Ruptured posteriorcerebralarteryaneurysmtreated with clipping in concomitantarteriovenousmalformation – case report

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Abstract: Cerebralaneurysmscoexist with arteriovenousmalformations. In tandem arteriovenousmalformation and aneurysm, in the case of haemorrhage, itisoftendifficult to indicatewhichis the source ofbleeding.Thiscancausediagnosticdifficulties.We present a case of a 40-year-old patient with subarachnoid hemorrhage, occipital malformation and concomitantaneurysm of the ipsilateral posterior cerebral artery. After clinical and neuroimaging analysis, anddiagnostic deliberations, the source of bleeding turned out to be an aneurysm. This case is significant because the aneurysm was treated by surgical clipping, which is rare today. Intravascularcoilingis the treatment of choice for vertebrobasilaraneurysms. Due to the development of endovasculartechniques, clipping of suchaneurysmshasbecomehistoricmethod.We present a procedure of clippingthroughanextendedpterionalcraniotomy. We detail the nuanses, limitations, and potentialcomplications.We also pay attention to maintaining the diagnostic vigilance of indicating the source of bleeding in the event of coexisting aneurysm and malformation.

Keywords: AMV, aneurysm, clipping, craniotomy, PCA

1. BACKGROUND

Arteriovenousmalformation (AVM) is a conglomerate of dilated and dysplasticarteries and veins [1]. Thereare no capillaries in the AVM and the abnormalcollection of bloodflows fromarteriesdirectlyinto the veins [2]. The incidence of AVM in populationis on average 0.15%, slightlymorecommon in men [2]. Theaverageage of patientsdiagnosedwith AVM is 33 years, and with aneurysmsis 43. The most commonsymptoms of AVM arebleeding, which, however, is less frequentthan with aneurysms [3]. Bleedingassociated with AVM has a 10% mortality and 30-50% morbidity [3]. AVM cancauseintracerebralhaemorrhage (ICH), intraventricularhaemorrhage (IVH), subarachnoidhemorrhage (SAH), and subduralhematoma (SDH)[2]. Intracranialaneurysmscoexist with AVM in somecases [1-3].Most of suchaneurysmsarelocatedin the mainfeedingarteries. Theyarerelated to increasedbloodflow[2,3]. Whentreating tandem AVMs and aneurysms in patients with bleeding, usuallyonly one issymptomatic and must be treatedfirst [3]. Onlyin rarecases, whentechnicallyfeasible, both AVM and aneurysmmay be treatedat the same surgicalprocedure. The location (ICH/IVH/SAH/SDH) and type of the bleedingisindicativeifthe sourceisAVM oraneurysm. Ifitisstillunclearwhatcausedhemorrhage, theoddsarethatit was aneurysm [3].

2. CASE DESCRIPTION

40-year-old patient in goodneurologicalconditio was treated in ourdepartment for SAH, computedtomographyangiography (CTA)revealedrightoccipitallobeAVMandposteriorcerebralartery(PCA)aneurysm, as shown in Figure 1.Takingintoaccountblooddistributionin the basalcisterns (Figure 2)it was concludedthat the source of bleedingwasaneurysm, and notAVM.DSA was performedbut aneurysmcould not be safelycoileddue to wideneck. The patient was qualified forsurgicalclipping, althoughthismethodisraremodernly. Theaneurysm was gained via extendedpterionalapproachand was clippedusingsiglestraight clip (Figure 3).After the operation, he developed a temporaryparesis of the ipsilateraloculomotornerve in the form of ptosis. It resulted from nerveirritationduringsurgery. The paresisresolvedspontaneouslyafter 5 weeks. The patientremained in a verygoodneurologicalcondition. After 5 months, secondsugery of AVMremoval by occipitalcraniotomy was perform. The operation was successful. No newdeficitswereobserved. The patientremained in verygoodcondition and the prognosisturned out to beveryfavorable.

3. DISSCUSION

The coexistence of AVM and aneurysmsisdescribed in the literature. Many authorsputattention on diagnosticdifficultieswhichis the source in case of haemorrhage.

Cunha et al. (1992)) hasbeendescribedcoexistinganeurysm in averaging 10% of AVM cases. His studyincludes 39 patients with thisassociation, derived from a total of 400 patients with AVM'streated in period 1970-1992 [3]. Cunha, et al. emphasizedthatgenerallysymptomaticlesion was treatedfirst, but occasionallybothlesionsweretreatedduring the same operation. Allpatientshadsurgicalorendovasculartreatment, directed to atleast one of the twotypes of lesions [3]. In Study of Cunha most common, symptomaticAVMweretreatedsurgicallyand allrupturedaneurysmswereobliterated and therewere no deaths in thatseries.Regardingourcase, we alsotreated the symptomaticlesionfirst (aneurysm). As in the study of Cunha et al., ourpatient'sprognosis was favorable. In contrast to ourdescription, in Cunha’sstudy, aneurysmsweregenerallycoiled.

Suzuki et al. (1979) describedninecases of intracranialaneurysmassociated withAVM, constituting in hisstudy 6.4% of allAVMs. Radicaloperation was performed for bothAVM and aneurysm in eightcases and for aneurysmonly in one case [4]. Suzuki et. discussedsuitability of surgicaltreatment of bothaneurysm and AVM.Although in

Suzuki'smaterial the most commontreatment was the simultaneoustreatment of both AVM and aneurysm, itrefers to AVM withoutbleeding [4]. Incontrast, inourcase,wasacutehemorrhage, soonlyaneurysm was treated.

Raper et al. (2020)describedseries of patients with intraventricular AVM-associatedaneurysmstreatedsurgically and highlighttechnicalnuances of the surgicalapproaches to theseaneurysms [5]. Thisstudyissimilar to ours, bacuseitalsodescribes the technicalnuances of dificultaneurysmsthatcoexist - just as in ourcase - with AVM [5]. Raper et al. (2020) concludedthatrupturedintraventricularaneurysmsassociated withAVMscan be treatedsurgically to reduce the risk of rebleeding in patients in whom the aneurysmsarenot accessible to endovasculartreatment [5].Also in ourcase, the ruptured PCA aneurysm was not accessible for coiling, andit was treated by clipping by extended pterional craniotomy.

Seoane et al. (1997)describedfifteenpatientsbearingsixteen PCA aneurysmsoperated in hisinstitution in a period of 10 years and paidattentionon approachesselected for eachlocation of aneurysms [6].According toSeoane et al. the first segment of PCA extends from the basilararterybifurcation to the point where the arteryreaches the level of the most lateraledge of the cerebralpeduncle [6]. Surgicalapproach for aneurysmslocated in this segment ispterionalorpretemporal [6]. In ourcase, PCA aneurysm was gained by pterionalapproachextended in the temporal and posterior. The surgicaltechniqueused in ouroperationisconsistent with the conclusions of Seoane et al. (1997).

Otherreferencedescribingoperativeapproaches to PCA aneurysmssimilar to ours was published by Heros et al. (1993). He de describedcombinedpterionaland anteriortemporalexposure for aneurysms of thislocation [7]. Heros noticedthat standard pterional skin incisionthatextendsbelow the zygomajustanterior to the traguswas used [7],exactly as in oursurgicalapproach. According to Heros et al., the onlysignificantdisadvantage of thisextendedapproach, whencompared with both the standard pterional and the subtemporalapproach, hasbeen the increase in operativetimerequired for the opening and the closure [7].

4. CONCLUSIONS

In cases of coexistence of AVM and aneurysm in patients with haemorrhage, diagnosticvigilanceshould bepreservedas toadjudicatewhich of themissympomatic. In cases ofaneurysmrupture, physicianmust be aware of the necessity of surgicalclipping, not coling,even indeeplocatedaneurysms, such as basivertebralorintraventricular.

Abbreviations

- AVM - arteriovenousmalformation
- CTA - computedtomographyangiography
- ICH - intracerebralhaemorrhage
- IVH - intraventricularhaemorrhage
- PCA - posteriorcerebralartery
- SAH - subarachnoidhemorrhage

- SDH - subduralhematoma

CompetingInterests: The authorsdeclarethattheyhave no conflict of interest.

5. REFERENCES

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Figurelegends

Figure 1. CTA showing AVM and PCA aneurysm (marked by author), A: axial, B: sagittal

Figure 2. CT showing SAH in basalcisterns

Figure 3. Post-op CT, A: axial with neurosurgical clip, B: 3D with extent of craniotomy