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ORIGINAL ARTICLE

Surgical approach and treatment outcomes for the rare giant aneurysms: 3 cases

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Abstract

Aim: Giant aneurysms are used to describe aneurysms over 25 mm.They are rarely seen cases within all aneurysms and usually present with rupture at an early age or mass effect at an older age. We aimed to describe the methods that can be applied in the diagnosis and treatment of giant aneurysms and the points to be considered.

Materials and Methods: Three patients, two males and one female, who were admitted to our clinic between 2015-2016 with different clinical findings and whose giant aneurysms were detected in their examinations, were discussed. Computed Tomography (CT), Digital Subtraction Angiography (DSA), Magnetic Resonance Imaging (MRI) were performed on the patients.Subarachnoid hemorrhage (SAH) presence, the size of the aneurysms, whether they were thrombosed or calcific, their localizations, compression occurred in neural structures of the patients were evaluated.

Results: One patient applied to the emergency department due to SAH.One patient had frontal lobe findings and one patient had headache.Giant aneurysms including left M1 in the level of the right middle cerebral artery (MCA) bifurcation in 2 of the patients and in the level of left internal carotid artery bifurcation in one of the patients.2 patients underwent operations and one was led to endovascular treatment.

Conclusion: Aneurysms may grow as big as to cause compression effect before being ruptured. Performing MRI,CT,DSA in the patients with giant aneurysms are critical in terms of leading the treatment.In particular, DSA investigation to be performed in detail is very valuable in terms of leading the patient to surgical and endovascular treatment and determining the strategy of the surgery and the endovascular treatment to be applied.

Keywords: Computed Tomography; Surgical Treatment; Giant Aneurysm; Digital Subtraction Angiography; Endovascular Treatment; Magnetic Resonance Imaging.

INTRODUCTION

Classically the aneurysms with the diameter over 25 mm are identified as giant aneurysms (1,2). Prevalence varies between 3 and 13% within all aneurysms. It is observed in 5% rate in average (3,4). Its location is often the internal carotid artery and it is especially in cavernous and paraclinoid segments in this area. The other frequent areas are vertebrobasilar system, middle cerebral artery and anterior cerebral artery, respectively (3,5). They may morphologically be saccular and fusiform structures. The fusiform ones are mostly located in vertebrobasilar system and middle cerebral artery. They are generally wide-necked and often thrombosed. Subarachnoid hemorrhage (SAH), parenchymal hematoma or both of them together are observed at the most in the patients (6,7). Apart from these, findings due to mass effect perforating arteries occlusion, epilepsy, cranial nerve compression may be observed.

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Data related to natural course of the giant aneurysms are insufficient. 5 year of hemorrhage incidence was found as 40% in anterior circulation and 50% in posterior circulation in the study performed by Wieber et al. Yearly hemorrhage incidence of the giant aneurysms was detected as 8-10% in the same study (8). In a retrospective study performed, the risks of 5 years of mortality and advanced neurological damage development were found as 80% in untreated giant aneurysms (9). 2 years of mortality in the patients with giant aneurysms that didn't have hemorrhage was found as 60% in another study (10). It is worse in prognosis in hemorrhagic patients. Endovascular treatment or surgical treatment may be preferred in the treatments of the patients. The type of the method to be preferred will be decided by evaluating the localization of the aneurysm, the structure of the neck, compression effect, the clinical status of the patient, comorbidity of the patient.

MATERIALS and METHODS

Three patients, two males and one female, who were admitted to our clinic between 2015 and 2016 with different clinical findings and whose giant aneurysms were detected in their examinations, were discussed. Computed Tomography (CT), Digital Subtraction

Angiography (DSA) were performed on all of the patients. Magnetic Resonance Imaging (MRI) was performed on 2 patients. MRI could not be performed on a patient since he was undergone an emergency operation. Subarachnoid hemorrhage (SAH) presence, the size of the aneurysms, whether they were thrombosed or calcific, their localizations, compression occurred in neural structures of the patients were evaluated.

RESULTS

CASE 1

The female patient aged 36 was evaluated in the clinic due to the complaint of headache. No pathology was detected in the neurological examination of the patient. Round partially hyper dense lesion in the area fit for the left middle cerebral artery (MCA) localization right in the upper part of the sylvian fissure on the left was detected in CT performed (Figure 1A). Round lesion, in which there were hyper dense images considered to have thrombus areas within itself in the T2 weighted images on the left middle cerebral artery proximal, is observed in the cranial MRI of the patient (Figure 1B). Aneurysms of 35x20 mm including MCA in the level of left internal carotid artery (ICA) bifurcation, 3x4 on the left ICA cavernous segment, 9x8 mm on the right ICA ophthalmic segment were detected in the DSA of the patient (Figure 1C). The patient was led to endovascular treatment due to the reasons that the aneurysm is not bled, it is multiple and, there is no prominent compression effect in the parenchyma. The patient became exitus due to the hemorrhagic complications developed after the endovascular intervention.

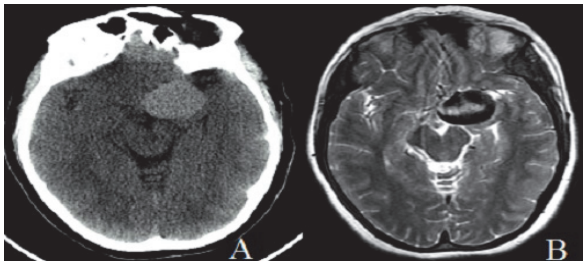

Figure 1A, 1B. Round hyper dense area is observed right in the upper part of the sylvian fissure on the left in the CT of the patient. Ovoid lesion, in which there are hyper dense areas (thrombus) in T2 weighted images in the same localization, is observed in cranial MRI.

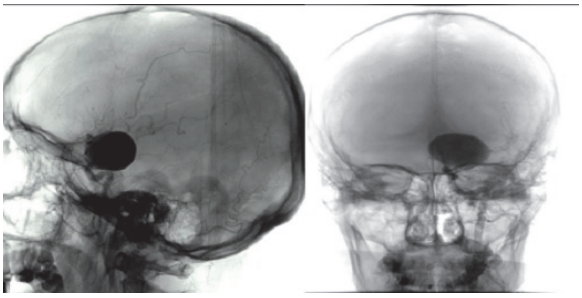

Figure 1C. Giant aneurysm originating from the ICA bifurcation level on the left ICA injection is observed in DSA of the patient.

CASE 2

56 years old male applied to the emergency department with the complaints of sudden severe headache and decline in his consciousness. The consciousness of the patient was inclined to sleep in the neurological examination. He moved 4 extremities spontaneously. WFNS score was evaluated as stage 2. Hyper dense ovoid lesion with approximately 20 mm diameter, in which there is partial calcification, and SAH image were detected in the area fit for the right MCA trace in CT performed to the patient (Figure 2A). Giant aneurysm in the sizes of 26x20 mm on the right MCA bifurcation was detected in DSA performed to the patient (Figure 2C). The patient was taken into operation as his neurological examination regressed. His aneurysm was clipped with the right pterional approach. No pathology was detected except for the post-operative changes in control CT after the operation of the patient (Figure 2B). It was observed there was 2-3/5 rate of weakness on the left side of the patient 3 days after the operation. Infarct area was detected on the right MCA in CT performed. No additional finding was detected in the follow-ups of the patient. It was observed that the loss of strength was 4/5 and the patient could perform his personal care in the controls of the patient after 6 months. It was observed that there was no filling in control DSA (Figure 2D).

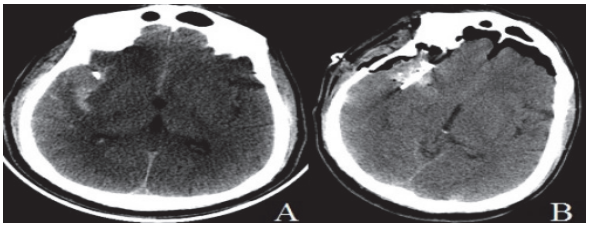

Figure 2A, 2B. Pre-operative and post-operative CTs of the patient are observed. Ovoid lesion, on which there is minimal calcification on the right side, is recognized in pre-operative CT.

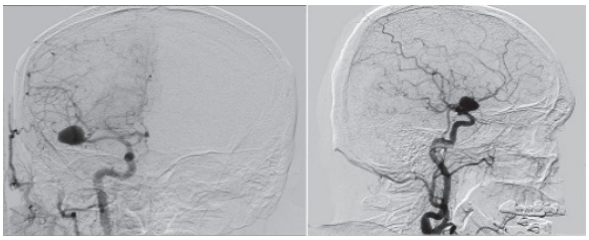

Figure 2C. AP and lateral DSA images of the patient

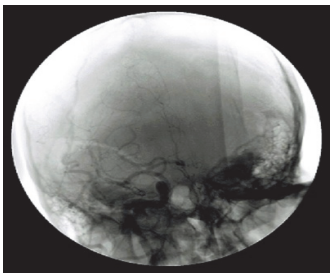

Figure 2D. It is observed that there is no filling in clipped aneurysm in the post-operative DSA of the patient.

CASE 3

59 years old male patient applied to the emergency department with the complaints of inclination to sleep, loss of time and place orientation and irrelevant speaking. In the neurological examination of the patient, the consciousness was inclined to sleep, orientation and cooperation were weak. 4 extremity of the patient was spontaneously mobile and there was no motor loss. Peripheral edema including calcification areas on the right frontotemporal and multi-lobular lesion causing shift in the middle line structures were observed in CT of the patient (Figure 3A). In MRI of the patient, it was observed that there were hyper dense areas considered to be thrombus in T2 weighted images localized on the right frontotemporal, round lesion approximately in the sizes of 40x32 mm causing edema and shift effect (Figure 3B). Aneurysm in the size of 22x9 mm in MCA M1 segment distal is detected in DSA of the patient (Figure 3C). It was considered that aneurysm is partially thrombosed when evaluated together with MRI image. The patient was taken into operation. The neck of the aneurysm was revealed with the intervention by the right pterional approach. It was excised with thrombosed part by clipping later. No additional neurological deficit of the patient occurred in the post-operative period. There was no finding other than post-operative changes in control CT (Figure 3D). No additional pathology was encountered in 3 months follow-up of the patient. It was observed in the control DSA and cranial MRI performed after 3 months that aneurysm was not filled and it was total excised (Figure 3E, 3F).

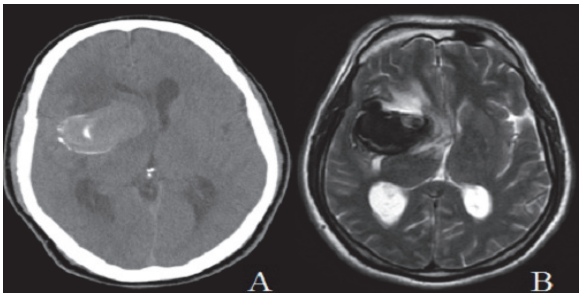

Figure 3A, 3B. The size of the lesion, compression effect and calcifications and thrombosis areas are clearly observed ,n pre-operative CT and cranial MRI images of the patient.

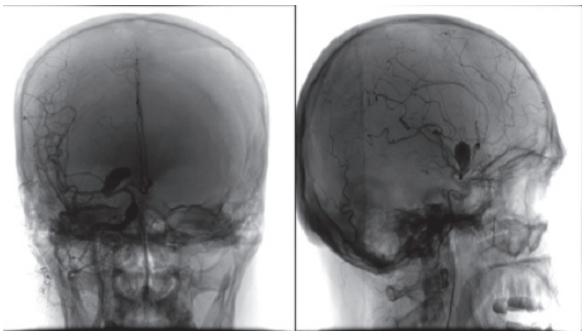

Figure 3C. AP and lateral images of DSA of the patient. In lateral image, it is observed aneurysm keeps involving contrast with turbulence flow although late arterial phase occurs.

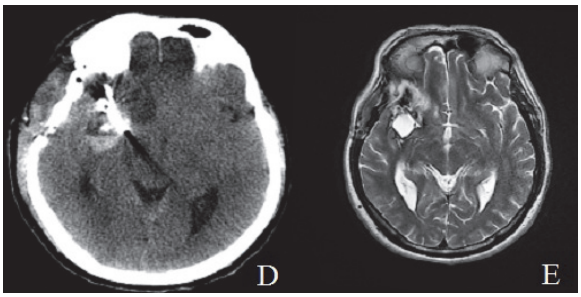

Figure 3D, 3E. Post-operative early period control CT and post-operative control MRI of the patient performed in 3rd month (T2 weighted section). Aneurysm was clipped and excised.

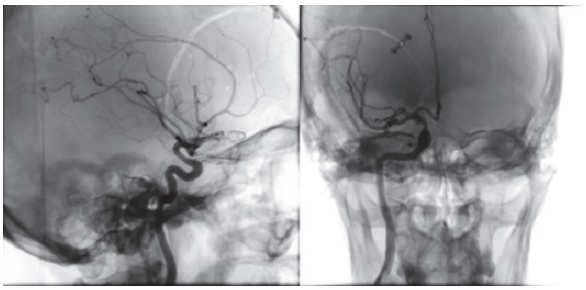

Figure 3F. AP and lateral images of control DSA of the patient. It is observed that there is no filling in aneurysm.

DISCUSSION

Giant aneurysms are the cases, of which the treatments are very difficult in the neurosurgery practice. It is a term used for identifying aneurysms bigger than 25 mm. Average incidence age is 5th decade and there is dominance of female patients (11,12). Our patients were 2 males and 1 female, 2 of whom were in 5th decade and 1 of whom was in 3rd decade. Aneurysm diameter of all patients was 25 mm and over.

Giant aneurysms are mainly located in internal carotid artery and vertebrobrasiler system. It is mainly supraclinoid and cavernous segment localized in internal carotid artery (13,14). However, some authors stated that the localization is mainly in MCA (15,16). There are various theories in terms of the growth of the aneurysm. Turbulence flow and endothelium damage occurred in the aneurysm are considered to be effective. Apart from this, micro-hemorrhage occurred on the wall of aneurysm is said to be effective in terms of growth (26). In terms of our cases, 2 of them were right MCA localized and 1 of them is ICA supraclinoid segment localized.

The patients primarily apply with the complaint of hemorrhage (SAH, hematoma or both of them together). In addition to this, the patients may apply with the complaints of parenchymal and cranial nerve compression, proximal or distal artery thrombosis, occlusion, findings depending on the occlusion in deep feeding arteries and seizures. The findings of the patients depending on the aneurysm compression vary according to the localization of the aneurysm. In

addition to this, non-specific symptoms such as headache, vomiting and weakness may occur in the patients. One of our patients was detected as incidental while being investigated due to headache. Another one applied with SAH findings and 3rd patient applied with frontal compression findings and the complaint of seizure.

In terms of treatment planning of the patients, radiological evaluation is very important. Application of endovascular or surgical treatment to the patient, and the strategies to be used in the treatment to be applied are determined by radiological evaluation. Although DSA is golden standard in terms of identification of these patients, MRI and CT also have considerable importance regarding the evaluation of the patients. It is determined by CT and MRI, which are important for clipping and dissection of the aneurysm and to be performed in addition to thrombus DSA. 10-30% calcification and thrombus presence is detected in giant aneurysms in the studies performed (17). A certain part of the authors specify that presence of thrombus and calcification has risks as much as the hemorrhage to occur during the surgery. In a study performed by Inci et al., they detected calcification in the necks of 25 of 600 anterior circulation aneurysms and 2 of them caused hemorrhage during clipping (25). In addition to them, MRI is the imaging method to ideally evaluate the compression effect in giant aneurysms (10). By this means, surgical excision of the aneurysm may be decided rather than endovascular treatment in case the compression effect is much. MRI was not performed to one of our patient as he/she was urgently taken into operation. DSA and CT were performed to all patients. Of the patients, thrombus was detected in one, calcification was detected in 1 and both thrombus and calcification were detected in 1.

Treatment is recommended to the patients since the rate of mortality and morbidity of giant aneurysms is high. Endovascular or surgical means may be selected in terms of treatment. Both of the methods may be applied for treatment at the same time for some patients. Radiological evaluation is the most important guidance in terms of the determination of the method to be preferred and detection of the strategy to be applied. Mortality and morbidity rates of the methods such as carotid artery occlusion, closing the main arteries in proximal and distal of the aneurysm applied in previous periods of the surgical treatment are high. It is very rarely applied in the present time. Developing technological opportunities, increased experience in microsurgery make leaving aneurysm out of circulation by placing clip in the neck of it easier. Different methods and techniques are applied in the surgery. According to the status of the patient, methods such as clipping the neck by microsurgery, by-passing the aneurysm from the circulation, by-passing aneurysm with another artery by closing the main artery from its proximal may be used. Deep circulatory arrest may be used while performing these interventions. In a study performed by Michael et al., in which 141 giant aneurysm patients were taken into operations, 108 aneurysms were closed totally, residual volume remained in 30 patients, 3 patients were referred to endovascular treatment after the clipping as their aneurysms were calcified. 18 of the patients died and severe neurological damage remained in 13 patients (18). In the study conducted by Sharma et al. surgical treatment was applied to 177 patients, 118 of them were performed control angiography and it was observed that aneurysms in 106 of 118 patients were totally obliterated. Very good scores in 74%, good scores in 22% and bad scores in 4.5% of the patients were achieved. Total mortality was detected as 9% (19). In a study performed by Cantore et al. on 99 patients, who were operated, they applied clipping to 58 patients, external internal carotid artery bypass to 41 patients; 94.4% of the patients, who were performed clipping, recovered, 6.9% of them became exitus, 91.9% of the patients, who were performed bypass, recovered, 9.8% of them became exitus (20). Kattner et al. applied surgery to 29 paraclinoid segment giant aneurysm patients, one of the patients became exitus as a result of the stroke, permanent 3rd nerve paralysis developed in 2 patients and temporary diabetes insipidus developed in 1 patient, severe neurological damage due to subdural hematoma development occurred in 1 patient (21). As it is observed in available series, good result rate is approximately 75-80%, morbidity and mortality rate is approximately 20-25% in terms of the surgery.

Endovascular treatment is a treatment method, which has been lately revealed, and usage area and number gradually increase in parallel with the technological developments. Endovascular treatment has typical complications, although its complications resulting from the surgery may be removed. Its application in the patients that already have had hemorrhage may pose a risk for re-hemorrhage. There are only methods such as coil application, coil application with stent, performing remodeling with flow converting stents, parent vascular occlusion. Treatment is also preferred due to facts that application period is short, hospitalization periods of the patients are short, availability of the process to be performed in the areas challenging to be reached surgically. In the multi-centered meta-analysis study of Dengler et al. comparing the surgery and endovascular treatment, good score rate in hemorrhage giant aneurysms was found as 84.2% while it was found as 84.9% in non-hemorrhage ones in terms of endovascular treatment. Surgical results were found close to the endovascular results. In the study of 10 patients performed by Zhi et al., endovascular treatment was applied to vertebrobasilar system giant aneurysms, 1 patient became exitus due to hemorrhage again after the process and re-intervention was needed in 2 patients. Very good results were achieved in 9 patients (23). In the study of 33 patients by Brinjikji et al., endovascular treatment was applied to complex and giant aneurysms and 3 patients became exitus due to hemorrhage after the process and severe neurological damage occurred in 1 patient due to ischemia (24). We applied surgical treatment to 2 of our 3 patients and guided the other patient for endovascular treatment. When it was decided that the treatment of the patients was surgical or endovascular, the aneurysm was surgically accessible and the aneurysm's pressure effect was taken into account. Endovascular treatment was

guided by the fact that there was no significant pressure effect on the patient who had not undergone surgery and that it would be difficult to achieve the surgical operation. Surgical treatment was preferred due to the presence of compression effect in one of the other 2 patients and surgical access to both aneurysms.

The success achieved in surgical treatment is better than the literature results, because it is correct to compare the literature with the reason that the low number of cases is not sufficient. However, the success of endovascular treatment is inadequate in literature.

CONCLUSION

Giant aneurysms are pathologies difficult to treat. However, they are obliged to be treated due to the mortality rate of them. A well radiological evaluation is absolutely required for the detection of treatment strategy to be applied on the patients. Although DSA is the golden standard for the diagnosis, CT and MRI must absolutely be performed. The patients are not superior to one another in terms of the results, though the number of studies comparing the endovascular treatment and surgical treatment is very low. They may be used as methods supporting each other in terms of some patients.

REFERENCES

1. Locksley HB: Natural history of subarachnoid hemorrhage, intracranial aneurysms and arteriovenous malformations. Based on 6368 cases in the cooperative study. J Neurosurgery 1966;25:219–39.
2. Heros S. Giant aneurysms. Ojeman RG, Ogilvy CS, Crowell RM, Heros RC. Surgical management of neurovasculer disease. Üçüncü baskı, Williams&Wilkins 1995:324-67.
3. Barrow DL, Alleyne C. Natural history of giant intracranial aneurysms and indications for intervention. Clin Neurosurgery 1995;42:214-44.
4. Sundt TM Jr, Piepgras DG, Fode NC, Meyer FB. Giant intracranial aneurysms. Clin Neurosurgery 1991;37:116-54.
5. Fox JL: Intracranial Aneurysms. New York, Springer-Verlag, 1983.
6. Khurana VG, Piepgras DG, Whisnant JP. Ruptured giant intracranial aneurysms. Part I. A study of rebleeding. J Neurosurgery 1998;88(3):425-9.
7. Onuma T, Suzuki J. Surgical treatment of giant intracranial aneurysms. J Neurosurgery 1979;51(1):33-6.
8. Wiebers DO, Whisnant JP, Huston J 3rd, Meissner I, Brown RD Jr, Piepgras DG, et al. Unruptured intracranial aneurysms: Natural history, clinical outcome, and risks of surgical and endovascular treatment. Lancet 2003;362(9378):103-10.
9. Steinberg GK, Drake CG, Peerless SJ. Deliberate basilar or vertebral artery occlusion in the treatment of intracranial aneurysms. Immediate results and long-term outcome in 201 patients. J Neurosurgery 1993;79(2):161-73.
10. Hanel RA, Spetzler RF. Surgical treatment of complex intracranial aneurysms. Neurosurgery 200862(6 Suppl 3):1289-97.
11. Gonzalez NR, Duckwiler G, Jahan R, Murayama Y, Vinuela F. Challenges in the endovascular treatment of giant intracranial aneurysms. Neurosurgery 2006;59(5 Suppl 3):113-S24.
12. Nakase H, Shin Y, Kanemoto Y, Ohnishi H, Morimoto T, Sakaki T Long-term outcome of unruptured giant cerebral aneurysms. Neurol Med Chir (Tokyo) 2006;46(8):379–84.
13. Vinuela F, Fox A, Chang JK, Drake CG, Peerless SJ. Clinico radiological spectrum of giant supraclinoid internal carotid artery aneurysms: observations in 93 cases. Neuroradiology 1984;26(2):93-9.
14. Wiebers DO, Whisnant JP, Huston J 3rd et al Unruptured intracranial aneurysms: natural history, clinical outcome, and risks of surgical and endovascular treatment. Lancet (2003) 362:103–110.
15. Dashti R, Hernesniemi J, Niemela M, Rinne J, Lehecka M, Shen H, Microneurosurgical management of distal middle cerebral artery aneurysms. Surg Neurol 2007;67(6):553–63.
16. Kato Y, Sano H, Imizu S, Yoneda M, Viral M, Nagata J, et al Surgical strategies for treatment of giant or large intracranial aneurysms: our experience with 139 cases. Minim Invasive Neurosurg 2003;46(6):339–43.
17. Cho YD, Park JC, Kwon BJ, Hee Han M, Endovascular treatment of largely thrombosed saccular aneurysms: follow-up results in ten patients. Neuroradiology 2010;52(8):751-8.
18. Sughrue ME, Saloner D, Rayz VL, Lawton MT. Giant Intracranial Aneurysms: Evolution of Management in a Contemporary Surgical Series. Neurosurgery. 2011;69(6):1261–70.
19. Sharma BS, Gupta A, Ahmad FU, Suri A, Mehta VS. Surgical management of giant intracranial aneurysms. Clin Neurol Neurosurg 2008;110(7):674-81.
20. Cantore G, Santoro A, Guidetti G, Delfinis CP, Colonnese C, Passacantilli E. Surgical treatment of giant intracranial aneurysms: current viewpoint. Neurosurgery 2008;63(4 Suppl 2):279-89.
21. Kattner KA, Bailes J, Fukushima T. Direct surgical management of large bulbous and giant aneurysms involving the paraclinoid segment of the internal carotid artery: report of 29 cases. Surg Neurol 1998;49(5):471-80.
22. Dengler J, Maldaner N, Gläsker S, Endres M, Wagner M, Malzahn U, et al. Outcome of surgical or endovascular treatment of giant intracranial aneurysms, with emphasis on age, aneurysm location, and unruptured aneuryms--a systematic review and meta-analysis. Cerebrovasc Dis 2016;41(3-4):187-98.
23. Zhi Chena, Yunfeng Yangb, Hongpin Miaoa, Weihua Tanga, Jingyu Chena, Yin Niua, et al. Endovascular treatment for large and giant fusiform aneurysms of the vertebrobasilar arteries. Clinical Imaging 2013;37(2):227–31.
24. Brinjikji W, Piano M, Fang S, Pero G, Kallmes DF, Quilici L, et al. Treatment of ruptured complex and large/giant ruptured cerebral aneurysms by acute coiling followed by staged flow diversion. J Neurosurg. 2016;125(1):120-7.
25. Inci S, Akbay A, Orunoglu M. Aneurysm Clip Compression Technique in the Surgery of Aneurysms with Hard/Calcified Neck. World Neurosurg 2015;84(3):688-96.
26. İnci S. Dev anevrizmalar .Temel Nöroşirurji 2010;(1):495-502.