International Journal of Neurology Sciences

ISSN Print: 2664-6161
ISSN Online: 2664-617X
Impact Factor: RJIF 5.42
IJNS 2023; 5(1): 01-05
www.neurologyjournal.in
Received: 03-11-2022
Accepted: 07-12-2022

Md Amir Ali
Professor (Colonel),
Department of Neurosurgery,
FCPS, CMH Mymensingh,
Bangladesh

Sudipta Kumer Mukherjee
Associate Professor,
Department of Neurosurgery,
MS, NINS, Dhaka, Bangladesh

Abdul Hye Manik
Associate Professor, Lt Col (),
Department of Neurosurgery,
MS, CMH Dhaka, Bangladesh

Corresponding Author:
Md Amir Ali
Professor (Colonel),
Department of Neurosurgery,
FCPS, CMH Mymensingh,
Bangladesh

A dilemma of most common domain of spontaneous intraparenchymal haemorrhage

Md Amir Ali, Sudipta Kumer Mukherjee and Abdul Hye Manik

DOI: https://doi.org/10.33545/26646161.2023.v5.i1a.7

Abstract
Background: Spontaneous intraparenchymal haemorrhage (IPH) is the bleeding within brain parenchyma in absence of any kind of trauma or surgery. Spontaneous IPH is serious disabling and deadly one; of all strokes. The most common site of insult is still enigmatic. The reason of our study is to find out the most involved area of brain of spontaneous IPH.
Materials & Methods: Our study is prospective type of study. Total 48 numbers of patients were diagnosed as spontaneous intraparenchymal haemorrhage and have first time been reported & admitted in Combined Military Hospital (CMH) Dhaka, between July 2021 and Jan 2022. All of our patients were randomly allocated and sampled as per inclusion and exclusion criteria. Diagnosis was done based upon details history, through clinical examination and releavant investigation. Computed Tomography (CT) scan (non-contrast) of brain was done to authinticate diagnosis and to define site of lesion as well. Data of our study collected by specially designed questionnaire and analyses of statistics was done by Statistical Package for Social Sciences version 26 for Windows (SPSS).
Results: In this study 48 cases were finally selected as 'Spontaneous IPHs'. All of them were diagnosed clinically and confirmed by Computed Tomography scan. In this study, it was revealed that most of the patients were male 37 (77.08%) and female only 11(22.92%) in number. Concerning distribution of age; old age (≥ 60 years) affected 28 (58.33%) than young adult (18-25 years) only 1 (2.08%) in number. It was observed that out of 48 patients; HTN alone 50% (24); next Mixed pathology 16.67% (8) (HTN, Amyloid angiopathy, Coagulopathy, Tumour etc.), then Idiopathic 8.33% (4). In regard to site & side of involvement of IPHs; it was noticed that basal ganglia is more affected 33 in number specially left alone 41.67%, and dominant (left) cerebral hemisphere is more frequent 23(47.92%) than opposite right (non-dominant) hemisphere 17 (35.42%).
Conclusion: Basal ganglia is supplied by a little beat peculier lenticulostriate artey, which is right angle, narrow, end artey and induce atherosclerotic microaneurysm; prone to rupture. Dominant cerebral hemisphere (usually left) is highly metabolically active with having raised blood flow; and highest incidence of IPH is at Basal ganglia of Dominant hemisphere.

Keywords: Spontaneous intraparenchymal haemorrhage, dominant cerebral hemisphere, domain

Introduction
There are two varieties of cerebrovascular Disease (CVD). Common one is ischemic and less evident in haemorrhagic stroke but fatality is more in haemorrhagic one [1].
CVD increases with advancement of age as life expectancy increases (due to development of medical science), number of stroke patients going up and expected to be double stroke death between year 2000 and 2030 [2].
Though IPH is bleeding within brain parenchyma but may extent upto ventricle. Incidence of stroke is estimated 84-262/100,000 in rural and 334-424/100,000 in urban area [3].
Regarding risk factors of spontaneous IPH; mainly: advanced age, male sex, alcohol abuse, smoking, previous history of stroke, cocaine and also sympathomimetic drugs [1].
Aetiology of Intraparenchymal haemorrhages: Primary- HTN mainly then Amyloid angiopathy, Secondary- Vascular malformation (AVM, Aneurysm), Thrombolytic drug, Coagulopathy, Brain tumour and Vaculitis [4].

Pathogenesis
Regarding pathophysiology of IPH; there are different ideas and thoughts: Intraparenchymal haemorrhage mostly transpired due to ruptured degenerated blood vessels of long-standing

HTN. Degeneration mostly occurs in tunica media and smooth muscles that facilitate tiny lipohyalinotic aneurysms and subsequently rupture [5].
Amyloid deposition in cerebral vasculature leads to micro-aneurysm that subsequently ruptures and induces IPH. And usually it is lobar in nature [6].
Other mechanisms of Intraparenchymal haemorrhage including anticoagulant, thrombolytic drug, bleeding diatheses, cocaine abuse [1, 4].
In intraparenchymal haemorrhage; primarily brain damage befall due to mechanical mass effect of haematoma and induce raised intracranial pressure (ICP) followed by reduction of cerebral perfusion and herniation usually inevitable without drastic measure [7]. (Fig 1).

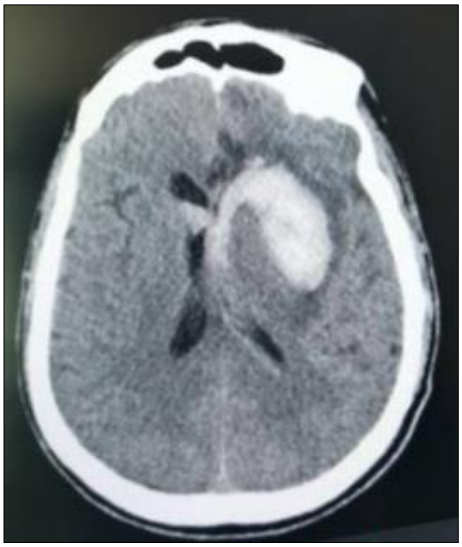

Fig 1: Spontaneous IPH at non-contrast CT scan head

Regarding affected side of spontaneous IPH; highest incidence of intraparenchymal hemorrhage/ICHs is at dominant cerebral hemisphere (usually left) as it is highly metabolically active with raised circulatory flow [8].
Pathophysiologically; vascular supply at basal ganglia is end artery, right angle and in old age atherosclerosis makes it much narrower. Hypertensive patients are more at a risk of degenerative changes [5]. Raised blood flow into atherosclerotic- narrow, right angle end artery at basal ganglia have higher risk of rupture [8].
In this regards to come into conclusion we tried to find out incidence of haemorrhagic stroke at basal ganglia and other parenchyma of brain as well as highly metabolic dominant hemisphere & non-dominant hemisphere in CMH Dhaka, Bangladesh.

Materials and Methods

This study, which we executed, is a prospective variety of study. It was carried out at the centre of Neurosurgery, CMH Dhaka, Bangladesh in between July 2021 to Jan 2022. All the total 48 patients were admitted with diagnosed clinically as spontaneous intraparenchymal haemorrhage. The patients whom we selected in this study with age 18-80 years; irrespective of gender and co-morbidities such as hypertension, diabetes MI; on anticoagulant drugs, coagulopathy etc. were included in our study. They also were confirmed by non-contrast CT scan of head. Either sex or age variables were randomly selected in this study. Finally selected these patients as per inclusion and exclusion criteria. All of our patients were right handed that means dominant hemisphere is left. Patient with CT scan negative and unwilling to participate; were not included in this study.
Informed written consent was noted. Relevant data were collected by using preformed data collection sheets. Photographs were taken with kind permission from the clients. Data collection sheets were completed with necessary information's from Dhaka CMH record, communication system and picture archive.
In this study statistical analyses were performed by Statistical Package for Social Sciences (SPSS), version 26 for Windows.

Results

In our study; total 48 cases were finally selected and diagnosed as spontaneous intraparenchymal haemorrhage.
All these patients were evaluated thoroughly by details history, through clinical examination-general examination, systemic examination especially neurological examination-elaborately and finally diagnosis confirmed by CT scan.
In our study distribution of patients according to gender; male were 37 (77.08%) & female were 11 (22.92%) in number & predominantly male (Fig 2).

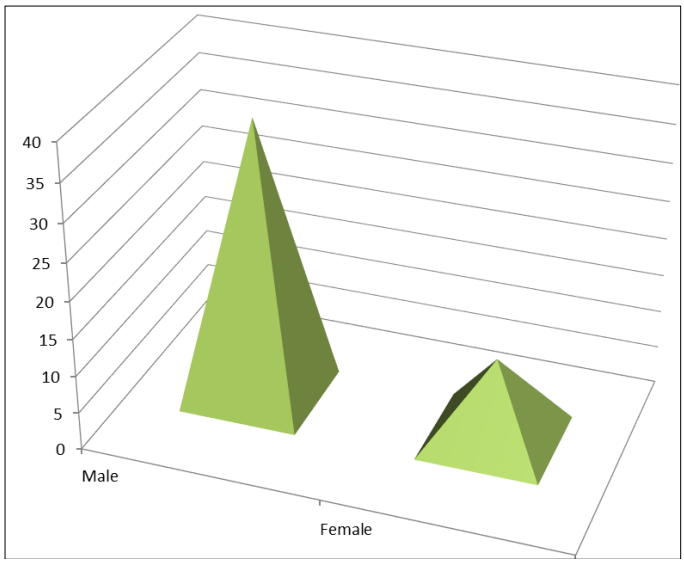

Fig 2: Distribution of patients according to Gender (n=48)

Concerning affected age group; Young adult (18-25 years) very less only1 (2.08%) and mostly Old age (≥60 years) 28(58.33%); others Adult (26-44 years) 2(4.17%), Middle age (45-59) years 17(35.42%) and majority were old age; shown in Table 2.

In our study, it was observed that among all aetiological factors, HTN is 50% (24); others Amyloid Angiopathy 6.25%(3), Vascular Malformation 6.25% [3], Coagulopathy 6.25%(3), Tumour 2.08% [1], Haemorrhagic conversion of Ischemic stroke 4.17% [2], Mixed 16.67% [8] and Idiopathic 8.33% [4] & obviously HTN was most culprit (Fig 3).

Regarding side of involvement of IPHs; it was revealed that Dominant (Lt- sided) cerebral hemisphere 23 (47.92%) and Non-dominant cerebral hemisphere (Rt-sided) 17 (35.42%) and Bilateral 01(2.08%) and others non- cerebral hemispheric 7(14.58%) with solely predominant dominant hemisphere entail (Fig 4).

According to site of incident; mostly at Basal ganglia; (Lt)-20(41.67%), (Rt) - 12 (25%), (Bil) - 01(2.08%), total 33 (68.75%). Cerebellar hemisphere, total 03 (6.25%);(Rt) 01(2.08%), (Lt)-01(2.08%), (Bil)-01(2.08%), Thalamus 02(4.17%); (Lt)-01(2.08%), (Bil)-01(2.08%), Parietal Lobe, total 05(10.42%); (Lt)-03(6.25%), Rt-02(4.17%), Frontal lobe, total 03 (6.25%); (Rt)-03(6.25%), Pontine 01(2.08%), Brain stem 01(2.08%); mostly basal ganglia 68.75% and left one is highest 41.67%; shown in Table 2.

Table 1: Distribution of patients according to Age group (n=48)

Age (years)	(n=48)	(%)
18-25	1	2.08
26-44	2	4.17
45-59	17	35.42
≥60	28	58.33
Range (max, min) 18, 80		

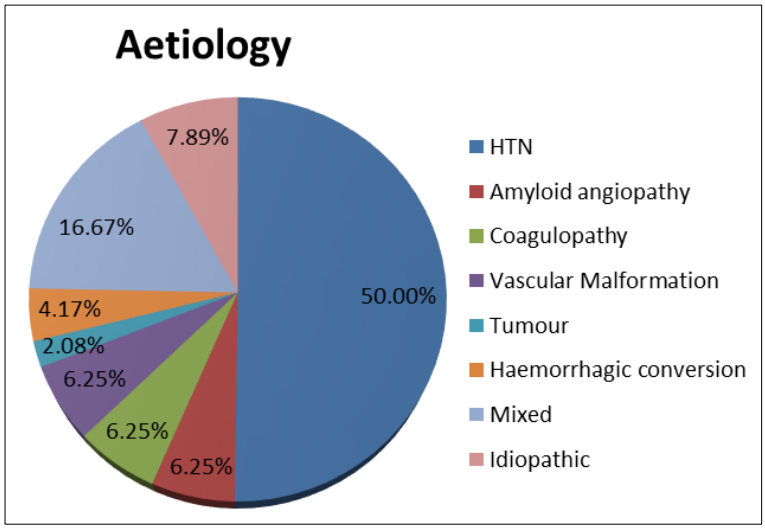

Fig 3: Distribution of patients according to Aetiological factors (n=48)

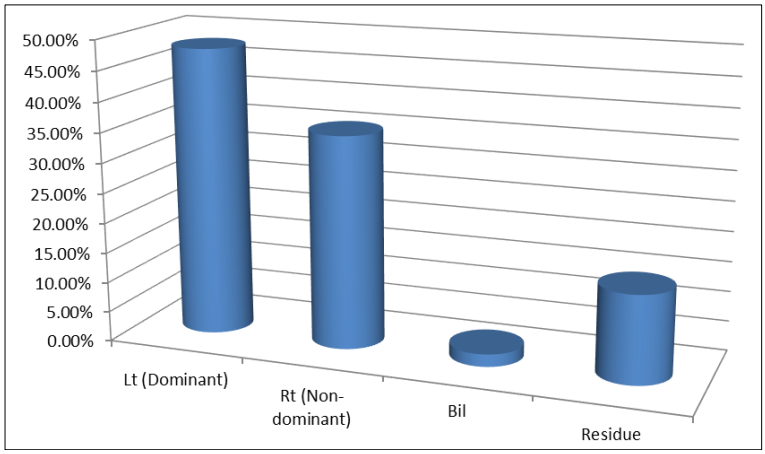

Fig 4: Distribution of patients according to side of cerebral hemisphere involvement (n=48)

Table 2: Distribution of patients according to region of Brain involved (n=48)

Region	Left	Right	Bilateral	Residue	Total
Basal ganglia	20(41.67%	12(25%)	1(2.08%)	-	33(68.75%)
Cerebellar Hemisphere	1(2.08%)	1(2.08%)	1(2.08%)	-	3(6.25%)
Thalamus	1(2.08%)	-	1(2.08%)		2(4.17%)
Parietal lobe	3(6.25%)	2(4.17%)	-	-	5(10.42%)
Frontal lobe	-	3(6.25%)	-	-	3(6.25%)
Pontine	-	-	-	1(2.08%)	1(2.08%)
Brain stem	-	-	-	1(2.08%)	1(2.08%)

Discussion

Advancing age is more vulnerable for different types of co-morbidities. Atherosclerosis, HTN are more common and thus CVD- spontaneous ICHs are frequent specially in old age. Our interest is on 'most common affected side & domain of spontaneous IPH' as it is still ambiguous for deduction.

In our study we have observed that female were only 11(22.92%) & male were 37 (77.08%) in number that is mostly male personnel.

Amir *et al*. [9], in 2022 showed that affected spontaneous ICH; Males were 141 (72.31%), females were only 54(27.69%) in number; which co-relates with our study.

In a study of 2011, Roditis *et al*. [10], showed that spontaneous ICH in young people below 35 years is less 0.5/100 000 population.

And the study in 2021 was done by Skajaa *et al*. [11], expressed that older of age; incidence of ICH much higher.

Stat Pearls in a study showed that rate of ICH increases after the age of 55 years [12].

In our study we found that <25 years only 1(2.08%) and ≥60 (old age) years 28(58.33%) in number having spontaneous IPHs, so old age group is more afflicted which co-relates to some extent with Roditis *et al*., Skajaa *et al*. and Statpearls study [10, 11, 12].

Regarding aetiology of spontaneous intraparenchymal haemorrhage; in 2014 Macellari *et al*. [4], expressed that: Primary- (cause) HTN mainly then Amyloid angiopathy and Secondary-Vascular Malformation (Aneurysm, AVM), Tumour, Thrombolytic drug, Vaculitis. In this study, we have seen that HTN is 50% (24); others Amyloid Angiopathy 6.25%(3), Vascular Malformation 6.25% (3), Coagulopathy 6.25%(3), Tumour 2.08% (1), Haemorrhagic conversion of Ischemic stroke 4.17% (2), Idiopathic 8.33%(4) Mixed 16.67% [8] and definitely HTN is singly 50% and most wrongdoer which co-relates with Macellari *et al*. [4], study.

Dominant cerebral hemisphere than non-dominant is highly metabolically active with raised blood flow and prone to rupture with less effort [8].

Incidence of IPHs; according to their side, it was expressed by Amir *et al*. [8], in 2022 that dominant (left) cerebral hemisphere is affected 24(63.16%) and non-dominant opposite right hemisphere is 14 (37%).

In our study; it was observed that dominant (left cerebral hemisphere) affected more 23(47.92%) than right one 17(35.42%) - which almost co-relates with Amir *et al*. [8], study.

Dominant hemisphere usually left one is highly metabolically active. And once metabolic activities increase the blood flow to that hemisphere raised [13].

High blood flow to right angle, narrow atherosclerotic end capillary of basal ganglia; vulnerable to rupture to spontaneous IPH.

Statpearls showed that common sites of spontaneous haemorrhage are at Basal ganglia (50%), Cerebral lobes (10% to 20%), Brain stem (10% to 20%), Thalamus (15%), Pons and Cerebellum (10%) [12].

In this study, we have seen that domain of IPHs are Basal ganglia 33 (68.75%); (Lt)-20 (41.67%), (Rt)- 12 (25%), (Bil)- 01(2.08%).Cerebellar hemisphere, total 03 (6.25%), Thalamus 02 (4.17%); Parietal Lobe total 05(10.42%); (Lt)-03 (6.25%), Rt-02(4.17%),Frontal lobe, total 03 (6.25%); (Rt)-03(6.25%), Pontine 01(2.08%), Brain stem 01(2.08%); mostly basal ganglia 68.75% and left one affected much 41.67%; which co-relates with statpearls study.

The constraint of our study is that it was done in a single center CMH Dhaka and not large number of patients. But the patients we included are serving soldiers with their families and parents, civil employee under defense budget, armed forces officers with their families and parents; live in different parts of the country. So study of these cases at this tertiary care center, CMH Dhaka; expressed to some extent the overall scenario at least Bangladesh.

Conclusion

Basal ganglia having vasculature with right angle pattern, much narrower and is end artery one. Metabolically highly active dominant hemisphere influence high blood flow. Raised blood flow to atherosclerotic narrow, right angle end artery of basal ganglia leads to rupture. And thus rate of haemorrhagic stroke increased at basal ganglia of dominant hemisphere.

References

1. An SJ, Kim TJ, Yoon BW. Epidemiology, Risk Factors and Clinical Features of Intracerebral Hemorrhage: An Update. J Stroke. 2017 Jan;19(1):3-10.
2. Smith WS, English JD, Johnston SC, Longo DL, Fauci AS, Kasper DL. Cerebrovascular Diseases. Harrison's Principles of Internal Medicine. 18th ed. New York: Mc Graw Hill. 2012, 3271-3272.
3. Banarjee TK, Das SK. Epidemiology of stroke in India. Neurology Asia. 2006:11:1-4.
4. Macellari F, Paciaroni M, agnelli G, Caso V. Neuroimaging in Intracerebral Hemorrhage. Stroke. 2014;45(3):903-908.
5. Qureshi AL, Tuhrim S, Broderick JP, Batjer HH, Hondo H, Hanley DF. Spontaneous intracerebral hemorrhage. N Engl J Med. 2001;344(19):1450-1460.
6. Rosand J, Hylek EM, O'Donnell HC, Greenberg SM. Warfarin-associated hemorrhage and cerebral amyloid angiopathy: a genetic and pathologic study. Neurology. 2000;55(7):947-951.
7. Qureshi AL, Mendelow AD, Hanley DF. Intracerebral haemorrhage. Lancet. 2009;373(9675):1632-1644.
8. Amir MA, Ashrafee P. Spontaneous intraparenchymal haemorrhage– A dilemma of afflicted hemisphere. International Journal of Neurology Research. "Spontaneous intraparenchymal haemorrhage– A dilemma of afflicted hemisphere". 2022 Mar;4(1):9-13. Available FREE in open access from: https://www.neurologyjournals.com/article/view/15/4-1-13
9. Amir MA, Ashrafee. Extreme age and spontaneous intracerebral haemorrhage. International Journal of Neurology Research, "Extreme age and spontaneous intracerebral haemorrhage ". 2022 Mar;4(1):5-8. Available FREE in open access from: https://www.neurologyjournals.com/article/view/14/4-1-14
10. Roditis S, Ianovici N. Hemorrhagic stroke in young people. Romanian Neurosurgery, 2011;18(3):294-299.
11. Skajaa N, Adelborg K, Horváth-Puhó E, Rothman KJ, Henderson VW, Casper TL, *et al*. Nationwide Trends in Incidence and Mortality of Stroke among Younger and Older Adults in Denmark. Neurology. 2021;96(13):e1711-e1723.

12. Haemorrhagic stroke. Available FREE in open access from: https://www.statpearls.com/articlelibrary/viewarticle/90188/
13. Logothetis NK, Pauls J, Auguth M, Trinath T, Oeltermann A. A neurophysiological investigation of the basis of the BOLD signal in fMRI. Nature. 2001 Jul; 412(6843):150-157.