Clipping of Posterior Inferior Cerebellar Artery (PICA) Aneurysm by Far Lateral Approach – A Case Report

Khandaker Abu Talha, MBBS, MS
Square Hospitals Ltd.
Dhaka, Bangladesh

Masum Hayder, MBBS
Square Hospitals Ltd.
Dhaka, Bangladesh

Anupam Shubhranjan Apu, MBBS
Square Hospitals Ltd.
Dhaka, Bangladesh

Farhana Selina, MBBS, MD
Square Hospitals Ltd.
Dhaka, Bangladesh

Tahmina Banu, MBBS, MD
Square Hospitals Ltd.
Dhaka, Bangladesh

Selvapandian, MBBS, MCh
Square Hospitals Ltd.
Dhaka, Bangladesh

Address for Correspondence:
Khandaker Abu Talha, MBBS, MS
Square Hospitals Ltd.
Dhaka, Bangladesh
E-mail: katalha@squarehospital.com

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Aneurysms of the Posterior Inferior Cerebellar artery (PICA) and Vertebral artery (VA) represent 0.5 to 3 percent of all intracranial saccular aneurysms and about 20 percent of posterior fossa aneurysm. Patients with the PICA-VA aneurysms usually present with the subarachnoid hemorrhage (SAH) or brainstem compression.

We are presenting a forty year old lady diagnosed as spontaneous SAH due to rupture of left PICA (WFNS-III) presented with the history of two episodes of loss of consciousness associated with vomiting and seizure. Computed tomography (CT) angiography of brain was done which showed left PICA fusiform aneurysm. This aneurysm was clipped by far lateral approach. She was discharged from hospital after removing the sutures on the tenth post operative day without any new deficit with Glasgow Outcome Score 4.

There are few approaches for the clipping of PICA aneurysm. Appropriate approach for a particular patient depends on the location of the aneurysm in terms of origin of PICA, direction of the dome and its relationship with lower cranial nerves. Authors of this case found far lateral approach more convenient for a laterally located proximal segment aneurysm.

Key words: aneurysm, far lateral approach, posterior inferior cerebellar artery (PICA)

The incidence of cerebral aneurysms in the population in general is about 1 percent, large autopsy studies revealed an incidence of two to six percent[2]. Both congenital and acquired factors have been proposed. The congenital anomalies of the circle of Willis, developmental defects of tunica media and the frequency of atherosclerosis are important causes of congenital aneurysms. The arterial wall certainly has defects of the muscular coat (congenital) at the point of sacculation of aneurysm. Subsequent degeneration of the elastic lamina (acquired lesion) may result in the development of an aneurysm.

Aneurysms of the Posterior Inferior Cerebellar artery (PICA) and Vertebral artery (VA) represent 0.5 to 3 percent of all intracranial saccular aneurysms and about 20 percent of posterior fossa aneurysm. They are more common on the left vertebral artery, as this is more frequently the dominant artery. Most of the aneurysms on the VA occur at the origin of the PICA. Rarely, aneurysms may occur along the distal PICA or along the VA at the VA-basilar artery (BA) junction[4].

Patients with the PICA-VA aneurysms usually present with the subarachnoid hemorrhage or brainstem compression. Because of the proximity of the PICA to the rootlets of the lower cranial nerves, dysfunction of these cranial nerves may be present. The most frequent involved cranial nerve is the Abducens nerve; other cranial nerves often involved are the facial, glossopharyngeal, vagal and hypoglossal nerves. The computed tomography (CT) scan

of patients with ruptured PICA-VA aneurysm varies from evidence of a little blood in the fourth ventricle to massive Subarachnoid and intraventricular hemorrhage.

The PICA has the most variable course of all the cerebellar arteries. The PICA-VA aneurysm occurs at branching points or at curves and points in the direction that blood flow would have taken if the curve or branching had not been present. The PICA-VA aneurysm usually arises at the point where the VA turns medially to join the contralateral VA. The sac of the aneurysm usually points superiorly and slightly posteriorly to lie against the medulla. In the normal course of the PICA, this point usually lies 10 mm from the foramen magnum in the anterolateral subarachnoid space between the medulla, skull bone, and lower cranial nerves. In most cases the PICA rises posterolateral to the aneurysm neck, and this helps facilitate the preservation of the PICA in the lateral approach to the aneurysm. The PICA gives off perforating, choroidal, and cortical arteries. The cortical arteries are divided into vermian, tonsillar, and hemispheric groups. The PICA is divided into five segments. They are anterior medullary, lateral medullary, tonsillomedullary, telovelotonsillar, and cortical [5].

The natural history of ruptured posterior circulation aneurysms involves high mortality [7]. Richardson's study appears to show that the mortality treated posterior circulation aneurysms is higher than that of medically treated anterior circulation aneurysms [10].

In far-lateral approach the patient is placed in the lateral position and the caudal limb of the incision extends from the base of the mastoid process into the neck while the rostral limb curves dorsally onto the retrosigmoid area. Dissection of the skin flap risks injury to the spinal accessory nerve as it exit from under the sternomastoid muscle. The sternomastoid muscle is detached from the mastoid process, and underlying muscles (e.g., splenius capitus, splenius cervicis, and levator scapulae) are divided. The transverse process of the atlas is identified. Between the laminae of C1 and C2, the C2 nerve root is found and followed anteriorly to identify the vertebral artery. The vertebral artery is mobilized and followed to its point of dural entry above C1 [11].

Clipping of ruptured PICA aneurysm is very challenging and rare. We have successfully clipped a PICA aneurysm by Left retromastoid suboccipital craniectomy and far-lateral approach.

Case report

We are presenting a forty year old lady diagnosed as spontaneous SAH due rupture of left PICA (WFNS-III) presented with the history of two episode of loss of consciousness associated with vomiting and seizure. On admission her GCS was 11/15 with equal and sluggish reacting pupils. There were no focal motor deficits. CT scan brain shows subarachnoid haemorrhage predominantly in the posterior fossa with ventricular extension and hydrocephalus. Initially CT angiogram was delayed due to her high serum Creatinine level. With adequate hydration her Creatinine came down close to normal within 2 days. CT angiogram of brain was done which showed left posterior inferior cerebellar artery fusiform aneurysm. Decision was taken to clip the aneurysm through far-lateral approach.

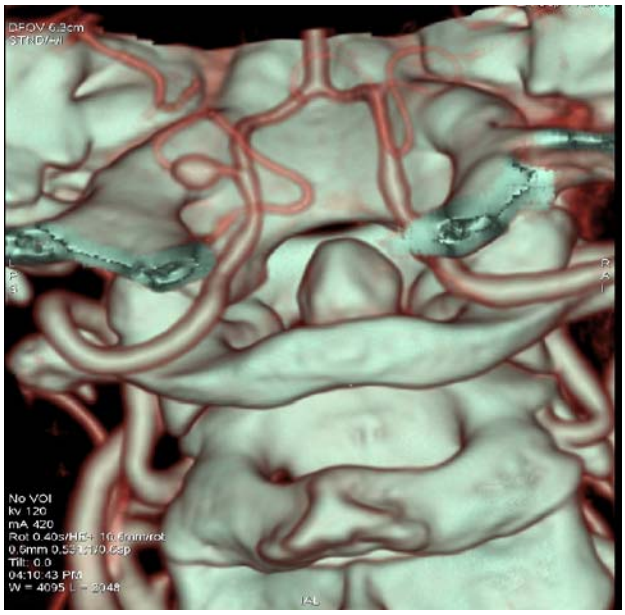

Figure 1: CT Angiogram showing left PICA aneurysm.

Under general anaesthesia patient was positioned in right lateral position, neck flexed, head was neutral and fixed with pins. A lazy "S" shaped retromastoid incision was made with the lower limb extending to the midline. Proximal control was taken in extradural VA. The aneurysm was seen wedged between the cerebellum and the spino-medullary junction. It was fusiform in shape, seen arising just distal to PICA origin. The hypoglossal nerve could be seen coursing over the intradural VA just distal to the PICA origin. The aneurysm after its origin could be seen extending superiorly with the distal vessel continuing as PICA. The aneurysm measured about 1cm in size. The spinal root of the accessory nerve could be seen coursing towards the jugular foramen. The lower cranial nerves could be seen quite superior to the aneurysm. The clot over the aneurysm was cleared out, the proximal stump of PICA identified and a 11 mm straight clip applied. Occlusion and release of the distal stump of PICA suggested retrograde filling through the distal stump and hence another 11mm straight clip was applied trapping the aneurysm. The sac had collapsed following this. The cerebellum was lax and pulsatile at the end of the surgery. Anesthetic recovery was smooth.

From the third postoperative day oral feeding was started cautiously under observation after ensuring no lower cranial nerve deficit. She did not develop any features

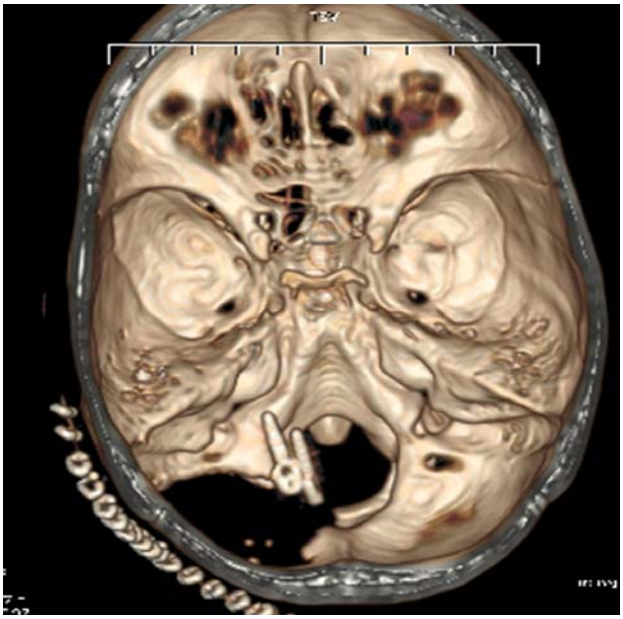

Figure 2: Post operative scan shows bone work for far-lateral approach and clips.

of lateral medullary syndrome. Her post operative recovery was relatively uneventful except for few episodes of fever which were treated by anti-pyretic drugs. Repeat CT scan of brain confirmed the location of clip in proper place without any feature of vasospasm of hydrocephalus. She was discharged from hospital after removing the sutures on her tenth post operative day without any new deficit with Glasgow Outcome Score 4.

Discussions

Authors are presenting a case report of a PICA aneurysm clipping by far lateral approach. There are few approaches for the clipping of PICA aneurysm. Appropriate approach for a particular patient depends on the location of the aneurysm in terms of origin of PICA, direction of the dome and its relationship with lower cranial nerves. According to few international studies several authors have mentioned about several approaches convenient for respective cases.

Yasargil reported 10 surgically treated patients without any mortality. Only one patient required shunt due to hydrocephalus [15]. Heros reported 15 patients who were operated with a suboccipital approach. Only two deaths occurred; one due to unclippable giant aneurysm rupture and the other one due to rupture of a partially clipped saccular aneurysm [3]. Yamaura reported 43 patients with PICA aneurysm who were treated surgically by a suboccipital approach. However in 10 cases the aneurysm was unclippable and treated by muscle wrapping [14]. Ausman et al reported the result of 11 patients of which one died from a fatal brainstem infarct [1]. Marsh and Sundt reported 51 patients of PICA aneurysm of which four patients died. 45 patients had excellent or good result [8].

Taryn et al reported the case of a patient with a right vertebral artery (VA)–PICA aneurysm that was reached via a contralateral far-lateral approach. The wide-necked saccular/fusiform aneurysm arose from the lateral aspect of the right V4 segment just proximal to the PICA origin, anterior to the jugular tubercle at the level of the hypoglossal canal. According to them a contralateral far-lateral approach to VA–PICA aneurysms should be considered when aneurysms cross the midline.

Tatemi et al. presented a ruptured distal posterior inferior cerebellar artery (PICA) aneurysm arising from the lateral medullary segment of the left PICA and located on the medial side of the left vertebral artery (VA) and the anterior surface of the medulla oblongata[13]. A transcondylar fossa approach was used to ensure a sufficient operating field and to obtain adequate visualization of the aneurysm, the parent artery, and the perforating arteries to the medulla oblongata. The aneurysm dome protruded medially at the hairpin curve, and was located on the medial side of the left VA and on the anterior surface of the medulla oblongata. The aneurysm was successfully clipped with minimum retraction of the cerebellar hemisphere and medulla oblongata.

Matsushima et al. successfully clipped a right VA-PICA aneurysm located in the anterior midline of the medulla oblongata through the transcondylar approach[9]. It was a right VA-PICA aneurysm located in the anterior midline of the medulla oblongata and at almost the same level as the hypoglossal canal. Direct clipping was first tried through the transcondylar fossa approach, but the aneurysm could not be exposed because of the obstacle created by the 12th C.N. Then the approach was changed to the transcondylar approach and partial condylectomy and partial C1 hemi-laminectomy were added. The aneurysm was clearly exposed through the approach with retraction of the medulla oblongata. A clip was successfully applied through the space between the 12th C.N. and the vertebral artery.

Liu-Guan Bian et al. clipped a left PICA via a left transcondylar approach[6]. The aneurysm was aroused from the tonsillomedullary segment of the left PICA. They selected the suboccipital transcondylar approach to minimize retraction of the cerebellum, because the aneurysm was small and its dome projected laterally and inferiorly. They found that the transcondylar approach not only provides exposure of an aneurysm, but also offers visualization of cranial nerves VII, VIII, IX, and X.

The location of aneurysm of our patient was just distal to its origin. It was clipped by a far lateral approach. Proximal control was taken in extradural VA. The aneurysm was seen wedged between the cerebellum and the spino-medullary junction. The hypoglossal nerve could be seen coursing over the intradural VA just distal to the PICA. There was no need for drilling of condylar process in our case. As it more

laterally sufficient space was present to reach the VA-PICA junction without transcondylar approach.

Clipping of PICA aneurysm is always challenging. There are multiple approaches for the clipping of this aneurysm. Authors of this case found far lateral approach more convenient for a laterally located proximal segment aneurysm.

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