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Case Report

Three cases of organized hematoma of the maxillary sinus in patients who underwent preoperative arterial embolization ☆

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ABSTRACT

Organized hematoma (OH) is benign tumor in the maxillary sinus. The standard treatment for OH is complete surgical resection, however massive bleeding can occur during the procedure, albeit rarely. Some reports have suggested preoperative embolization is useful for reducing the volume of intraoperative bleeding. We report 3 cases of OH in the maxillary performed preoperative embolization. We identified the feeding arteries by angiography or IVR-CT, and we embolized them using Gelatin sponge particles. The embolized artery was the maxillary artery or both the maxillary and the facial artery. There were no major complications as a result of embolization. The mean fluoroscopy time was 35.8 minutes, and the mean fluoroscopy dose was 329.3 mGy. Tumor resection was performed the next day after arterial embolization. The mean bleeding volume for surgery was 383.3 ml, and the mean operative time was 194 minutes. No recurrence was observed in any of the cases over a 4-year follow-up period. We considered that it is possible that preoperative artery embolization is useful for decreasing intraoperative bleeding volume. Although the methods and usefulness of embolization await future reports, it is a technique that should be considered preoperatively because of its potential to prevent massive bleeding.

☆ Competing interests: The authors declare that there is no conflict of interest regarding the publication of this article.

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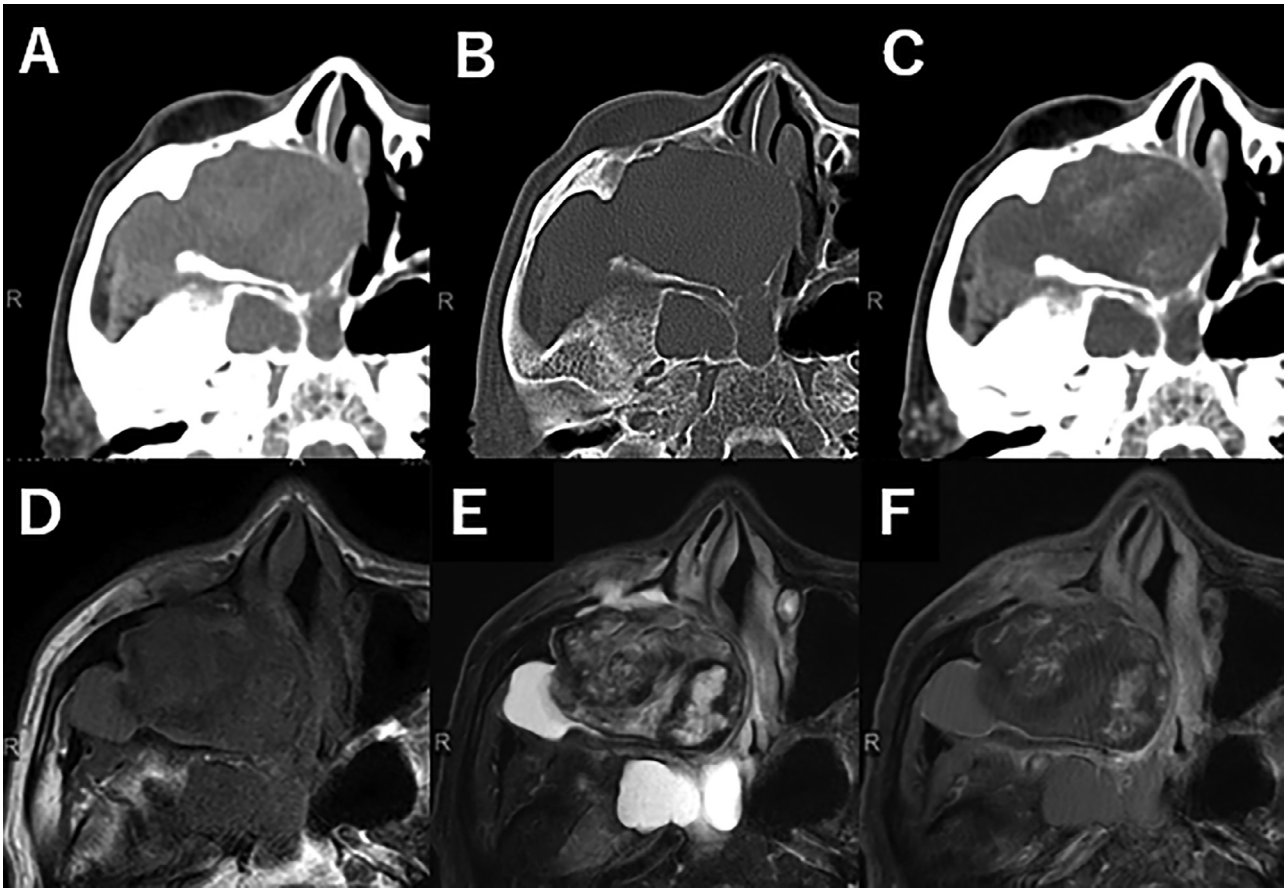

Fig. 1 – CT and MRI images of Case 1.
(A) Axial non-contrast CT image shows a soft-tissue mass with a higher CT value than muscle. (B) Axial bony algorithm CT image shows smooth bone erosion associated with OH. (C) Axial contrast CT image shows slight enhancement.
(D, E) Axial T1WI and T2WI demonstrates a heterogeneous signal. (F) Axial contrast Fat–Saturation T1WI shows uneven enhancement

Introduction

Organized hematoma (OH) is an uncommon benign nonneoplastic lesion in the maxillary sinus. It is characterized by hemorrhage, swelling, and bone destruction [1,2]. Because the CT findings of OH are similar to those of a malignant tumor, preoperative diagnosis is sometimes difficult.

The standard therapy is complete surgical resection; however, massive bleeding can occur during the procedure, albeit rarely. Several studies have reported that preoperative embolization of the feeding artery is useful for decreasing the amount of bleeding during surgery [1].

Here we report these cases of OH in which preoperative embolization was performed.

Case presentation

Three patients with OH of the maxillary sinus underwent preoperative embolization between 2015 and 2019.

Case 1

The patient was a 72-year-old male with a chief complaint of nasal obstruction. He had no past history of sinus surgery or trauma. CT showed a 5 × 4 cm mass lesion with bone destruction in the right maxillary sinus. The mass had a higher CT value than the surrounding muscle, and contrast CT image demonstrated slight enhancement. It was suspected to have a rich vascular component with internal bleeding. MRI showed low and iso intensity on T1 weighted image (T1WI), low and high intensity on T2 weighted image (T2WI) in the mass. Contrast fat-saturation T1WI showed uneven enhancement (Fig. 1). 2 biopsies were performed, but there was no evidence of malignancy. Based on the clinical course and CT or MRI imaging findings, OH was suspected. To reduce intraoperative bleeding, it was decided to perform embolization before the surgery.

The patient underwent arterial embolization 24 hours before surgery. Catheters and/or guidewire were used depending on the situation. When we performed embolization, we selected the femoral artery as the access route. After insertion of the sheath, heparin 5,000 units was administered in-

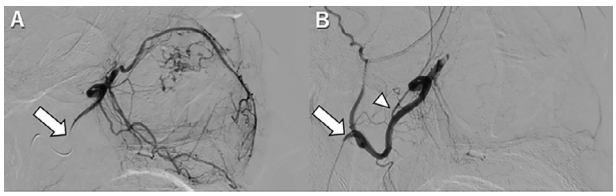

Fig. 2 – Angiography images of Case 1.
(A) Lateral view of DSA (Digital subtraction angiography) image shows maxillary artery distal to the middle meningeal artery (MMA). It is considered to be the feeding artery of OH. Arrow demonstrates the catheter tip position. (B) Lateral view of DSA image shows the embolized OH artery. Arrow demonstrates the catheter tip position and arrowhead demonstrates MMA

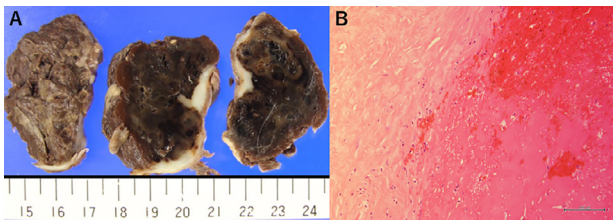

Fig. 3 – Macroscopic and microscopic findings of organized hematoma in Case 1.
(A) The resected specimen mainly showed dark red appearance, suggesting old hematoma. The lesion was partially covered with white shell, suggesting organized fibrous tissue. (B) Microscopically, the lesion contain old red blood cells (right upper side), old fibrin exudation (right lower side) and dense collagen fiber (left side). No tumor cells were found

travenously to prevent complications due to thrombus, and an additional 1,000 units were administered every hour thereafter until IVR finished.

Angiography images are shown in (Fig. 2). We identified the feeding arteries by angiography and IVR-CT. In the current case, we identified that the feeding artery of OH is only the maxillary artery. Embolization was performed using Gelatin sponge particles, approximately 1 × 1 × 1 mm in size, which were made from Gelatin sponge sheets by cutting with a scalpel and scissors. We advanced the tip of the catheter deeper than the bifurcation of middle meningeal artery (MMA), and we embolized the feeding artery with gelatin sponge particles. The fluoroscopy time was 28.2 minutes, and the fluoroscopy dose was 334 mGy.

There were no major complications as a result of embolization.

Surgical resection was performed the next day after arterial embolization. The patient underwent surgery with Weber Ferguson incision for OH.

The bleeding volume for surgery was about 420 ml, and the operative time was 183 minutes. No severe postoperative thrombocytopenia or coagulation factor abnormalities were observed. The resected specimen was a dark red mass, partially covered with white fibrous shell (Fig. 3 A). In microscopy, the mass consisted of degenerated red blood cells and old fibrin exudation covered with dense collagen fiber, was diagnosed OH (Fig. 3 B). No recurrence was observed over a 4-year follow-up period.

Case 2

A 69-year-old female with myelodysplastic syndrome had frequent epistaxis and swelling of the left cheek. She also exhibited thrombocytopenia (7,000/μL) due to myelodysplastic syndrome. The CT findings showed a 4 × 3.5 cm mass lesion with smooth bone destruction, which was similar to that in Case 1. In addition, MRI findings were almost the same as those found in Case 1; high and low intensity on TIWI and T2WI, respectively. We suspected that the findings were due to bleeding. Contrast fat-saturation T1WI showed uneven enhancement. There was no evidence of malignancy with histopathology of biopsy, and OH was suspected.

The patient underwent arterial embolization 24 hours before surgery. In this case, we identified that the feeding artery of OH is the maxillary artery and facial artery. We embolized them using Gelatin sponge particles, as described in Case 1. Fluoroscopy time duration and dose were 60.3 minutes and 470 mGy, respectively.

Due to a low platelet (PLT) count, platelet transfusions were given every day. A total of 60 units of concentrated platelets were transfused until just before surgery, and the PLT count increased to 47,000/μL.

Surgery was performed the day after the IVR. The patient underwent surgery with modified Weber Ferguson incision for OH. The bleeding volume for the surgery was about 400 ml, and the operative time was 176 minutes. No severe postoperative thrombocytopenia or coagulation factor abnormalities were observed. A pathological diagnosis of OH was made, and no recurrence was observed over a 4-year follow-up period.

Case 3

An 87-year-old male presented with frequent epistaxis and swelling of the right cheek. The patient had no significant past history of sinus surgery or trauma. CT and MRI findings showed a 5 × 3.5 cm mass lesion with the specific features of OH, similar to Cases 1 and 2. There was no evidence of malignancy with histopathology of biopsy, and OH was suspected.

The patient underwent arterial embolization 24 hours before surgery, we embolized the maxillary and facial arteries using Gelatin sponge particles. The fluoroscopy time was 18.9 minutes, and the fluoroscopy dose was 183.7 mGy.

The patient underwent surgery with modified Weber Ferguson incision 24 hours after IVR was performed. The bleeding volume for surgery was about 330 ml, and the operative time was 224 minutes. A pathological diagnosis of OH was made. No recurrence was observed over a 4-year follow-up period.

Discussion

Organized hematoma (OH) is a clinical diagnosis, and it has many different terms, such as blood boil, hematoma-like

mass, inflammatory pseudotumor, and others. The mechanism of occurrence is hypothesized to be as follows: OH in the maxillary sinus is developed by bleeding diathesis, aggressive fungal infection, postoperative complications, and/or trauma. Next, the fresh hematoma causes necrosis and fibrosis, leading to neovascularization. However, the new vessels are weak, so rebleeding can easily occur. As a result, this negative spiral causes the eventual formation of OH. The hematoma grows due to repeated bleeding and neovascularization [1,3]. The classic CT findings are dilatation of the maxillary sinus and bone erosion [4]. CT shows slightly higher values in the maxillary sinus than in the muscles, and uneven enhancement [2]. The lesion is characterized as slow progressive, and has a tendency toward bone thinning and crushing destruction [4–7], however, to date there has been no report regarding the specific CT findings of OH [5]. The bone erosion associated with OH is smooth, but frank bony destruction associated with adjacent tissue invasion is characteristic of malignancy [4,8]. It has also been previously reported that OH might show a [^{18}F] fluorodeoxyglucose (FDG) uptake pattern in Positron-Emission Tomography (PET) images similar malignant tumor patterns, thus, it is difficult to deny malignancy in such cases [6].

On MRI, OH shows a heterogeneous signal on T1WI and T2WI images, and postcontrast T1WI shows an enhanced thickening mucosa [1]. In particular, the isointense areas on T2WI may represent areas of vascular proliferation because they show clearly contrasted effects. MRI is more sensitive than CT in detecting contrast-enhanced lesions.

The standard treatment for OH is complete surgical resection, which is curative. Some previous studies have reported various approaches, such as lateral rhinotomy incision, Caldwell-Luc operation, Denker operation, and endoscopic sinus surgery (ESS) [5]. It has been reported that there is little difference regarding intraoperative bleeding between ESS and the other approaches [9]. Although there are few studies that investigated the volume in the intraoperative bleeding [1,3,10], some reports have suggested that preoperative embolization is useful for reducing the volume of intraoperative bleeding [1,9,11]. However, Omura et al. reported that there is no significant difference in the amount of bleeding with and without embolization, and it was therefore difficult to define the necessity of preoperative embolization [3]. It is difficult to predict the amount of blood loss before the procedure. Suzuki et al. said that it is unnecessary to perform preoperative arterial embolization in patients who do not have bleeding disorders or whose lesion shows weak enhancement [10]. Although the evidence of preoperative arterial embolization for OH is insufficient, many papers have reported its usefulness in decreasing bleeding volume. In the cases of the current report, all preoperative embolization was performed from the maxillary artery, and additional embolization was performed if CT or angiography revealed suspected involvement of the facial artery. The most reported embolized artery is the main trunk of the maxillary artery [1,3]. Embolization of the sphenoid artery, which is a distal branch of the maxillary artery, has also been reported, with an intraoperative bleeding volume of 50 ml [12]. It cannot be concluded that embolization of the distal branches of the maxillary artery result in lower bleeding volumes when OH removal operation is performed, because there have also been reports of embolization from the main trunk of the maxillary artery with small bleeding volumes [1,12]. In addition, selecting the descending palatine artery or sphenopalatine artery, which are the terminal branches of the maxillary artery, requires more skill and longer operation time. In the current clinical setting, which artery to embolize may depend on the surgeon's judgment.

Regarding embolization materials, most studies report to use a Gelatin sponge, and the use of n-butyl-2-cyanoacrylate (NBCA) was reported in 1 case [12]. Which embolic materials should be used for preoperative embolization of OH is unclear. Gelatin sponge is a transient embolization material, and if used, the embolized arteries will reperfuse after over time. The use of coils or NBCA may be better in case it takes time to perform surgery after embolization. NBCA sometimes causes extensive more embolization than expected and its use requires a skillful technique.

In the present study, we considered the usefulness of preoperative embolization for OH. In the second case, regardless of thrombocytopenia, the intraoperative bleeding was almost the same as those in the other cases. We considered that it is possible that preoperative artery embolization is useful for decreasing intraoperative bleeding volume. Although the methods and usefulness of embolization await future reports, it is a technique that should be considered preoperatively because of its potential to prevent massive bleeding.

Conclusion

It is possible that preoperative embolization for OH is useful to reduce bleeding. Further investigation into preoperative embolization for OH should be conducted.

Patient consent

No consent obtained for this case report as this is a retrospective study with no patient identifiers. We confirm that there is no personal identifying information contained within the entirety of the submitted manuscript. Furthermore, as this is a retrospective case report, no institutional review board approval was necessary.

REFERENCES

[1] Ohta N, Watanabe T, Ito T, Kubota T, Suzuki Y, Ishida A, et al. Clinical and pathological characteristics of organized hematoma. Int J Otolaryngol 2013;2013:1–6. doi:10.1155/2013/539642.

[2] Pang W, Hu L, Wang H, Sha Y, Ma N, Wang S, et al. Organized hematoma: an analysis of 84 cases with emphasis on difficult prediction and favorable management. Otolaryngol - Head Neck Surg (United States) 2016;154:626–33. doi:10.1177/0194599815625956.

[3] Omura G, Watanabe K, Fujishiro Y, Ebihara Y, Nakao K, Asakage T. Organized hematoma in the paranasal sinus and

nasal cavity—imaging diagnosis and pathological findings. Auris Nasus Larynx 2010;37:173–7. doi:10.1016/j.anl.2009.06.009.
[4] Lee HK, Smoker WRK, Lee BJ, Kim SJ, Cho KJ. Organized hematoma of the maxillary sinus: CT findings. AJR Am J Roentgenol 2007;188:370–3. doi:10.2214/AJR.05.1479.
[5] Hyung Min, Song Yong Ju, Janfg Yoo-Sam, Chung B-JL. Organizing hematoma of the maxillary sinus. Otolaryngol Neck Surg 2007;136:616–20. doi:10.1016/i.
[6] Park YK, Kim KS. Organizing hematoma of the maxillary sinus mimicking malignancy diagnosed by fluorodeoxyglucose positron-emission tomography (FDG PET/CT): A case report. Iran J Radiol 2015;12:1–6. doi:10.5812/iranjradiol.18924.
[7] Tabaee A, Kacker A. Hematoma of the maxillary sinus presenting as a mass—a case report and review of literature. Int J Pediatr Otorhinolaryngol 2002;65:153–7. doi:10.1016/S0165-5876(02)00148-9.
[8] Kim EY, Kim HJ, Chung SK, Dhong HJ, Kim HY, Yim YJ, et al. Sinonasal organized hematoma: CT and MR imaging findings. Am J Neuroradiol 2008;29:1204–8. doi:10.3174/ajnr.A1042.
[9] Almasoud M, Alhumaidan A, Ashoor M. Maxillary sinus hematoma: current pathogenesis and management. Egypt J Ear, Nose, Throat Allied Sci 2014;15:37–40. doi:10.1016/j.ejenta.2013.09.005.
[10] Suzuki H, Inaba T, Hiraki N, Hashida K, Wakasugi T, Kadokawa Y, et al. Endoscopic sinus surgery for the treatment of organized hematoma of the maxillary sinus. Kurume Med J 2008;55:37–41. doi:10.2739/kurumemedj.55.37.
[11] Imayoshi S, Kanazawa T, Fukushima N, Kikuchi H, Hasegawa M, Nagatomo T, et al. 3 cases of organized hematoma of the maxillary sinus: clinical features and immunohistological studies for vascular endothelial growth factor and vascular endothelial growth factor receptor 2 expressions. Case Rep Otolaryngol 2015;2015:1–5. doi:10.1155/2015/846832.
[12] Saito H, Tanaka M, Hadeishi H. [Preoperative embolization for organized hematoma of the maxillary sinus with low-concentration n-butyl-2-cyanoacrylate:a case report]. No Shinkei Geka 2020;48:407–12. doi:10.11477/mf.1436204202.