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Case report

ENDOVASCULAR PRELUDE FOR DELICATE MENINGEOMA OPERATION: A CASE REPORT

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Abstract: **Introduction:** Embolization prior to surgery can make tumor resection less complicated by reducing blood loss during surgery and shortening the time of the operation.

Case report: In this paper, we presented a case of a sixty-three-year-old woman who was admitted to the Clinic of Neurosurgery, Clinical Center Niš, Serbia, at November 2016, after she underwent a CT brain scan that showed a large tumor of the left cerebellopontile angle. Digital subtraction angiography presented a large, highly vascularized tumor lesion that compressed the brain stem. The patient underwent endovascular procedure, and complete embolization of the tumor vessels was established. The radiologist delivered embolization material via the left ascending pharyngeal artery. In the next 24 hours, an operation was performed i.e.radical extirpation surgery (Simpson grade I). Postoperatively, the patient's GCS was 15, with no new neurological deficit. Postoperative brain CT scan showed neither rest tumor nor blood clot inside the tumor bed. Pathohistological finding revealed atypical meningioma grade II.

Conclusion: Despite some clinicians' dilemma considering the utility of preoperative embolization of meningioma vessels, we believe that a team of educated and dedicated radiologist and neurosurgeon could achieve great results in resection of large and inaccessible cranial tumors.

Key words: embolization, meningioma, highly vascularized tumor.

INTRODUCTION

Many cranial tumors have dense three-dimensional vessel net and strong blood influx to a tumor lesion, and that can complicate or even make impossible complete tumor removal. Tumors like meningiomas, hemangiopericitomas, glomus tumors and paragangaliomas or some spinal tumors tend to bleed intensively, making the surgery a dramatic and risky event. Tumor embolization may help treating such tumors by blocking the blood vessels that supply them. Embolization prior to surgery can make tumor resection less complicated by reducing blood loss during surgery and by shortening the time of the operation. In some cases, it can be a tumor therapy *per se* (1), where indicated intra-arterial embolization can provide palliative therapy. There are a lot of different kinds of embolization materials available for this procedure, depending on the tumor size, type, location, and the diameter and convolution of the blood vessels. Some of them are polyvinyl alcohol (PVA) particles of different sizes, pledges of gelatin sponge and microfibrillar collagen. Liquid embolization agents are Onyx, n-butylcyanoacrylate, and ethanol. Occlusion of large vessels (diameter > 1,5 mm) may require the use of detachable coils, where only tumor supplying feeders are embolized without the occlusion of the tumor vasculature. Complex anatomy of cranial vasculature should always be kept in radiologist's mind as many vascular anastomoses can make intervention uncertain and lead to an unexpected neurological deficit (2).

Time to operation after embolization may vary depending on tumor characteristics, embolization technique, and degree of devascularization. Embolization is usually performed within the first day or two of expected surgical resection, while some new embolization materials allow up to seven-day period between embolization and operation (3).

Embolization can be performed trans-arterially or by direct puncture in order to achieve occlusion of the small tumor vessels, sparing the normal brain vessels.

Trans-venous embolizations are rare, and they are not considered for tumor embolization but for arteriovenous malformations (4).

CASE REPORT

A sixty-three-year-old woman was admitted to the Clinic of Neurosurgery, Clinical Center Niš, Serbia, at November 2016. after she underwent a CT brain scan that showed a large tumor of the left cerebellopontile angle (Figure 1).

Figure 1. *Preoperative CT scan - large tumor of the left cerebellopontile angle*

Except for extreme vertigo, horizontal nystagmus and walking instability, neurological examination showed no other pathological findings. Digital subtraction angiography presented a large, highly vascularized tumor lesion that compressed the brain stem (Figure 2).

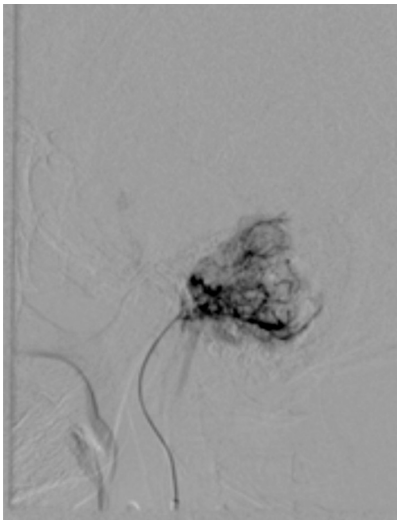

Figure 2. *Digital subtractionon angiography - highly vascularized tumor lesion*

The patient underwent endovascular procedure, and complete embolization of the tumor vessels was established (Figure 3). ASAHI Masters PARKWAY HF KIT guide wire preloaded micro-catheter was used for the application of embolization material: Bead-Block 500–700 μm compressible polyvinyl-alcohol microspheres in the quantity of 1 ml. The radiologist delivered embolization material via the left ascending pharyngeal artery.

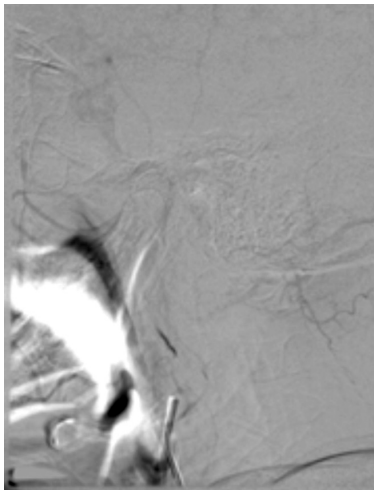

Figure 3. *Post-embolization finding – complete obliterated tumor vessels*

In the next 24 hours, an operation was performed. The patient was operated in the sitting position, using all the necessary monitoring equipment. Surgery lasted for 9 hours, and the patient lost 320 ml of blood. Radical extirpation surgery (Simpson grade I) was performed. Postoperatively, the patient's GCS was 15, with no new neurological deficit. Postoperative brain CT scan showed neither rest tumor nor blood inside the tumor bed (Figure 4).

Figure 4. *Control brain CT scan – favorable finding*

Ten days after admission and 7 days after the operation, the patient was discharged from the hospital. The pathohistological finding reveled atypical meningioma grade II.

DISCUSSION

The two main problems concerning surgery are bleeding and infection. Postoperatively, infection of CNS could be fatal in a significant percentage, especially if bacterial meningitis occurs. Intra-operatively, bleeding could be an urgent problem, and any method that reduces it is of essential importance for surgery. Tumor embolization is one such method. Ideal tumor embolization can be achieved by the occlusion of the small vessels within a tumor, while preserving supply to the surrounding neural tissue. Sometimes, this golden standard of embolization can be outflanked (5).

Due to the lack of randomized controlled clinical trials, it is difficult to assess the usefulness of preoperative embolization of meningioma vessels to consider it a standard practice (6). Nevertheless, if there is an opportunity of reducing intraoperative bleeding and therefore decreasing surgical morbidity by reducing blood loss, shortening operative procedure time, allowing better visualization of surgical filed, and therefore increasing the chances of complete surgical resection and reducing the possibility of damaging the surrounding normal tissue, then there is hardly any surgeon who would not embrace it.

Tumor derives its vascular supply from a dominant vessel, and is visualized as a "blush" after applying a contrast injection. In the region of the anterior and temporal skull base, meningiomas are vascularized via the middle meningeal and accessory meningeal arteries arising from the internal maxillary artery. Olfactory groove meningioma usually has blood influx from the ethmoidal arteries. In this case report, meningeal tumor was usually vascularized from the anterior and posterior branches of the left or right VA, with the support of meningeal branches via the ascending pharyngeal and occipital arteries. In this case, the radiologist used endovascular approach via ascending pharyngeal artery and completely obliterated tumor vasculature.

Few decades ago, materials like gel foam, lyophilized duramater and several kinds of catheters were available (7, 8) for tumor embolization. Nowadays, new materials and techniques make tumor vessels' embolization relatively safe and reliable option in preoperative treatment (9, 10, 11, 12). Intra-arterial perfusion MRI and a new imaging modality for identifying biomarkers can reveal perfusion status and extent of ischemia in embolized meningiomas, thus becoming new, very useful diagnostic tool in meningioma patients (13).

We used asimilar therapeutic approachas some authors (14) and achieved complete tumor mass embolization. In the study of Gruber et al. (9), the total or subtotal angiographic devascularization of the tumor parenchyma was accomplished in more than 60% of cases of intracranial meningiomas (9). Our patient had no post-embolization complications, which is similar to some studies that have shown low to moderate percentage of post-embolized complication in patients with cranial meningioma, ranging from 5% to 17% (6, 9). Blood loss during our operation of embolized large tumor was less than 500 ml, similarly to data published in Sigla's (6) paper where average blood loss was 574 ml.

In the same study, an average time of surgery was 4 hours and 18 minutes, while our operation lasted much longer. Location of the tumor adherent to the brain stem, which demands a careful microscopic arachnolisis, with the preservation of all cranial nerves and vessels contained inside the pontocerebellar angle, is a reason for prolonged duration of surgery. Using CUSA could have expedited the operation, but technical reasons prevented us from using it.

Atypical meningiomas are difficult to treat as they have high recurrence and low survival rates. In the series of Jo et al. (15), complete resection of the tumor was a key determinant for a preferable outcome. Adjuvant radiation therapy is recommended if incomplete surgical resection was performed.

CONCLUSION

Despite some clinicians' dilemma considering the utility of preoperative embolization of meningioma vessels, we believe that a team of educated and dedicated radiologist and neurosurgeon could achieve great results in resection of large and inaccessible cranial tumors.

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Abbreviations

CT — computed tomography,
GCS — Glasgow Coma Score,
CNS — central nervous system,
VA — vertebral artery,
MRI — magnetic resonance imaging,
CUSA — Cavitron Ultrasound Surgical Aspirator

Conflict of interest

Authors confirmed that no actual or potential conflict of interest exists in relation to this article.

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There were no external funding sources for this study.

Sažetak

ENDOVASKULARNA PRIPREMA ZA DELIKATNU OPERACIJU MENINGEOMA — PRIKAZ SLUČAJA

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Uvod: Preoperativna embolizacija može učiniti resekciju tumora manje komplikovanom tako što skraćuje vreme operacije i smanjuje intraoperativni gubitak krvi.

Prikaz slučaja: U ovom prikazu slučaja, prikazali smo bolesnicu staru 63 godina, koja je primljena na Kliniku za neurohirurgiju Kliničkog Centra u Nišu, novembra 2016, nakon urađenog CT-a mozga koji je pokazao postojanje velikog tumora pontocerebelarnog ugla. Panangiografija krvnih sudova mozga je pokazala da je tumor koji vrši kompresiju na moždano stablo, dobro prokrvljen. Kod bolesnice je preduzeta endovaskularna procedura, kompletna embolizacija tumorskih krvnih sudova. Interventni radiolog je embolzacioni material isporučio u tumorsku masu preko a. pharingicae ascedens. Resekcija tumora je izvršena u sledećih 24 sata, po tipu kompletnog odstranjenja, (Simpson gradus I). Postoperativno, bolesnica je bila potpuno svesna, bez novonastalih neuroloških deficita. Postoperativni CT mozga je pokazao da nema ostataka tumora, niti krvarenja u loži. Patohistološki nalaz je ukazao na atipični meningeom, gradus II.

Zaključak: Uprkos dilemi nekih kliničara oko upotrebne vrednosti preoperativne embolizacije, mišljenja smo da edukovani i posvećeni tim radiologa i neurohirurga može postići velike rezultate u operacijama velikih i teško pristupačnih tumora.

Ključne reči: embolizacija, meningeom, vaskularizovani tumori.

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