Merits of intrallesional fibrin glue injection in surgery for cavernous sinus cavernous hemangiomas

Technical note

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In planning surgical treatment for extraaxial cavernous hemangiomas, care should be taken to control severe tumor bleeding. The authors present a case of a large cavernous hemangioma of the cavernous sinus, which was completely removed with the aid of multiple intratumoral injections of fibrin glue. This novel method is very effective for preventing excessive blood loss during surgery for this type of lesion.

Key words • cavernous hemangioma • cavernous sinus • surgery • fibrin glue

Intracranial extracerebral cavernous hemangiomas are relatively rare and histologically benign vascular tumors that bleed uncontrollably when their removal is attempted. The middle fossa is the site most commonly involved by these lesions, which actually arise within the CS. When completely resected, they are surgically curable; however, total removal has been unsuccessful with a few exceptions. To minimize blood loss during resection of these hemorrhagic tumors, various surgical methods that decrease tumor size and vascularity have been reported.

Some authors have controlled troublesome bleeding from cavernous hemangiomas, which is not usually controlled by bipolar coagulation, by packing the sites of bleeding with a fibrin glue-soaked oxidized cellulose or gelatin sponge. This type of biological tissue adhesive has been in standard use in various neurosurgical procedures. The authors report a case in which a CS hemangioma was resected with minimized bleeding by intraoperatively injecting a fibrin adhesive preparation (Greenplast; Greencross Pharmaceutical Co., Seoul, Korea) into the tumor.

Case Illustration

History and Examination. This 36-year-old woman was admitted to the hospital because of blurred vision and diplopia that had worsened during a 1-year period. The visual acuity of the patient’s left eye was 0.06 and the optic disc was slightly pale. Neurological examination confirmed left oculomotor and trochlear nerve pareses. A CT scan demonstrated an extensive, hyperdense, homogeneously enhancing mass; the surrounding, osseous structures of which were focally destructed. With respect to MR imaging, the well-defined extraaxial lesion appeared hypointense on T1-weighted images and markedly hyperintense on T2-weighted images (Fig. 1 upper right and upper left) and was strongly enhanced after gadolinium injection (Fig. 1 lower left). The tumor was located in the left CS and extended to the middle cranial fossa, suprasellar space, and perimesencephalic cistern. Angiography demonstrated a subtle delayed tumor stain with an enlarged meningohypophysal trunk and stretching of the intracavernous portion of the ICA. Unfortunately, the interventional neuroradiologist failed to select the main artery feeding the hemangioma.

Operation. Surgery was performed via a frontotemporoorbitozygomatic craniotomy and the temporal bone was nipped down to the floor of the middle fossa by using a rongeurs. The tumor was approached intradurally via subtemporal and intrasylvian routes. The sylvian fissure and basal cisterns were widely dissected to expose the CS, and the optic nerve and chiasm were identified, together with the ICA at its entry into the CS. The thinned temporal lobe was elevated posterolaterally, exposing the tumor, which was notable for its large, dark-blue appearance. After we carefully incised the thin dura mater covering the tumor, we tried to create a surgical plane between the tumor and the temporal base dura by bipolar coagulation of the tumor capsule. Unfortunately, the extracapsular dissection could not be extended farther around the tumor because the lesion was very hemorrhagic in response to high tension and appeared to be incompletely encapsulated.

We applied direct puncture and injection of fibrin glue into the lesion at many sites. The blunt-tipped needle of
the syringe containing fibrin glue was specially designed. When this needle met a slight resistance or there was no reflux of blood, it was withdrawn and repositioned. To avoid blood loss from the puncture hole, we applied compression to the injection sites. The intratumoral injections were continued until the tumor pulsation was markedly decreased. As the tumor visibly hardened, additional punctures no longer induced profuse tumor bleeding. The lateral wall of the CS was then opened horizontally at its most prominent bulging area and its outer layer was peeled away to reveal the third, fourth, and fifth cranial nerves draped over the tumor surface. After rapid internal decompression of the middle fossa tumor with coagulation of tiny vessels connecting the dura mater and tumor, the CS was entered via a superior approach and the intracavernous feeding arteries were divided early, so that the tension on the tumor could be reduced. The medial portion of tumor was gradually peeled away from the intracavernous ICA, cranial nerves, pituitary gland, and tentorial edge. The glue-mixed tumor, which was gelatinous and reddish white, could be easily excised. A total of 36 ml of glue was needed to embolize the various tumor compartments. The patient tolerated surgery well and only 600 ml of blood was needed during the operation. After the tumor had been totally removed, the CS was filled with a fat graft, and the CS wall was reapproximated with suture.

Postoperative Course. The patient’s postoperative course was uneventful except for the development of transient diabetes insipidus. A contrast-enhanced CT scan obtained 3 months postoperatively confirmed total removal of the lesion (Fig. 1 lower right). Four months after exploratory surgery, there was an improvement in the patient’s visual disturbance and extraocular movement in the left eye.

Pathological Findings. Microscopic examination of the specimen confirmed the diagnosis of cavernous heman-
gioma with loose interstices, and also demonstrated numerous fragments of fibrin glue in dilated sinusoid spaces of the tumor (Fig. 2).

Discussion

Cavernous hemangiomas in the CS have been rarely identified and commonly misdiagnosed as meningiomas.5,10,14 The preoperative recognition of this tumor is very important because extraaxial cavernous hemangiomas have the potential for active bleeding during surgical resection. With regard to their diagnosis, the evidence of bone erosion on CT scans, marked hyperintensity on T2-weighted MR images, and little to no angiographic blush are characteristic imaging findings.8,23,30 Two subtypes of cavernous hemangioma of the CS were documented in a pathological report,27 which revealed marked differences in light microscopic features, difficulty in hemostasis, tumor hardness, and resectability.

For the removal of small CS cavernous hemangiomas, en bloc excision in one piece is possible.11 On the contrary, it is often difficult to remove large or giant tumors totally without performing a debulking procedure by incising the capsule.7,8,10 For the safe removal of CS cavernous hemangiomas for which embolization is not possible, as shown in this report, some authors have suggested that a superior approach to the cavernous ICA be followed at an early operative stage to interrupt the main feeding source.11,27 This procedure is not performed easily until internal decompression of the lesion has been completed from the lateral approach. Using conventional techniques of piecemeal resection to perform the internal decompression of CS hemangiomas is not advisable and can inevitably lead to significant bleeding.4,5,7,10–12,27 Therefore, a new surgical strategy has to be taken. Although excellent surgical results have recently been achieved using induced systemic hypotension during surgery of CS cavernoma,18,21 it is a bothersome procedure and is not routinely practiced in the absence of strong cardiovascular and neuroanesthesiological teams.

To perform a smooth operation on vascular and neoplastic lesions in the head and neck area, for which devascularization through intravascular access might be difficult or dangerous, direct puncture and embolization of the tumor has been performed successfully using various materials.3,7,13 For the safe and complete excision of large CS cavernous hemangiomas, the same procedure has also been advised.1 Hashimoto, et al.,8 recently achieved success in the complete piecemeal removal of a large CS hemangioma by using intratumoral injection of a biobond adhesive. Because of possible untoward biological reactions to this substance,31 however, the surrounding tissue was meticulously walled off with wet cottonoid during the injections and any fragment of biobond that had been injected into the lesion was completely removed during the operation. The technique of intralresional embolization with fibrin glue for the treatment of cavernous and venous hemangiomas in the orofacial region has proved to be suc-
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cessful in achieving easy and complete resection without blood loss. The merits of fibrin glue for the treatment of these hemangiomas include its ease of application and removal, the fact that it is safe to handle, the excellent hemostasis attained by instant polymerization on contact with blood, and the negligible toxicity of the glue. During surgery of CS cavernous hemangiomas, a glue-soaked absorbable hemostat has simply been packed into the lesion to control active bleeding from the venous sinus and tumor tissue. Based on these previous trials, we injected fibrin glue directly into the sinusoid spaces of the hemangioma to fix the spongelike hemangioma and produce a resectable mass. Jemec and Sanders described the immediate and mechanical action of injected fibrin glue as that of “space occupying substances with a thrombotic character;” this phenomenon has been confirmed by our pathological examination, which demonstrated that blood within the vessels of the hemangioma was replaced with this material. The main advantage of using this technique during open craniotomy is that huge cavernous hemangiomas can be cut into two or three pieces and piecemeal debulking is possible without significant blood loss. During this procedure, however, careful attention should be paid to avoid injury to the cranial nerves and the ICA, which are displaced from their original anatomical courses. We did not aspirate blood during injection of fibrin glue because the negative pressure exerted during needle puncture of the hemangioma causes continued profuse bleeding and does not significantly reduce the size of the lesion.

Conclusions

We believe that direct intratumoral injection of fibrin glue during surgery for a CS cavernous hemangioma is relatively simple, easily accomplished, and universally available. Its efficacy simplifies the surgical procedure and consequently facilitates complete tumor excision while decreasing intraoperative blood loss.

References


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