

ORIGINAL ARTICLE

EVALUATE VARIOUS FACTORS RELATED TO MORTALITY IN PATIENTS AFFECTED BY HYPERTENSIVE CEREBELLAR HEMORRHAGE

Sohrab Sadeghi¹, Masoud Hatefi², Aryoobarzan Rahmatian³, Hassan Reza Mohammadi¹

¹Department of Neurosurgery, School of Medicine, Imam Hossein Hospital, Shahid Beheshti University of Medical Sciences, Tehran, ²Department of Neurosurgery, School of Medicine, Ilam University of Medical Sciences, Ilam, ³Department of Neurology, School of Medicine, Ilam University of Medical Sciences, Ilam, Iran.

ABSTRACT

Background: Hypertension is the most common cardiovascular disease that often causes stroke. The objectives of this study were, to evaluate the effects of level of consciousness, volume of hematoma, time interval between diagnosis and surgery and systolic blood pressure with mortality due to hypertensive cerebellar hemorrhage.

Materials & Methods: In this descriptive study, all patients who underwent surgery from 1st January 2021 to 31st December 2021 due to cerebellar HTN hemorrhage in Imam Khomeini Hospital were investigated. After performing neurological examinations and determining the level of consciousness using the GCS criteria in all patients, brain CT-scan was performed. The indication for surgery was determined based on clinical examination and CT findings. The demographic and research variables were noted on preformed proforma. Data analysis was carried out using the descriptive in SPSS ver. 16.

Results: Total 25 patients were included in this study, in which 16 were female and 23 were older than 50 years age. Regarding the disease outcome, death occurred in 1 man and 10 women and similarly death occurred in 1 patient under 50 years of age, and 10 in patients over 50 years old. There was no relationship between M (SD) of systolic blood pressure and hematoma volume with mortality ($P > 0.05$), but the mortality rate was higher in patients with longer diagnosis-to-surgery interval and those with a lower level of consciousness (p -value 0.001).

Conclusion: Patients with cerebellar hematoma should be operated early, as delay can lead to increased mortality.

KEY WORDS: Hypertension; Outcomes; Hypertension cerebellar.

Cite as: Sadeghi S, Hatefi M, Rahmatian A, Mohammadi HR. Evaluate various factors related to mortality in patients affected by hypertensive cerebellar hemorrhage. *Gomal J Med Sci* 2023 Oct-Dec;21(4):235-9. <https://doi.org/1046903/gjms/21.04.1316>

INTRODUCTION

Heart diseases caused the death of 17.9 million people in the world in 2016, and 57% of CVA-related deaths occurred due to hypertension (HTN).¹ HTN is the most common cardiovascular disease that often causes stroke, heart attack and chronic kidney failure.² The HTN prevention and control has received special attention, but it is still not properly observed

Corresponding Author:

Dr. Hassan Reza Mohammadi, Associate Professor
Department of Neurosurgery
School of Medicine, Imam Hossein Hospital,
Shahid Beheshti University of Medical Sciences
Tehran, Iran
E-mail: Mohammadihassanreza40@gmail.com

Date Submitted: 29-03-2023

Date Revised: 15-09-2023

Date Accepted: 17-10-2023

and a large number of Iranian hypertensive patients do not know about their disease. HTN causes a lot of disability in patients and is known as one of the 25 factors affecting disability.³

The number of hypertensive patients in high-income countries (HICs) and in low-middle-income countries (LMICs) was equal to 349 million people and 1.04 billion people in 2010, respectively. It is predicted that the number of hypertensive patients will increase from 918 million in 2000 to 1.56 billion. In fact, the HTN prevalence was 23.8%, and 31.5% in LMIC in 2000 and 2010, respectively. The same figure was also equal to 31.1%, and 28.5% in HIC in 2000, and 2010, respectively. Also, aware and controlled rate in LMIC during the years 2000 and 2010 was 44.5%, was 5.6%, -0.7%, respectively. While the same figures in HIC between 2000 and 2010 were equal to 11.10%, 8.80%, and 10.5%, respectively.^{4,5} In LMIC, the average age of hypertension onset is lower than

in HIC and more than half of hypertensive patients live in LMIC.^{6,7}

HTN causes many complications such as stroke and its treatment are a global challenge.⁸ HTN, the most common causes of stroke, include cerebral function disorders of vascular origin with rapidly progressive focal or diffuse clinical manifestations for 24 hours or longer, which sometimes leads to hemorrhage and death. The prevalence of stroke types, including ischemic hemorrhage, intracerebral and subarachnoid stroke was 87%, 10%, and 3% in the US, respectively.⁹ Depending on the area and extent of involvement that occurs in HTN-induced CVA, it leads to surgery, disability, or death.^{10, 11} Hypertensive cerebral hemorrhage (HCH) is one of the complications of HTN.¹¹ HCH has a rapid spread and slow recovery.

Although HTN is a preventable factor in causing cerebral hemorrhages, fundamental preventive measures have not been taken.^{12, 13, 24} The objective of this study were to evaluate the effects of level of consciousness, volume of hematoma, time interval between diagnosis and surgery, and systolic blood pressure with mortality due to hypertensive cerebellar hemorrhage.

MATERIAL AND METHODS:

In this descriptive study, all patients who underwent surgery from 1st January 2021 to 31st December 2021 due to cerebellar HTN hemorrhage in Imam Khomeini Hospital were investigated. These patients were admitted to the emergency room and underwent surgical consultation due to decreased level of consciousness or headache. They were included in the study if they met the inclusion criteria.

After performing neurological examinations and determining the level of consciousness using the GCS criteria in all patients, brain CT-scan was performed. Patients were placed in the prone posture, were subjected to subaxial craniectomy based on CT-Scan findings and hematoma drainage was performed for them. Ventriculostomy was performed during hematoma drainage and continued through external ventricular drainage to reduce ICP and eliminate hydrocephalus.

The inclusion criterias were decrease in the level of consciousness in patients based on the GCS scale, the presence of hematoma and hydrocephalus in the brain. Patients with GCS less than 3 or patients with no motor response or non-reactive pupils were excluded from the study. Data analysis was carried out using SPSS ver. 16.

RESULTS

Total 25 patients were included in this study, in which 16 were female and 23 were older than 50 years age. The associated diseases and other variables are shown in table 1. Moreover, cerebellar vermis and

cerebellar hemisphere were reported in 5(20%) and 13(52%) patients, respectively (Table 2).

Table 1- Patient characteristics

Variable		N	%
History of diabetes		5	20%
Hypertension at the time of admission		25	100%
Under regular blood pressure treatment		5	20%
History of CVA and previous hemiparesis		2	9%
GCS time of admission	4-8	9	36%
	9-12	6	24%
	13-15	10	40%
GCS time of surgery	4-8	17	68%
	9-12	7	27%
	13-15	1	4%
Headache	Yes	25	100%
	No	0	0
Nausea and vomiting	Yes	24	96%
	No	1	4%
Hemiplegia	Yes	5	20%
	No	20	80%
Ataxia	Yes	25	100%
	No	0	0
Nystagmus	Yes	24	96%
	No	1	4%

Table 2 - CT scan results

Variable		N	%
Hematoma site	Cerebellar vermis	5	20%
	Cerebellar hemispheres	13	52%
	vermis and cerebellar hemisphere	7	28%
Fourth ventricle	Complete closure	12	48%
	Partial closure	9	35%
	IVH	4	17%
Presence of hydrocephalus	Yes	19	76%
	No	6	24%

Table 3-Frequency of death in patients with cerebellar hemorrhage according to gender

Variable		Consequences of the disease		P-value
		Death	Live	
Gender	Man	1(9.1%)	8(57.1%)	0.001
	Female	10(90.9%)	6(42.9%)	
	Total	11(100%)	14(100%)	
Age	Under 50 years	1(9.1%)	1(7.1%)	0.001
	Over 50 years old	10(90.9%)	13(92.9%)	
	Total	11(100%)	14(100%)	

Table 4- M(Sd) status of variables related to the level of consciousness of patients with cerebellar hemorrhage according to outcome

Variable		Consequences of the disease		P-value
		Death	Live	
level of consciousness	Time of admission	5.82(1.72)	8.64(2.06)	0.001
	Time of surgery	8(2.49)	12.21(2.04)	
Systolic blood pressure (mmHg)	Less than 200	3(27.3%)	5(35.7%)	0.65
	More than 200	8(72.7%)	9(64.3%)	
Hematoma volume	Less than 30 cc	7(63.3)	18(57.1%)	0.72
	30 cc and more	4(36.4%)	6(42.9%)	
Time interval from diagnosis to surgery	M(Sd)	18.54(11.77)	4.71(3.15)	0.001

Regarding the disease outcome, death occurred in 1 (9.1%) man and 10 (90.9%) women and similarly in 1 (9.1%) in people under 50 years of age, and 10 (90.9%) in people over 50 years old (Table 3).

There was no relationship between M(SD) of systolic blood pressure and hematoma volume with mortality ($P > 0.05$), but the mortality rate was higher in patients with longer diagnosis-to-surgery interval and those with a lower level of consciousness. (Table 4).

DISCUSSION

Diseases of the nervous system cause various complications, which have negative effects on all aspects of the patient's quality of life.²⁷⁻³⁰ HTN can cause CVA, followed by complications such as paralysis, speech disorders, motor restriction or disability.¹⁴ If HCH occurs due to CVA, surgery can be performed to reduce pressure in the brain. One of these methods is decompressive craniectomy.^{15, 16} Risk factors that cause a poor prognosis for patients include age over 80 years, large ICH volume, clot locations and low GCS.¹⁷

In this study, the outcome was evaluated with the GCS scale. GCS has also been used in studies by Guoqiang Wang in ICH patients,¹⁸ T. Yamamoto in HCH patients,¹⁹ and Wenjun Wang in HICH patients.²⁰ While the outcome status of patients was checked using the ADL tool in studies by Zaiyu Li in HICH

patients,²¹ Yi Feng in Yi Feng patients,²² and Shuwu Lin in HICH patients.²³

In a meta-analysis of 16 studies (n=1912 patients) Tang et al. showed that surgery can reduce the mortality of patients and increase their quality of life.²⁵ Also, Hou et al. showed in a meta-analysis study that surgery led to the improvement of ICH symptoms.²⁶

Conducting epidemiological studies in the world to identify the spread of diseases and the factors affecting them plays an important role.³⁰⁻³³

CONCLUSION

By identifying the variables affecting cerebral HTN and also causing its complications, appropriate measures can be taken in order to prevent related complications. The findings of this study can help in planning to improve the health of patients.

REFERENCES:

- Ramakrishnan S, Zachariah G, Gupta K, Rao JS, Mohanan P. Prevalence of hypertension among Indian adults: results from the great India blood pressure survey. *Indian Heart J* 2019;71(4):309-313. <https://doi.org/10.1016/j.ihj.2019.09.012>
- Izadirad H, Masoudi GR, Zareban I. The Effect of Educational Program Based on BASNEF Model on Women's Blood Pressure with Hypertension. *Journal of Torbat Heydariyeh University of Medical Sciences* 2013;1(2):22-31.

3. Murray CJ, Lopez AD. Measuring the global burden of disease. *N Engl J Med* 2013;369(5):448-457. <https://doi.org/10.1056/NEJMra1201534>
4. Mills KT, Bundy JD, Kelly TN, Reed JE, Kearney PM, Reynolds K, et al. Global disparities of hypertension prevalence and control: a systematic analysis of population-based studies from 90 countries. *Circulation* 2016;134(6):441-450. <https://doi.org/10.1161/CIRCULATIONAHA.115.018912>
5. Burnier M, Egan BM. Adherence in hypertension: a review of prevalence, risk factors, impact, and management. *Circulation research* 2019, 124(7):1124-1140. <https://doi.org/10.1161/CIRCRESAHA.118.313220>
6. Woodward M, Barzi F, Martiniuk A, Fang X, Gu D, Imai Y, et al. Cohort profile: the asia pacific cohort studies collaboration. *Int J Epidemiol* 2006;35(6):1412-1416. <https://doi.org/10.1093/ije/dyl222>
7. Mirzaei M, Moayedallaie S, Jabbari L, Mohammadi M. Prevalence of Hypertension in Iran 1980-2012: A Systematic Review. *J Tehran Heart Cent* 2016;11(4):159-167.
8. Kishore J, Gupta N, Kohli C, Kumar N. Prevalence of Hypertension and Determination of Its Risk Factors in Rural Delhi. *Int J Hypertens* 2016;2016:7962595. <https://doi.org/10.1155/2016/7962595>
9. Benjamin EJ, Virani SS, Callaway CW, Chamberlain AM, Chang AR, Cheng S, et al. Heart disease and stroke statistics- a report from the American Heart Association. *Circulation* 2018;137(12):e67-e492. <https://doi.org/10.1161/CIR.0000000000000573>
10. Ma SM, John J. Assess the prevalence of hypertension and knowledge regarding the prevention of stroke. *Asian J Pharm Clin Res* 2017;10(8):177-180. <https://doi.org/10.22159/ajpcr.2017.v10i8.18558>
11. Lakičević G, Arnautović K, Mužević D, Chesney T. Cerebellar glioblastoma multiforme presenting as hypertensive cerebellar hemorrhage: case report. *J Neurol Surg Rep* 2014;75(01):e117-e121. <https://doi.org/10.1055/s-0034-1376198>
12. Valenzuela PL, Carrera-Bastos P, Gálvez BG, Ruiz-Hurtado G, Ordovas JM, Ruilope LM, et al. Lifestyle interventions for the prevention and treatment of hypertension. *Nature Reviews Cardiology* 2021;18(4):251-275. <https://doi.org/10.1038/s41569-020-00437-9>
13. Diaz-Gutierrez J, Ruiz-Estigarribia L, Bes-Rastrollo M, Ruiz-Canela M, Martin-Moreno JM, Martinez-Gonzalez MA. The role of lifestyle behaviour on the risk of hypertension in the SUN cohort: the hypertension preventive score. *Preventive medicine* 2019;123:171-178. <https://doi.org/10.1016/j.ypmed.2019.03.026>
14. Ahmadabadi S, Alavian F, Sedaghati P. Effectiveness of Motor Interventions in Improving the Motor Abilities of Post-stroke Patients: A Systematic Review. *The Scientific Journal of Rehabilitation Medicine* 2022;10(6):1140-1155. <https://doi.org/10.32598/SJRM.10.6.2>
15. Zhao J, Zhou C. The protective and hemodynamic effects of dexmedetomidine on hypertensive cerebral hemorrhage patients in the perioperative period. *Experimental and Therapeutic Medicine* 2016;12(5):2903-2908. <https://doi.org/10.3892/etm.2016.3711>
16. Zhao XH, Zhang SZ, Feng J, Li ZZ, Ma ZL. Efficacy of neuroendoscopic surgery versus craniotomy for supratentorial hypertensive intracerebral hemorrhage: A meta-analysis of randomized controlled trials. *Brain Behav* 2019, 9(12): e01471. <https://doi.org/10.1002/brb3.1471>
17. Mirsen T. Acute Treatment of Hypertensive Intracerebral Hemorrhage. *Curr Treat Options Neurol* 2010;12(6):504-517. <https://doi.org/10.1007/s11940-010-0096-3>
18. Wang GQ, Li SQ, Huang YH, Zhang WW, Ruan WW, Qin JZ, et al. Can minimally invasively puncture and drainage for hypertensive spontaneous Basal Ganglia intracerebral hemorrhage improve patient outcome: a prospective non-randomized comparative study. *Mil Med Res* 2014;1(1):1-12. <https://doi.org/10.1186/2054-9369-1-10>
19. Yamamoto T, Nakao Y, Mori K, Maeda M. Endoscopic hematoma evacuation for hypertensive cerebellar hemorrhage. *min-Minimally Invasive Neurosurgery* 2006;49(03):173-178. <https://doi.org/10.1055/s-2006-944242>
20. Wang W, Zhou N, Wang C. Minimally invasive surgery for patients with hypertensive intracerebral hemorrhage with large hematoma volume: a retrospective study. *World Neurosurg* 2017;105:348-358. <https://doi.org/10.1016/j.wneu.2017.05.158>
21. Li Z, Luo Y, Jin M, Chen D, Shi P, Xu X. Clinical therapeutic effect of different surgical approaches on the hypertensive intracerebral. *J Dalian Med Univ* 2012;34(1):60-63.
22. Yi F, Jianqing H, Bin L, Likun Y, Yuhai W. Endoscope-assisted keyhole technique for hypertensive cerebral hemorrhage in elderly patients: a randomized controlled study in 184 patients. *Turk Neurosurg* 2016;26(1).
23. Lin SW, Hu JQ, Yu SY. The minimally invasive surgery on hypertensive cerebral hemorrhage. *Chin J Neurol* 2004;37(4):307-310.
24. Feng Y, He J, Liu B, Yang L, Wang Y. Endoscope-Assisted Keyhole Technique for Hypertensive Cerebral Hemorrhage in Elderly Patients: A Randomized Controlled Study in 184 Patients. *Turk Neurosurg* 2016;26(1):84-89. <https://doi.org/10.5137/1019-5149.JTN.12669-14.0>
25. Tang Y, Yin F, Fu D, Gao X, Lv Z, Li X. Efficacy and safety of minimal invasive surgery treatment in hypertensive intracerebral hemorrhage: a systematic review and meta-analysis. *BMC Neurology* 2018;18(1):136. <https://doi.org/10.1186/s12883-018-1138-9>
26. Hou D, Lu Y, Wu D, Tang Y, Dong Q. Minimally

- Invasive Surgery in Patients with Intracerebral Hemorrhage: A Meta-Analysis of Randomized Controlled Trials. *Front Neurol* 2022;12. <https://doi.org/10.3389/fneur.2021.789757>
27. Komlakh K, Karbasfrushan A. The effect of Pregabalin on the pain status of patients with disc and spinal surgeries: A systematic review of drug therapy. *Eurasian Chem Commun* 2022;4(11):1147-55.
28. Tarjoman A, Borji M, Safari S, Otaghi M. Investigating the effects of adaptive stability model on headache of patients with migraine. *Arch Neurosci* 2019;6(1).29. <https://doi.org/10.5812/ans.81492>
29. Vasigh A, Tarjoman A, Soltani B, Borji M. The relationship between mindfulness and self-compassion with perceived pain in migraine patients in Ilam, 2018. *Arch Neurosci* 2019;6(3). <https://doi.org/10.5812/ans.91623>
30. Tahmasbi F, Madani Neishaboori A, Mardani M, Toloui A, Komlakh K, Azizi Y, Yousefifard M. Efficacy of polyarginine peptides in the treatment of stroke: A systematic review and meta-analysis. *Brain Behav* 2023;13(1):e2858. <https://doi.org/10.1002/brb3.2858>
31. Darabi B, Shokri M, Bastani E. Investigating spirometry indices in children with asthma. *Gomal J Med Sci* 2023;21(3):145. <https://doi.org/10.46903/gjms/21.03.1289>
32. Bastani E, Shokri F. Incidence Trend of Lung Cancer in Iran: A Systematic Review and Meta-analysis. *Int J Cancer Manag* 2023;16(1):e135020. <https://doi.org/10.5812/ijcm-135020>.
33. Fazelpour S, Adhami Moghadam F, Davudi P, Tootian Z, Assadi F. Histometrical study of ovarian follicles of immature mice treated with methylphenidate. *J Vet Res* 2015;70(3):301-7. <https://doi.org/10.22059/jvr.2015.55274>

CONFLICT OF INTEREST

Authors declare no conflict of interest.
GRANT SUPPORT AND FINANCIAL DISCLOSURE
None declared.

AUTHORS' CONTRIBUTION

The following authors have made substantial contributions to the manuscript as under:

Conception or Design: UAR, MAI
Acquisition, Analysis or Interpretation of Data: UAR, MAI, MZM, KA, MJB, IA
Manuscript Writing & Approval: UAR, MAI, MZM, KA, MJB, IA

All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.



Copyright © 2023. Usman Ali Rahman, et al. This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License, which permits unrestricted use, distribution & reproduction in any medium provided that original work is cited properly.