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Case Report

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Trigeminal Neuralgia Caused by Cerebellar Arteriovenous Malformations: A Case Report and Review of the Literature

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Abstract

Trigeminal neuralgia (TN) is a syndrome characterized by paroxysmal pain, originating from compression in the trigeminal neurogenic root entrance zone (REZ). Sometimes compression can be caused by local arterio-venous malformations(AVM) which are less common clinically. In our study, we review the literature of AVMs caused trigeminal neuralgia and we represented a TN case caused by cerebellar AVM which we treated by surgical resection of the AVM and after we performed a microvascular decompression.

Even if trigeminal neuralgia caused by AVMs requires a multi-model approach for treatment in our study we wanted to show that after successful microsurgical resection without complications treatment can be achieved successfully.

Keywords: AVM; Cerebral Arteriovenous Malformation; Trigeminal Neuralgia

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Background

Trigeminal neuralgia or tic douloureux is a syndrome characterized by paroxysmal pain triggered by provocation and has a well-known description as a severe, sudden, jolts of electricity like pain. Trigeminal neuralgia has an approximate incidence of 4.7/100.000 per year [1]. The cause of so-called idiopathic trigeminal neuralgia is now well known that vascular compression of the V. cranial nerve or root entry zone(REZ).In most cases, vascular compression is caused by a superior cerebellar artery loop (SCA) 80% and less commonly anterior inferior cerebellar artery loop (AICA), vein, or an intraneural vessel. Cerebral arteriovenous malformations are most commonly represented as intracranial bleeding in young patients therefore, patients with non-bleeding AVMs have a risk of 2-4% rupture and every repeated bleeding is related with a risk of 18% mortality [2]. Intracranial AVMs also may present themselves as chronic headaches, epileptic seizures, and leading to neurological deficits. In addition to this infratentorial arteriovenous malformations associated with trigeminal root entry zone are a known cause of secondary trigeminal neuralgia and AVM associated TN accounts for approximately 0.4-1.8% of TN cases [3,4]. The gold standard treatment for idiopathic TN is surgical microvascular decompression [5]. Up to date, there is no consensus for the optimal treatment method for AVM associated TN.

Case Presentation

A 54-year-old male with a 3 years history of paroxysm of electric shock-like pain which first began at his left eye, after a while the pain started to project through his temple. Pain affected patient's nutrition and chewing function. Neurological examination findings were first and second branches of the trigeminal nerve were affected without autonomic symptoms or other neurological deficits. The patient prescribed carbamazepine daily dosage of 1200 mg and the treatment was ineffective for relieving the pain without any side effects. Cranial magnetic resonance imaging (MRI) with constructive interference in steady-state (CISS) study showed a left vascular lesion consistent with the trigeminal nerve compression. The lesion was on the left pontocerebellar cistern proximal to V. Cranial nerve and the lesion was consist of tubular vascular structures, İV contrast injection cranial MRI demonstrated the pathological contrast involvement complied with nidus formation of an AVM. MVD was undertaken via the left retrosigmoid approach. Intraoperatively 'C' skin incision was made 2x2 cm craniectomy was performed. After opening dura, VII, VIII, and V. cranial nerve and superior petrosal vein were identified. The superior petrosal vein was dilated and blocking the vision of the lesion, according to this superior petrosal vein was sacrificed. The vascular structure was detected which was consist of a nidus and a drainage vein surrounding the trigeminal nerve. The vascular structure identified as AVM and total excision performed with its nidus and drainage vein. The trigeminal nerve was decompressed and it was not mandatory to use Teflon for decompression.Surgery was ended without any complication. The postoperative patient was free of pain and has no

neurological deficit. There was no complication and the patient was discharged at 3day postoperatively.No additional treatment applied after discharge.

Outcomes and Implications

We have researched the PubMed database using keywords of 'AVM', 'Bavm', 'cerebral arteriovenous malformation', 'trigeminal neuralgia', and in literature, 16 TN patients are resulting from AVM's including our case published in English (Table 1).

These patients have ages between 21-69 and which were 10 males and 6 females. These patients treated with different modalities, 1 patient had aneurysm clip combined with microvascular decompression, 1 patient had a partial surgical resection, 3 patients had embolization [6-9], 1 patient had embolization and surgical resection combination treatment and 1 patient had postoperative stereotactical radiotherapy [10,11], 2 patients had embolization with coils, 3 patients had surgical resection [12] and 4 patients had embolization and stereotactical radiotherapy combination treatment. Postoperative complications include visual agnosia, Cerebellar ataxia in 2 patients, facial hypoesthesia in 1 patient and 5 patients have been described to have a definite history of AVM hemorrhage [6,13-16].

Verbies H (1961)had applied partial resection and postoperatively developed visual agnosia [11]. Mineura K, et al. (1998) reported a patient with cerebellar AVMs-associated TN and then postoperatively developed hemiparesis, sensory disturbance, and homonymous hemianopsia [17]. Mineura K, et al. (1998) has applied total resection on the embolization threshold but developed complications of hemiparesis homonymous hemianopsia and cerebellar ataxia. Sato K, et al. (2003) described a patient with cerebellar AVMs-associated TN whose pain gradually increased in intensity after SRS [10]. Garcia-Pastor C, et al. (2006) reported two patients with cerebellar AVMs associated TN; one received MVD and clipping of an associated aneurysm and at a 9-year follow-up without hemorrhage. The second patient received MVD with complete pain relief immediately [18]. Levitt MR, et al. (2011) reported a patient with cerebellar AVMs-associated TN who had pain recurrence several years after multiple embolizations [8]. Kondo A (1997) treated with minimal EMB of PTA with coil technique and did not see any complication [19]. Feng L, et al. treated TN associated AVM with surgery after postoperative 5th day they performed a second surgery at the same patient and did a total resection. In our case, we performed a retrosigmoid approach surgery and managed to total excision without any complications (Figures 1 and 2).

Infratentorial arteriovenous malformations related to the trigeminal nerve root entrance zone are a known cause of secondary trigeminal neuralgia. Despite that, these AVMs are not common these are high-risk lesions that can also cause intracranial hemorrhages

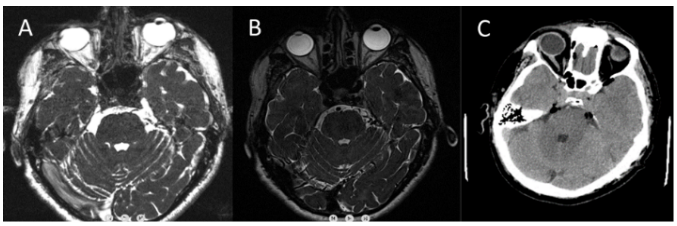

Figure 1: Preoperative T2-weighted CISS MRI (A-B) and postoperative CT (C) study of the patient.

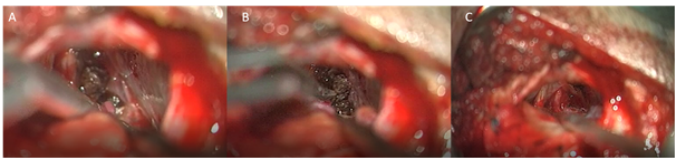

Figure 2: Intraoperative images taken through the surgical microscope(A-B-C).

Table 1: Review of the literature about TG AVMs.

Sira	Reference	Age	Sex	Compressing Vessels	Treatment	Complication
1	Verbiest,1961	23	M	SCA	AVM partial resection+ MVD	Visualagnosia,completely
						disappeared within 2 weeks
						posteroperatively
2	Mineura et al,1998	21	M	BV	Multiple EMB+AVM total resection	Hemiparesis,sensory
						disturbance and homonymous
						Hemianopsaafter EMB;
						cerebellar ataxia
3	Sato et al,2003	49	F	LMV,MMV	SRS+MVD	N/A
4	Athanasiou et al,2005	56	M	N/A	Partial AVM EMB with coils	N
5	Garcia-Pastor et al,2006	38	M	AİCA,PV	MVD+clipping of an associated aneurysm	N/A
		40	M	N/A	MVD+AVM resection	N/A
6	Lesley,2009	55	M	SCA	Partial AVM EMB with Onyx+SRS	N
7	Levitt et al,2011	13	F	N/A	Multiple AVM EMB with Onyx+EMB of AFR	Facial hypesthesia
8	Kono et al,2013	53	M	PTA	Minimal EMB of PTA with coil	N
9	Dou et al,2014	24	F	N/A	Partial AVM EMB with Onyx	N/A
10	Mori et al,2014	69	M	SCA	Partial AVM EMB+SRS	Cerebellar ataxia after EMB
11	Ge et al,2016	32	F	N/A	Near-complete AVM EMB with Onyx	N
		19	F	N/A	Partial AVM EMB with Onyx	N
		24	F	N/A	Complete AVM EMB with Onyx+SRS	N
12	Feng Ling et al,2017	47	M	SCA,LMV	AVM total resection+MVD	N
13	Present Case	54	M	SCA	AVM total resection+MVD	N

M: male; F: female SCA: superior cerebellar artery; AİCA: anterior inferior cerebellar artery; PİCA: posterior inferiorcerebellar artery; AFR: artery of the foramen rotundum; PTA: primitive trigeminal artery; BV: brachial vein; LMV: lateral pontomesencephalic vein; MMV: medial pontomesencephalic vein; SVV: superior vermian vein; PV: petrosal vein; AVMs: arteriovenous malformations; MVD: microvascular decompression; EMB: embolization; SRS: stereotactic radiosurgery; N: none; N/A: not available.

besides neurovascular compression. Infratentorial AVMs account for the 5-25% of all intracranial AVMs and treatment modalities of these lesions are include excision, endovascular embolization, and stereotactic radiosurgery. These modalities can be used independently or combined [19-22]. Cerebellar AVMs have an increased risk of morbidity and mortality of 62 to 92% and have a higher risk of hemorrhage when compared to supratentorial AVMs [23-26]. The treatment goal of a patient with an AVM related trigeminal nerve is to preserve the normal nerve function, decrease pain, and to decrease the risk of hemorrhage. Our case was a clinically typical pain of TN case and did not require any post-operative treatment after surgical excision and did not develop any postoperative complications [27-29]. There is no consensus of a treatment modality up to date in case emergency pain relief is demanded, as in our case, removal of the lesion without microvascular decompression is a good choice considering all the facts about the patient.

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Availability of Data and Materials

We obtained permission from the patient's family to use all the materials for this case report and all materials used belong to the archive of our own clinic in this case report

Authors' Contributions

Pelin K -writing,original draft, Review & Editing,

Göktuğ U - writing,original draft,

Yiğit A -Review & Editing,

Emre YM -Conceptualization, Writing - Review & Editing, Supervision,

Şükrü A- Conceptualization, Writing - Review & Editing, Supervision,

All authors read and approved the manuscript.

Conflict of Interest

The authors declare that they have no conflict of interest.

Consent for Publication

We have written and verbal obtained consent to publish from the all patients and patient's family for this case report.

Ethical Approval

Not applicable.

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