &Cercueil, J. P. (2015). Preoperative portal vein embolization in liver cancer: indications, techniques and outcomes. Quantitative imaging in medicine and surgery, 5(5), 730–739. https://doi.org/10.3978/j.issn.2223-4292.2015.10.04

14.Mignon F, Dufour C, Boidard F. Embolisation selective pré-opératoire d'un Angiomyolipomerénalper mettan tunechirurgieconservatrice [Preoperative selective embolization of a renal angiomyolipoma allowing conservative surgery]. Prog Urol. 2006 Feb;16(1):78-81. French. PMID: 16526546.