

EPIDEMIOLOGICAL, CLINICAL AND LABORATORY PROFILE OF PATIENTS SUBMITTED TO MICRO-SURGICAL TREATMENT BY MULTIPLE ANEURYSMS AT THE GUILLERMO ALMENARA HOSPITAL FROM 2010 TO 2017

Perfil epidemiológico, clínico y de laboratorio de los pacientes sometidos a tratamiento microquirúrgico por aneurismas múltiples en el Hospital Guillermo Almenara del 2010 al 2017

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ABSTRAC

Objective: Multiple aneurysms are common in patients with subarachnoid hemorrhage, their characteristics influence the prognosis of the patient, so their study and analysis are relevant. The objective of this study was to know the epidemiological, clinical and lab characteristics of patients with multiple aneurysms in a surgical treatment in the Guillermo Almenara Irigoyen National Hospital (HNGAI) from January 2010 to August 2017.

Methods: This study was descriptive, cross-sectional retrospective study with epidemiological type. We found 311 cases of patients with aneurysm clipping procedure of which 57 corresponded to a multiple aneurysm.

Results: Of the total number of patients, 71.93% were 50 or older, 75.44% were women and 82.46% were from the coast of the country. It was found that 28% of the patients had previous hypertension. 64.91% of patients had a Glasgow scale of 14-15 on admission, 47.37% were in the Hunt Hess II stage and 45.62% in the Fisher IV Scale. The most frequent location of the multiple aneurysms was the combination of middle cerebral artery - middle cerebral artery and the combination of middle cerebral artery - posterior contralateral communicating artery.

Conclusions: Multiple aneurysms are a frequent pathology related to female sex, advanced age and history of hypertension. The predominant affection is the middle cerebral artery, bilaterally.

Keywords: Subarachnoid Hemorrhage, Intracranial Aneurysm, Middle Cerebral Artery. (source: MeSH NLM)

RESUMEN

Objetivo: Los aneurismas múltiples son frecuentes en pacientes con hemorragia subaracnoidea, sus características influyen en el pronóstico del paciente por lo que su estudio y análisis es relevante. El objetivo del presente estudio fue conocer las características epidemiológicas, clínicas y de laboratorio de los pacientes con aneurismas múltiples sometidos a tratamiento quirúrgico en el Hospital Nacional Guillermo Almenara Irigoyen (HNGAI) de enero de 2010 hasta agosto de 2017.

Métodos: Este estudio fue descriptivo, retrospectivo transversal de tipo epidemiológico. Se encontraron 311 casos de pacientes con procedimiento de clipaje de aneurisma de los cuales 57 correspondían a aneurismas múltiples.

Resultados: Del total de pacientes, el 71.93% tenían 50 o más años, 75.44% eran mujeres y 82.46% procedían de la costa del país. Se encontró que el 28% de los pacientes tenía como antecedente hipertensión arterial. El 64.91% de los pacientes tenían una escala de Glasgow de 14-15 al ingreso, 47.37% se encontraban en el estadio Hunt Hess II y 45.62% en la Escala de Fisher IV. La localización más frecuente de los aneurismas múltiples fue la combinación arteria cerebral media - arteria cerebral media y la combinación de arteria cerebral media - arteria comunicante posterior contralateral.

Conclusiones: Los aneurismas múltiples en el HNGAI son una patología frecuente relacionada al sexo femenino, edad avanzada y antecedente de hipertensión arterial. La afectación prevalente es la arteria cerebral media, bilateralmente.

Palabras clave: Hemorragia Subaracnoidea, Aneurisma Intracraneal, Arteria Cerebral Media (fuente: DeCS Bireme)

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Multiple aneurysms are a frequent pathology that can be found in 20 to 34% of patients with subarachnoid hemorrhage due to a ruptured aneurysm,¹ the prognosis of these patients being less favorable than that of those with a single aneurysm². Thus, *Seppo Juvela* reports a mortality of 40 to 50%¹. Given this high incidence, there is a need to know more in depth the factors involved in its etiology and pathophysiology, as well as the environmental and genetic factors associated with the development of this pathology.

Previous studies in our country on surgical and endovascular management of aneurysms show in general that aneurysms are more prevalent in women and occur between the fifth and seventh decade of life, however, their most frequent location differs from that found in international studies.

Rocca et al in a study from 1983 to 2001, found that the most frequent location was the posterior communicating artery, followed by the middle cerebral artery and the anterior communicating artery, this latter location being the most frequent in American studies. He also found that multiple aneurysms were present in 16.12% and when they were associated with an arteriovenous malformation, 1.48% more multiple aneurysms were added¹⁸. Other studies based on large populations have shown that advanced age and female sex are significantly associated in the presence of subarachnoid hemorrhage, although this relationship is controversial in patients with multiple aneurysms.²

Given the need to know better the factors related to this pathology, we conducted the present study whose objective was to know the epidemiological profile of patients operated for multiple aneurysms at the Guillermo Almenara National Hospital between 2010 to 2017.

METHODS

Between January 2010 and August 2017, data were collected on all patients operated for multiple aneurysms at the Guillermo Almenara Irigoyen National Hospital (HNGAI). The inclusion criteria were: Patient of any age who had a radiological clinical diagnosis of 2 or more ruptured or unruptured cerebral aneurysms, who had undergone surgical treatment. The exclusion criteria were: Patients diagnosed with a single aneurysm and who only received endovascular treatment.

The present study is observational, retrospective and descriptive cross-sectional since the characteristics of the study subjects were analyzed making use of the data collection in a single moment. Likewise, it is of epidemiological type because it sought to find the measurable rates on the variables to be studied.

Respect to the sample, an accidental non-probabilistic type of sampling was used, all patients with a diagnosis of Multiple Brain Aneurysms were considered in the study period, and the data collection instrument was the clinical record of hospitalization from the HNGAI Neurosurgery Department between January 2010 and August 2017.

The obtaining of data is done taking as a source the Statistical Office of the Guillermo Almenara Irigoyen National Hospital where the patients were searched according to the procedure name as "Clipping of Aneurysm", which is coded, obtaining a total of 311. In the period studied, a detailed review of clinical records was carried out in the Hospital Archive, considering only 57 cases that presented the diagnosis of 2 or more cerebral aneurysms, regardless of location or rupture.

RESULTS

Of the total number of patients diagnosed with cerebral aneurysm in the study period, only 57 patients (18.33%) presented 2 or more aneurysms, classified as Multiple Aneurysms and being subjects of our study.

Regarding the diagnostic age of patients with multiple aneurysms, it was possible to show that the greatest number of patients were elderly, so that 41 patients (71.93%) were 50 years old or older, as shown in table N° 1

Table N° 1: Age groups in patients with multiple aneurysms operated in the HNGAI 2010 to 2017

AGE (years)	NUMBER	%
0 a 20	1	1.75
20 a 29	3	5.26
30 a 39	6	10.53
40 a 49	6	10.53
50 a 59	12	21.05
60 a 69	14	24.56
70 o more	15	26.32
TOTAL	57	100

Regarding sex, it was observed that most patients were women (75.44% versus 24.56% of men). Also, on the place of origin it was determined that 47 patients (82.46%) came from the coast, 9 patients (15.79%) from the sierra and only 1 patient (1.75%) was from the jungle.

In relation to the risk factors associated with the presentation of multiple aneurysms, it was possible to determine that the majority of patients (47.38%) had no pathological history. Of the patients who, if they had an associated factor, it could be determined that the main factor was Hypertension in 28.07% of the cases, followed by Diabetes Mellitus in 10.53%, as shown in Table N° 2.

Table N° 2: Medical History in patients with multiple aneurysms operated in the HNGAI 2010 to 2017.

MEDICAL HISTORY	NUMBER	%
Arterial Hypertension	16	28.07
Diabetes Mellitus	6	10.53
Dyslipidemia / Obesity	1	1.75
Smoking	1	1.75
Alcoholism	0	0
Endocrinopathy	1	1.75
Hematological alteration	1	1.75
Other	4	7.02
None	27	47.38
TOTAL	57	100

When assessing the Glasgow Coma Scale (GCS) at admission, it could be observed that 64.91% of patients had a Glasgow Scale of 14-15 points, but this percentage decreased to 59.65% in the immediate presurgical period. This difference is justified in the increase of patients with a Glasgow scale of 9 to 13 points, which was 24.56% at admission and 29.82% in the immediate presurgical period. Patients with GCS of 8 or less were maintained in the same percentage (10.53%) if we compared admission with immediate presurgical admission.

If we observe the classification of subarachnoid hemorrhage at the entrance of these patients, with the Hunt & Hess Scale, we observed that 27 patients (47.37%) admitted with severe headache and meningeal signs (Hunt Hess II) as can be seen in the Table N° 3.

Table N° 3: Hunt and Hess scale in patients with multiple aneurysms operated in the HNGAI 2010 to 2017.

HUNT HESS	NUMBER	%
Unruptured	5	8.77
I	7	12.28
II	27	47.37
III	11	19.30
IV	6	10.53
V	1	1.75
TOTAL	57	100

When applying the Fisher's Scale to the admission of patients with multiple aneurysms it was evidenced that 26 patients (45.62%) had an intraparenchymal hematoma or intraventricular irruption, as shown in Table N° 4.

Table N° 4: Fisher's scale in patients with multiple aneurysms operated in the HNGAI 2010 to 2017.

FISHER SCALE	NUMBER	%
Unruptured	5	8.77
I	2	3.51
II	3	5.26
III	21	36.84
IV	26	45.62
TOTAL	57	100

Most of the multiple aneurysms were conformed by the presence of 2 cerebral aneurysms, their main location was in the both Middle Cerebral Artery (bilaterally) as well as the presentation of the Middle Cerebral Artery with Contralateral Posterior Communicating Artery (both with 19.3%). The combination of Middle Cerebral Artery and Internal Carotid Artery, or both Posterior Communicating Artery, was presented in 8.77%, being the second place in frequency. While the presence of 3 or more aneurysms is rare, presenting only in 5.26%, as can be seen in Table N° 5.

Table N° 5: Location of multiple aneurysms in patients with multiple aneurysms operated in the HNGAI 2010 to 2017.

LOCATION	NUMBER	%
MCA Bilateral	11	19.30
Múltiples de AComA	2	3.51
PCoMA Bilateral	5	8.77
ICA Bilateral	1	1.75
MCA + AComA	4	7.02
MCA + PCoMA	11	19.30
MCA + ICA	5	8.77
AComA + ICA	3	5.26
AComA + PCoMA	2	3.51
PCoMA + ICA	4	7.02
Other locations	6	10.53
3 o more aneurysms	3	5.26
TOTAL	57	100

CMA: Cerebral Media Artery, AComA: Anterior Communicating Artery, PCoMA: Posterior Communicating Artery, ICA: Internal Carotid Artery.

Regarding associated laboratory factors, it was observed that the great majority were not recorded in the medical records. Among the conspicuous laboratory data reported, it was observed that the majority had normal natremia values, leukocytosis without left deviation in its majority and hyperglycemia

DISCUSSION

The literature reports that between 20% and 30% of patients with an intracranial aneurysm have additional intracranial aneurysms ^{1,2}. In our setting, Rocca et al in an 18-year study (1983-2001) found that multiple aneurysms were present in 16.12% ¹⁸. In our study we found a percentage similar to that of Rocca (18.33%), although less than the described in the foreign literature, probably due to underdiagnosis of the same because it is not protocolized to perform an emergency pan-angiography of the brain, in those patients who require emergency surgery.

McDowell et al ³ found in their study that 9.4% of patients had 3 or more aneurysms, and Kaminogo et al ² found that 13.02% of patients had 3 or more aneurysms, this data is higher than 5.26% of patients found by our study presenting 3 or more aneurysms.

Kaminogo et al found in their study that 33.8% of patients with aneurysms had multiple lesions and were women, while 10.2% had multiple aneurysms and were male, practically in a ratio of 3 to 1², this result agrees with our results in the same proportion of 3 to 1 (75.44% in women and 24.56% in men).

With respect to the age groups, Kaminogo et al observed that the highest percentage of patients was diagnosed with multiple aneurysms after 50 years, in an approximate average of 20%², as can also be observed in our study in similar percentages.

When the background was studied, McDowell et al showed that the main association with multiple aneurysms was first with Arterial Hypertension, although this association was not statistically significant, and found that the only statistically significant medical history was polycystic kidney disease. Juvela et al¹ also found that the main factor associated with multiple aneurysms was high blood pressure. In our study, we found that most patients did not have any associated factor, but those who did had it were mostly associated with arterial hypertension, coinciding with international studies.

Kaminogo et al found in their study that the main arteries affected in multiple aneurysms in male patients was the Middle Cerebral Artery (33.8%), followed by the Anterior Communicating Artery (28.8%), and in women it was the internal carotid artery (35.9%) followed by the middle cerebral artery (22.8%)². Compared to our study, we could observe a coincidence, which is the high prevalence of multiple aneurysms in the middle cerebral artery (19.3%) followed by the association of the cerebral artery mediated with the posterior communicating artery (19.3%).

Kaminogo et al found in their study that the majority of patients arrived in Hunt Hess I and II (38.1%)², somewhat similar to what was described in our study, where the Hunt Hess I and II occupy the majority with 59.65%

McDowell et al, describes in his study an average of Fisher's Scale value of the patients, resulting in Fisher's degree 2.52, something different from our reality, where we find that Fisher's scale is the most frequent III and IV, which in total make 82.46% of patients. It is also worth mentioning that it is questionable that Fisher's degree has been processed as a quantitative variable, when it is qualitative.

According to Sablotzki et al,¹⁴ leukocytosis is an expected response in patients with a ruptured aneurysm, and may even be related to an increased production of myeloperoxidase, and this is in relation to that found in our study, since patients with laboratory values reported, it could be found that the highest percentage (15.79%) presents leukocytosis, and this does not have a deviation to the left in its majority (22.8%), that is, this could indicate that leukocytosis is not due to an infectious disease, but to the same inflammatory process of aneurysmal rupture.

In Peru, Rocca et al found that the predominance of sex was female, with a ratio of 1.5 to 1, whereas we have found that this relationship has doubled to 3 to 1, and this is probably due to the fact that in our study we only included patients with multiple aneurysms. On the other hand, the age over 50 years for the presentation of ruptured cerebral aneurysms is still predominant, and on its clinical presentation Rocca found that 61.19% had a low Hunt Hess (II or lower), similar to 68.42% that was found in the present study. On Fisher's scale, Rocca found that 50.6% were III and IV, and in this study a higher percentage of 82.46% was found. In the Rocca study it was found that the most frequent location of aneurysms in general was the posterior communicating artery, but a predominant location is not described in the case of multiple aneurysms.¹⁸

CONCLUSION

After carrying out this descriptive study, it can be concluded that multiple aneurysms in the Guillermo Almenara National Hospital is a frequent pathology, found in 18.33% of patients with aneurysms. And that they are related to the female sex and the history of high blood pressure.

In addition, it was observed that the main artery affected is the Middle Cerebral Artery. It was also observed that this type of patients has a non-infectious leukocytosis reactive to the disease.

It can be evidenced that the incidence of patients with multiple aneurysms in the Guillermo Almenara Hospital remains constant, with predominance of females, patients with advanced age and on admission there is a good clinical stage, seen in the Hunt Hess under admission. However, it is necessary to continue studying the specific group of multiple aneurysms over the years, in order to show some epidemiological variation that may contribute to the development of public health policies.

Finally, it should be emphasized that the findings are only observed data, which have no statistical causal relationship. Faced with these results, new analytical studies are suggested in order to determine the risk factors associated with these pathologies, as well as the best management of associated complications.

REFERENCES

1. Juvela S. Risk factors for multiple intracranial aneurysms. *Stroke*. 2000; 31:392-397.
2. Kaminogo M, Yonekura M, Shibata S. Incidence and outcome of multiple intracranial aneurysms in a defined population. *Stroke*. 2003; 34:16-21.
3. McDowell M, et al. Demographic and clinical predictors of multiple intracranial aneurysms in patients with subarachnoid hemorrhage. *J Neurosurg*. 2017 Jun; 9:1-8.

4. Shen X, Xu T, Ding X, et al. Multiple Intracranial Aneurysms: Endovascular Treatment and Complications. *Interventional Neuroradiology*. 2014; 20:442-447.
5. Mizoi K, Suzuki J, Yoshimoto T. Surgical treatment of multiple aneurysms. Review of experience with 372 cases. *Acta Neurochir (Wien)* 1989; 96:8-14.
6. Vajda J. Multiple intracranial aneurysms: a high-risk condition. *Acta Neurochir (Wien)*. 1992; 118:59-75.
7. Rinne J, Hernesniemi J, Puranen M, Saari T. Multiple intracranial aneurysms in a defined population: prospective angiographic and clinical study. *Neurosurgery*. 1994; 35:803-808.
8. Rinne J, Hernesniemi J, Niskanen M, Vapalahti M. Management outcome of multiple intracranial aneurysms. *Neurosurgery*. 1995; 36:31-38.
9. Østergaard JR, Hog E. Incidence of multiple intracranial aneurysms: influence of arterial hypertension and gender. *J Neurosurg*. 1985; 63:49-55.
10. Qureshi AI, Suarez JI, Parekh PD, Sung G, Geocadin R, Bhardwaj A, Tamargo RJ, Ulatowski JA. Risk factors for multiple intracranial aneurysms. *Neurosurgery*. 1998; 43:22-27.
11. Sablotzki A, Ebel H, Mühling J, et al. Dysregulation of immune response following neurosurgical operations. *Acta Anaesthesiol Scand*. 2000 Jan; 44(1):82-7.
12. McLaughlin N, Bojanowski MW. Early surgery-related complications after aneurysm clip placement: an analysis of causes and patient outcomes. *J Neurosurg*. 2004 Oct; 101(4):600-6.
13. Malinova V, Schatlo B, Voit M, Suntheim P, Rohde V, Mielke D. The impact of temporary clipping during aneurysm surgery on incidence of delayed cerebral ischemia after aneurysmal subarachnoid hemorrhage. *J Neurosurg*. 2017 Sep; 15:1-7.
14. Canhão A, Pinto A, Ferro H. et al Smoking and aneurysmal subarachnoid hemorrhage : A case-control study. *J Cardiovasc. Risk*. 1994; 1: 155-158.
15. Hope JKA, Wilson JL, Thompson FJ. Three-dimensional CT angiography in the detection and characterization of berry aneurysms. *Am J Neuroradiol*. 1996; 17: 439-445.
16. Phillips LH, Whisnant JP, O'Fallon WN et al. The unchanging pattern of subarachnoid hemorrhage in a community. *Neurology*. 1980; 30: 1034-1040.
17. Rodríguez-Yañez M, Castellanos M, Freijo MM, López Fernández JC, Martí-Fábregas J, Nombela F, et al. Guías de actuación clínica en la hemorragia intracerebral. *Neurología*. 2013; 28(4):236-249.
18. Rocca U, Rosell A, Dávila A, Bromley L, Palacios F. Aneurismas Cerebrales. *Revista de Neuropsiquiatría*. 2001; 64: 382-406.
19. Qureshi AI, Suarez JI, Parekh PD, et al. Risk factors for multiple intracranial aneurysms. *Neurosurgery*. 1998 Jul; 43(1):22-6.
20. Ellamushi HE, Grieve JP, Jäger HR, Kitchen ND. Risk factors for the formation of multiple intracranial aneurysms. *J Neurosurg*. 2001 May; 94(5):728-32.
21. Wang GX, Liu LL, Wen L, et al. Morphological characteristics associated with rupture risk of multiple intracranial aneurysms. *Asian Pac J Trop Med*. 2017; 10(10):1011-1014.
22. Jeon HJ, Lee JW, Kim SY, et al. Morphological parameters related to ruptured aneurysm in the patient with multiple cerebral aneurysms. *Neurological Research*. 2014; 36(12):1056-1062.
23. Zhang Y, Yang X, Wang Y, et al. Influence of morphology and hemodynamic factors on rupture of multiple intracranial aneurysms: matched-pairs of ruptured-unruptured aneurysms located unilaterally on the anterior circulation. *BMC Neurology*. 2014; 14:253.
24. Jabbarli R, Dinger TF, Darkwah Oppong M, et al. Risk Factors for and Clinical Consequences of Multiple Intracranial Aneurysms: A Systematic Review and Meta-Analysis. *Stroke*. 2018 Apr; 49(4):848-855.
25. Lu HT, Tan HQ, Gu BX, Wang W, Li MH. Risk factors for multiple intracranial aneurysms rupture: a retrospective study. *Clin Neurol Neurosurg*. 2013; 115(6):690-694.
26. Doddasomayajula R, Chung BJ, Mut F, et al. Hemodynamic characteristics of ruptured and unruptured multiple aneurysms at mirror and ipsilateral locations. *Am J Neuroradiol*. 2017; 38(12):2301-2307.
27. Baumann F, Khan N, Yonekawa Y. Patient and aneurysm characteristics in multiple intracranial aneurysms. *Acta Neurochir Suppl*. 2008; 103:19-28.

Disclosures

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

Authors Contributions

Conception and design: All authors. *Drafting the article:* Vargas. *Critically revising the article:* Palacios, Vargas. *Reviewed submitted version of manuscript:* Vargas. *Approved the final version of the manuscript on behalf of all authors:* Vargas.

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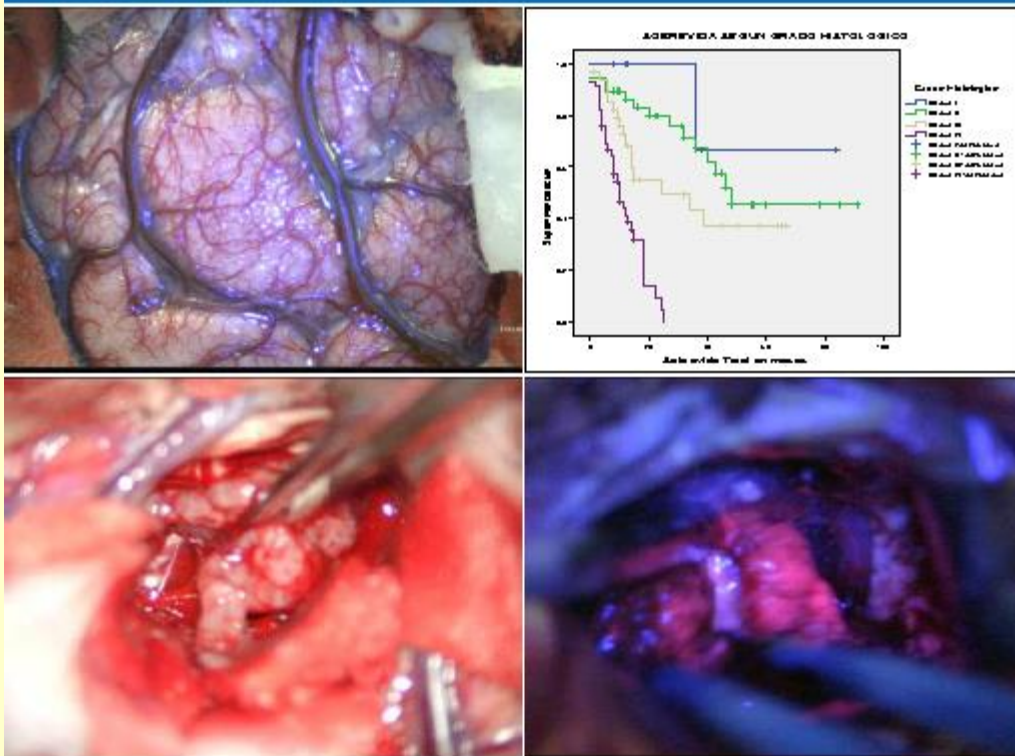
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CEREBRAL GLIOMAS



Survival and Advances in Surgery of Gliomas