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AN ANATOMICAL STUDY ON THE DISTRIBUTION OF ANEURYSMS INVOLVING THE ANTERIOR COMMUNICATING ARTERY AND THE PRE-COMMUNICATING SEGMENT OF ANTERIOR CEREBRAL ARTERY IN THE POPULATION OF ASSAM

Anatomy

KEYWORDS: Aneurysm,Anterior communicating artery,Pre-communicating segment of Anterior Cerebral Artery,Population of Assam.

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ABSTRACT

In a post-mortem, dissection study of 109 brains belonging to the population of Assam which includes 19 brains belonging to the Tribal population(T) and the rest 90 brains belonging to the Non-tribal population (NT) ; the Anterior Communicating Artery (ACoA) and ACoA-A1 (pre-communicating segment of Anterior Cerebral Artery) junction were examined for the presence and distribution of aneurysms. Photographic records of aneurysms were kept and relevant data were statistically analysed using SPSS (version 16). Saccular aneurysms involving ACoA and ACoA-A1 junction were present in 12.8% of the brains.Statistically significant difference (P=0.000) of aneurysms involving the left A1-ACoA junction were present between Tribal and Non-Tribal populations of Assam. Multiple aneurysms in the ACoA and A1-ACoA junction were present in 6.4% of the population. A study of this nature is potentially of value to the Neurosurgeons and Vascular Surgeons practising in this region.

INTRODUCTION

The circle of Willis (named after the English neuroanatomist Sir Thomas Willlis) is a hexagon of blood vessels that gives rise to all of the major cerebral arteries. It is fed by the paired Internal Carotid Arteries and the Basilar artery. When the circle is complete, it contains a Posterior Communicating Artery on each side and an Anterior Communicating Artery [1].Aneurysm is a widening, dilatation or ballooning out of an artery due to weakness in its walls [2].Intracranial aneurysms are relatively common, with a prevalence of approximately 4%.85% of saccular aneurysms of the cerebral vasculature occur in the Circle of Willis. Multiple aneurysms are seen in 30% of patients. The most frequent location is in the Anterior Communicating artery (35%) [3] .An aneurysm usually occurs at the site of branching of one of the larger arteries at the base of the brain [4]. There are studies which demonstrate existence of ethnic differences in the incidence of intracranial aneurysms [5,6]A study on Intracranial Aneurysms on the population of Assam which can broadly divided into Non-Tribals (the majority) and Tribals(12.82%) has not been attempted earlier [7]

The purpose of the present study is to study the presence of aneurysms involving the Anterior Communicating artey (ACoA) , ACoA-A1(Pre-communicating segment of Anterior Cerebral Artery) junctions of both right(R) and left side(L) in the Circle of Willis and the type of aneurysms ie.single or multiple in the Circle of Willis of the human brain in the total population of Assam. Also, the study aims to asses if there exists a statistically significant difference of the above findings between the Tribal and Non-Tribal populations of Assam.

MATERIALS AND METHODS.

The permission of Institutional Ethical Committee was taken for the present study. A total of 109 brains belonging 19 Tribal and 90 Non-Tribal brains were acquired from autopsies done in the Department of Forensic Science of Gauhati Medical College & Hospital (GMCH), Guwahati, Assam. As GMCH is a referral hospital, bodies brought here are said to represent the population of Assam. Brains with intact Circle of Willis(CW) were acquired, whose autopsies were done within 6 hours of death.10% formalin was used for fixation of the brains for at least one week . Fine dissection was done to expose the Circle of Willis. Each examined Circle of Willis was serially numbered. Aneurysms present in the circle of Willis were photographed by Sony Digital Camera and their sites and type (single/multiple) recorded in a database. Statistical analysis was done using SPSS(version 16). P value ≤0.05; is considered statistically significant.

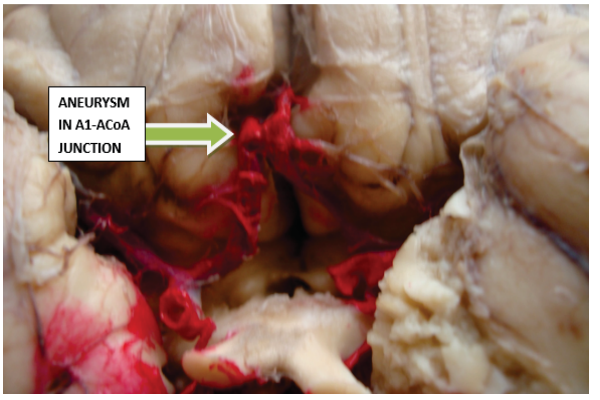


FIGURE 1:Aneurysm in ACoA-A1 junction

RESULTS AND OBSERVATIONS

ANEURYSMS		Frequency(n)	Percentage(%)	t-value	Degree Of freedom(df)	P-value
SITES OF ANEURYSMS	ACoA-A1 R	5	4.6%	0.175	5	0.868
	ACoA-A1 L	2	1.8%			
	ACoA	2	1.8%			
	A1 R-ACoA-A1 L	4	3.7%			
	ACoA, ACoA-A1 R	1	0.9%			
TYPES OF ANEURYSMS	Single	7	6.4%			
	Multiple	7	6,4%			

TABLE 1: Site-wise distribution of Aneurysms and Percentages of Single and Multiple Aneurysms.

Abbreviations :A1 R-Right sided Pre-communicating segment of Anterior Cerebral Artery,**A1 L**-Left sided Pre-communicatig segment of Anterior Cerebral Artery.

ANEURYSM SITE	TRIBAL (T)	PERCENT (%)	NON-TRIBAL (NT)	PERCENT (%)	t-value	Degree Of Freedom (df)	P-value
ACoA-A1 R	2	10.5%	3	3.3%	0.328	3	0.764
ACoA-A1 L	1	5.3%	1	1.1%	0.169	0	0.000
ACoA			2	2.2%			
A1 R-ACoA-A1 L	1	5.3%	3	3.3%	0.091	2	0.937
ACoA,ACoA-A1 R			1	1.1%			
Total	4	21.1%3	10	11.1%	0.488	12	0.634

TABLE 2: Difference between Tribal and Non-Tribal Populations in the site-wise distribution of Aneurysms.

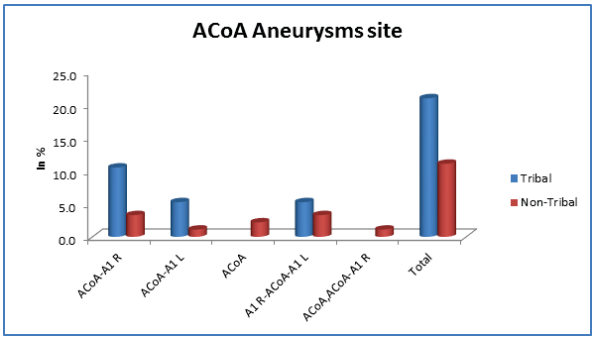


FIGURE 2: Diagram showing site-wise distribution of Aneurysms in the Tribal and Non-Tribal populations of Assam.

TYPE OF ANEURYSMS	Tribal (T)	Percent (%)	Non-Tribal (NT)	Percent (%)	Total	Per cent (%)	T-value	Degree Of Freedom (df)	P-value
SINGLE	3	15.8%	4	4.4%	7	6.4 %	0.514	5	0.630
MULTIPLE	1	5.3%	6	6.7%	7	6.4 %	0.053	5	0.960

TABLE 3: Difference of the type of aneurysms in the Tribal and Non-Tribal populations of Assam.

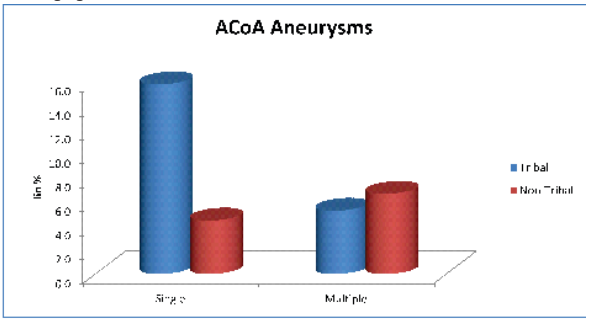


FIGURE 3: Diagram showing type of aneurysms in the Tribal and Non-Tribal populations of Assam.

In the Total population of Assam; the highest number of CW (n=5; 5%) showed aneurysms in ACoA-A1 R junction. The Circle of Willis of 4 brains(3.7%) in the population had aneurysms in A1 R-ACoA-A1 L junctions. Aneuryms were present in ACoA-A1 L junction and ACoA, with each site being involved in 2(1.8%) CW of the total population. Least number of Circle of Willis (n=1;0.9%) had aneurysms in the sites involving both ACoA, ACoA-A1 R. There was no statistically significant difference between the Right and Left side in aneurysms involving the sites, ACoA-A1 R and ACoA-A1 L respectively(*P=0.868).*Equal number (n=7; 6.4%) of brains showed Single and Multiple Aneurysms involving the ACoA and A1-ACoA junctions in Total population of Assam.

There is a highly statistically significant difference (*P=0.000)* between the Tribal (n=1; 5.3%) and Non-Tribal populations (n=1; 1.1%) which showed aneurysms in ACoA-A1 L junction sites. There is no statistical differences between each of the type of aneurysms ie.single and multiple ,between the Tribal and Non-Tribal populations of Assam.All the aneurysms observed are saccular.

DISCUSSION:

Kitami et al [8], examined 704 aneurysm patients ,the site distribution being : ACoA 27% and Anterior cerebral artery 6%. Karazincir et al [9],found aneurysms in ACoA(30%) of cases with aneurysms of which 17% had multiple aneurysms.Kayembe et al [10],in a study of 44 complete CW with aneurysm found most CW had aneurysms involving the ACoA (n=27; 40.3%) of which 10 CW were involved in each of both ACoA and Right ACoA-ACA(Anterior Cerebral Artery) junction. The Left ACoA-ACA junction had aneurysm in 7 cases. In the present study of the CW in the population of Assam, the ACoA was involved in aneurysms of 12.8% of population, with multiple aneurysms involving ACoA being present in 6.4% of the total population. There is a statistically significant difference between aneurysm involving ACoA-A1 L junction between Tribals (5.3%) and Non-Tribals (1.1%). Quintero-Oliveros et al [11] ,in a study of aneurysm of CW in a sample of mestizo Colombian population, 33.3 % aneurysms were present in the ACoA and 11.1% werte present in A1. Kapoor and Kak, [12] examined 1000 brains obtained from autopsies done in P.G.I. , Chandigargh found 7 brains with aneurysm in the junction of Anterior Communicating artery with Anterior cerebral arteries,4 0n the left and 3 on the right side. In 2 specimens Aneurysm was found in the middle of ACoA. Ohaegbulam et al[13],reported racial differences in the incidence of aneurysms and found whites more prone to having aneurysm than black population which was similar to present study where Tribals had more aneurysms than the Non-Tribals in the ACoA-A1 L junction.Also similar to present study Multiple aneurysms have been reported by Riggs and Rupp [14], Inagawa and Hirano[15], Vare and Bansal[16] ,Bigelow[17],Chason and Hindman[18]. In India; Ramamurthi [19] found 30% of aneurysms in Anterior cerebral and Anterior Communicating arteries,Sambasivan et al [20] observed 31% of aneurysms in the Anterior cerebral artery,Tandon[21] found 24.8% aneurysms on the ACoA .Incidence of aneurysms involving the ACoA and ACoA-A1 junctions in the present study is less than those reported by similar studies done in India and other countries.

CONCLUSION

Its important to know about the incidence and multiplicity of aneurysms in a particular population or ethnic race while performing a radical neurovascular surgery. Also, it helps to asses the risk and prevent subarachnoid hemorrhage

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