VOL. 30 NO. 2 ISSN 1023-4853 July 2014

BANGLADESH JOURNAL OF NEUROSCIENCE

CONTENTS

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ORIGINAL ARTICLES

Spinal Arterio- venous lesions: Variable Clinical and Angiographic Feature

MD SHAHIDULLAH[1], SUVASH KANTI DEY[1], ANIS AHMED[2], NAHID SULTANA[3]

Abstract:

Background: *Spinal Arterio-Venous Shunts are rare but treatable diseases. AVF has a direct shunt between artery and vein. AVM has a nidus between artery and vein. Differentiation is necessary because, the clinical presentation, angiographic architecture, and treatment options are different.* ***Rationale:*** *Presenting clinical features are non-specific and vary in age and sex. MR images raise the suspicion of diagnosis. For proper understanding of disease and planning of treatment DSA is necessary. Objectives: To evaluate the nature of clinical feature, angiographic findings, and initial outcome after embolization in patients of spinal arterio-venous shunt.* ***Materials & Methods:*** *It was prospective study. Patients were referred for spinal DSA. Risk of complication was properly discussed with the patient and attendant and informed written consent was taken.* ***Results:*** *Among 9 patients, 5 were female and 4 were male. Male female ratio was 1: 1.25. Three patients were diagnosed as type I, three as type II, and three as type IV. All 3 patients (100%) of dural fistula were male, all 3 patients (100%) of pial fistula were female. Average age at presentation was 36 yrs. And mean age of dural AVF was 60.33 yrs, pial AVF was 18.33 yrs and spinal AVM was 29.33 yrs. Spinal DAVF occurred in patients ranging from 57 to 64 years of age, with an average age of 60.33 years. The average length of time between onset of symptoms and diagnosis was 16.44 months (ranging from 3 to 36 month). All 9 patients (100%) of patients had motor weakness, sensory disturbance was found in 66.66% (six of nine patients) and urinary disturbance was found in 77.77% (seven of nine patients). Progressive clinical course was followed in 100% of patients (all of nine patients). MRI findings revealed flow void in 77.77% of patients (seven of nine patients). Increased T2 signal in the spinal cord was present in 88.88% of patients (eight of nine patients). After DSA total 77.7% (seven of nine patients) feeder was located in low thoracic and lumbar region.* ***Conclusion:*** *Spinal AVM & AVF remain undiagnosed for a long period. They should be treated early for prevention of progressive morbidity and disability. MRI features of cord edema, contrast enhancement, and peri-medullary vessels may lead to the diagnosis of these vascular lesions.*

Key words: *Arteriovenous fistula, Arteriovenous malformation, Digital Subtraction Angiography*

Abbreviation: *AVF: Arteriovenous fistula, AVM: Arteriovenous malformation, DSA: Digital Subtraction Angiography*

Introduction:

Spinal arterio-venous lesion represent different group of vascular anomalies. They are uncommon [1]. Based on hemodynamic criteria, spinal vascular lesion can be categorized into 2 distinct group: i) Spinal AVF (Direct shunt between the artery and vein) ii) Spinal AVM (Presence of nidus between the artery and vein) [2]. They can be classified into 4 types:

Type I: Dural arteriovenous fistulas (AVFs)

Type II: Intramedullary glomus AVM

Type III: Juvenile or combined AVM

Type IV: Intradural perimedullary AVF

Spinal arteriovenous fistula is the most common among spinal vascular malformation [3]. Approximately

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70% of spinal vascular lesions are dural AVF [4]. Spinal dural AVF consists of a lesion that makes a shunt which is located within the dura near the neural foramina and along the spinal canal [5]. It is an acquired lesion[6,7]. It typically present after fourth or fifth decade and in more in male [3]. Symptoms are progressive in nature[4]. It is treatable and curable disease, so diagnosis should be early and in time[8] to avoid morbidity[9].If untreated, approximately 50% patients of dural AVF will be disabled[4]. Spinal AVM usually presents at younger age[10]. Perimedullary spinal cord AVF is not a common among spinal vascular malformation. It is mainly seen in the conus medullaris or cauda equina region [10].

Materials and Method:

In this institution, no department of Interventional Neurology exists. We, the interventionist, are working in different unit of Neurology Department. There are six units in this department. Patients are referred for angiogram or procedure from different units. We are working as operator. Angiogram have to be done in Paediatric Cardiac Cath Lab. Different unit asked for Spinal DSA to evaluate the patient whenever they need it. So, not every patient had MRI or MRI with contrast. From July 2012 to June 2015 was the study period. Total 12 patients were referred for Spinal DSA. Among 12 patients, angiogram of 3 patients was normal. We evaluated the findings of 9 patients.

Risk of complication of Spinal DSA was properly discussed with the patient and attendant and informed written consent was taken. Spinal DSA was done under local anesthesia through trans-femoral route. Modified seldinger technique was used for sheath placement. Images were obtained at a rate of 2-4 f/sec and for 25-30 seconds. During DSA, segmental arteries were injected with iohexol (300 mg/ml) at 1 ml/sec. From the supreme intercostals artery to Lumbar 3 segmental artery were injected. In all cases, anterior spinal artery was identified. If no fistula was found, then additional injection was given to Carotid, Vertebral, Thyrocervical, Costocervical, Iliolumbar arteries

Results:

Table I & II showed total number of patients were 9(nine) and 5 were female and 4 were male. Male female ratio was 1: 1.25. Three patients were

Table-I

sex, age and type of AVM

patient	male	female	Ratio	Age average	Type I AVM	Type II AVM	Type IV AVM
9	4	5	1:1.25	36 yrs	3	3	3

Table-II

sex, age and presentation of patients

Patient no	Sex	Age	Presentation
1	M	57	M, S, U
2	F	18	M, U
3	F	18	M, U
4	F	19	M, S
5	M	56	M, S, U
6	F	13	M, S, U
7	#	#	#
8	M	60	M, S, U
9	M	64	M, S, U
10	F	19	M, U
11	#	#	#
12	#	#	#

#: normal spinal angiography (not evaluated in study); M= Motor weakness; S= Sensory disturbances; U= urinary disturbances

diagnosed as type I, three as type II, and three as type IV. All 3 patients (100%) of dural fistula were male; all 3 patients (100%) of pial fistula were female. Average age at presentation was 36 yrs. And mean age of dural AVF was 60.33 yrs, pial AVF was 18.33 yrs and spinal AVM was 29.33 yrs. Spinal DAVF occurred in patients ranging from 57 to 64 years of age, with an average age of 60.33 years. The average length of time between onset of symptoms and diagnosis was 16.44 months (ranging from 3 to 36 month). All 9 patients (100%) of patients had motor weakness, sensory disturbance was found in 66.66% (six of nine patients) and urinary disturbance was found in 77.77% (seven of nine patients) (Fig.1). Progressive clinical course was followed in 100% of patients (all of nine patients). No patient had presented with an acute neurological deficit.

MRI findings revealed flow void in 77.77% of patients (seven of nine patients). Increased T2 signal in the spinal cord was present in 88.88% of patients (eight of nine patients). Hyperintense signal was homogenous and central in location that spared a thin rim of the cord peripherally. 5 patients were referred to us with MRI of Spine with gadolinium contrast. Among those 40% (two of five patients) had contrast enhancement.

After DSA, we found location of arterial feeder (Figure 2) in lumbar region was 44.4% (four of nine patients), in lower thoracic was 33.3% (three of nine patients) (Fig.2). One was located in cervical region and one was in mid thoracic region. Total 77.7% (seven of nine patients) feeder was located in low thoracic and lumbar region (Table III).

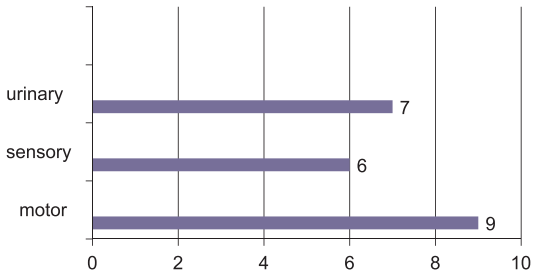


Fig.-1: *distribution of patients on clinical presentation*

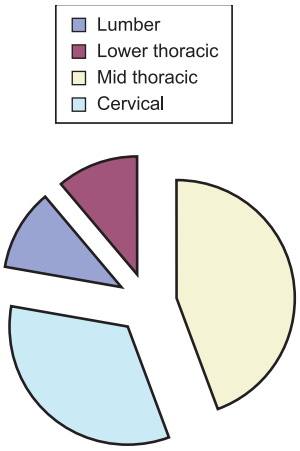


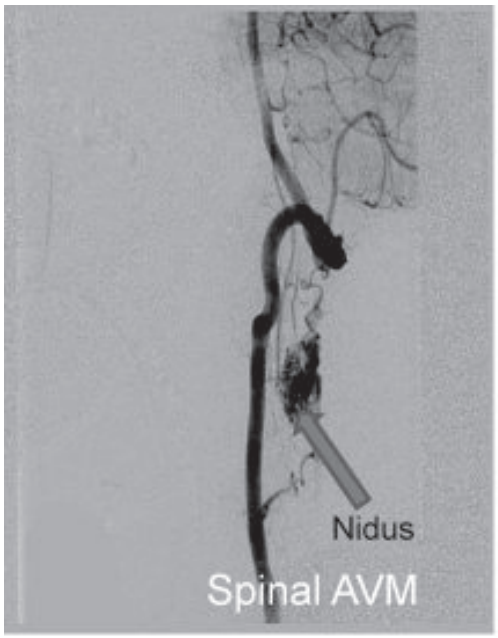
Fig.-2: *distribution of respondents on location of arterial feeder in Spinal DSA*

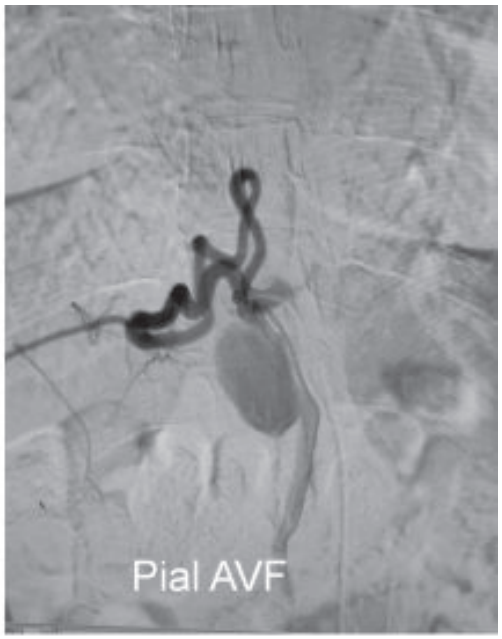
Table III

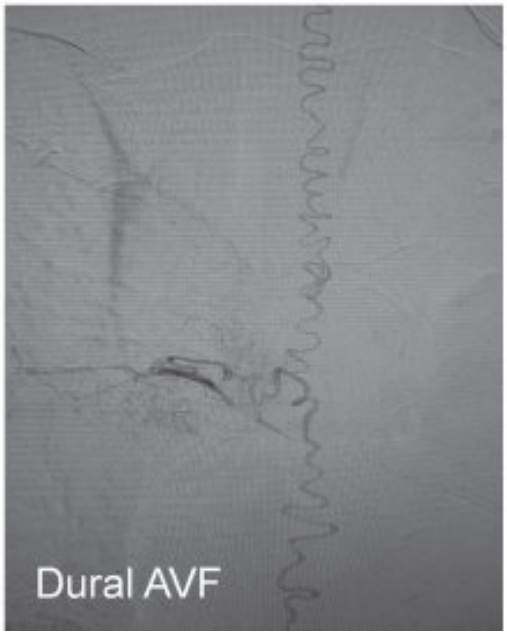
Angiographic findings of the patients

Patient no	Arterial feeder	Venous Aneurysm	Venous drainage Rostral/Caudal/Both	Angiographic Diagnosis
1	L1	0	B	Dural AVF
2	L2	0	R	Pial AVF
3	D11	1	R	Pial AVF
4	D12	0	B	AVM (Intramedullary)
5	C2	0	C	AVM (Intramedullary)
6	D11	0	B	AVM (Intramedullary)
7	#	#	#	#
8	L2	0	B	Dural AVF
9	D6	0	B	Dural AVF
10	L1	1	B	Pial AVF
11	#	#	#	#
12	#	#	#	#

C: Cervical; D: Dorsal; L: Lumbar. 0: Absent; 1: Present. B: Both; C: Caudal; R: Rostral. AVF: Arterio venous fistula; AVM: Arterio venous malformation







Discussion:

Spinal vascular lesions are rare disease and accounts approximately 2 to 4 % of spinal diseases[11]. In our series, fistula was the most common spinal vascular malformation. 66.6% of patients had fistula and 33.3% had AVM. Dural fistula represented 68% of all spinal malformations in the study conducted by Gilbertson and his colleagues[6] and 63.33% (19 of 30 patients) in another study[9]. In our study, 33.3% patients had spinal AVM. In a review done by Patsalides A et.al.[10] showed 20-30% had AVM in different studies. Mean age of dural AVF was 60.33 years in our study. Data from other studies showed mean age of 62 years (range from 38-87 years) in a study done by Guillevin R. and his colleagues[11]. The late age presentation

of dural fistula was also found in other series[12-14]. Dural AVF occurs most commonly in male[15]. In our study all patients were male. This male preponderance was also found in other series[13,14]. In a review by Patsalides A et. al.[10] showed that spinal AVM was typically seen in children and early adults. It was 29.33 years in our study. Corkill et. al.[16] found female dominance, and Cullen et. al.[17] and Rodesch et. al.[19] found male dominance in case of spinal AVM. Casasco et. al[18] reported two cases of female gender in Perimedullary AVF. Although Meng et. al.[20] and Cho et al.[21] showed male preponderance. Mean age was 8.1 in those studies done by Meng et al. and 28 years in Cho et al. In our study all case of perimedullary AVF was female and mean age was 18.33 years. As dural AVF is rare and clinical features are non specific, diagnosis is delay[22]. In our study, mean period of diagnosis from time of onset was 16.44 months. This finding is comparable to other studies[13,14]. It was 25 months in the study done by Guillevin R. and his colleagues among 26 patients[11]. Song JK et al.[8] found the mean time of 21 months (ranging from 3-60 months). In perimedullary AVF and intramedullary AVM duration between onset and diagnosis was 0.5 to 144 months (mean 16 months)[10].

Clinical Feature:

The typical feature of fistula and spinal malformations had been described by many authors[23,24]. In this study all patients had motor weakness, 66.6% had sensory disturbances, and 77.7% had urinary disturbances. Gemmete JJ. et al.[4] found motor weakness in 87% and sensory symptoms in 75% of patients. These are also comparable to other studies (13,14,15). Bowen BC. et al.[15] found 87.5% patients had motor weakness and 62.5% and 75% had sensory disturbances and urinary problem respectively. Song JK et al.[8] found 75% had leg weakness, 70% had sensory disturbances as the presenting feature. But at the time of diagnosis almost all had the triad of weakness, sensory disturbance, and micturation problem. Most of the patient's symptoms were gradually progressive[17]. In our study, all patients had progressive course.

MRI finding:

Typical findings in MRI include T2 hyper intensity in central region, contrast enhancement within spinal cord, and vascular flow voids at the surface of the spinal cord[5]. Many authors described the abnormal T2 hyper intensity changes I the spinal cord in vascular lesion[6]. In our study 88.8% patients had T2 hyper intensity. In the study done by Gilbertson JR et al. T2 signal change was found in all patients and they concluded this as the most sensitive MR findings[6]. Prominent flow voids along the dorsal surface of the cord on T2 sequences is an important MRI finding[6]. In our study, this was present in 77.7% and this finding was comparable with other studies. Bowen BC. et al.[15] found in 62.5% of patients. Song JK et al. [8] found combination of perimedullary vessels and cord hyperintensity in 89% of patients. Gadolinium enhancement increases the sensitivity and specificity of MR finding [6]. Gilbertson JR [6] found enhancement in 88% and Bowen BC et al.[15] found in 45.45%. In our study five patients did MRI with gadolinium injection. Among them 40% (two of five) of patients had enhancement.

Angiogram:

MRI findings has minimal role for the localization and characterization of vascular malformation[7]. Combination of MRI and MRA (with contrast enhanced and 3D) has approximately 73% sensitivity to locate the fistula level [7]. The sensitivity, specificity of MRI with MRA is 80-100% and approximately 80% respectively[24]. Recently advancement in spinal MRA has been grown up with fast 3D contrast enhanced MRA with combination of a rapid bollus injection and good timing mechanism[7]. MRA help reduction of > 50% of radiation and use of contrast agent in DSA. 3D contrast enhanced MRA has the limitation of selecting the fistula level because of long acquisition time and low resolution. Fast (24 sec) contrast enhanced MRA can identify the level of fistula. But for detection of the level, repeated double/ triple MRA session is often required because of small field of view (FOV) Mull M. et al. [9] found that MRA could identify the level of fistula in 14 out of 19 patients when compared to DSA. In AVM, MRA could identify 10 out of 11 feeding artery. Additional feeders in 5 patients were also missed by MRA[7].CTA has also

role for detection of vascular diseases. In CTA, data acquisition must be done at the time when contrast agent fills the vessel to be imaged. Single detector CT has low speed; Multidetector has more speed and larger anatomical coverage with higher spatial resolution. MDCT can detect the feeding artery, fistula, and draining vein which correlate with conventional catheter angiography[7]. Digital subtraction angiography (DSA) is the standard for spinal vascular lesion[17]. For classification and diagnosis of spinal vascular lesions, DSA is the definitive test. Both 3D contrast enhanced MRA and MD CTA are not suitable to differentiate the arterial feeder from draining vein in fistula. DSA has the role to distinguish them. Additionally to understand the character of the fistula, to identify any additional feeding artery and to determine whether the feeding artery and the anterior spinal artery arises from the same pedicle, DSA is the gold standard [7].

Conclusion:

Spinal AVM and AVF remain undiagnosed for a long period. They should be treated early for prevention of progressive morbidity and disability. MRI features of cord edema, contrast enhancement, and perimedullary vessels may lead to the diagnosis of these vascular lesion. DSA is the gold standard for characterization of the lesion and to determine the treatment modality of the vascular lesion.

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Study of Sites of Lesion in Ischemic Stroke and Intracerebral Hemorrhage

MD. TAUHIDUL ISLAM CHOWDHURY, MOHAMMAD SHAH JAHIRUL HOQUE CHOWDHURY[2], SHAMIM AHMED [3], MURSHED BAQUI[4], MD. AHSAN HABIB[5], QUAZI DEEN MOHAMMAD[6]

Abstract:

Objective: *To find out lesion sites in ischemic stroke and intracerebral haemorrhage.*

Methodology: *This retrospective cross sectional observational study was carried out in the Department of Neurology and Department of Medicine of Dhaka Medical College Hospital. (DMCH), during March, 2010 to February, 2011 in patients admitted with a history of first ever stroke. The duration of the study was one year .For this purpose, a total number of 140 patients, of which 70 were included in ischemic stroke and 70 in intracerebral haemorrhage group. CT scan of head of each patient was done at least 6 hours after the onset of the event .CT diagnosed cases of infarct and ICH were included in this study and subarachnoid haemorrhage cases were excluded. CT negative cases were further investigated by MRI brain when the clinical suspicions of stroke were strong.* ***Results:*** *The mean age of the patients having features of ischemic stroke and intracerebral haemorrhage were 59.81±11.08 and 57.21±10.09 respectively. Male female ratio was 1.92:1 and 1.69:1 in IS group and ICH group respectively. Regarding the risk factor hypertension and smoking were observed most common risk factors in the study patients in both groups. However, diabetes mellitus, arrhythmia, ischemic heart disease and dyslipidemia were observed more common in patients of ischemic stroke than ICH patients. Among the studied patients, ischemic stroke was observed more common in parietal region (20% of patients), internal capsule/ capsular region (17.14% of patients) and caudate nucleus region (10% of patients). ICH was observed most frequently 32.86% (n=23), 15.71% (n=11) and 5.71% (n=4) in lentiform nucleus/putamen, thalamus and combined gangliothalamic region respectively. In both group left sided lesion prevailed more than right side. In case of ischemic strokes, left side lesion was 61.43% .In intracerebral haemorrhage, left side lesion was 58.57%. It was also observed that deep intracerebral haemorrhage is the most common location (74.29%) than the lobar region (25.71%).* ***Conclusion:*** *Site of predilection of lesions and their distribution pattern differ in ischemic stroke and intracerebral haemorrhage. This study revealed that infarcts were more common in parietal and capsular region and haemorrhage were more common in putamen, thalamus and combined gangliothalamic regions. Ischemic stroke and ICH also have differences in clinical presentation and risk factor profile.*

Key words: *Ischemic stroke, intracerebral hemorrhage*

Introduction:

Stroke is a major cause of mortality and morbidity around the world. It is the third most common cause of death in developed countries after coronary heart disease and cancer[1]. On etiological basis of all strokes about 85% are ischemic and 15% are haemorrhagic of which about 10% are due to ICH[2,3].

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Ischemic stroke occurs either due to thrombosis or embolism involving the cerebral circulation and categorized as small vessel lesion and large vessel lesion[4]. This distinction can usually be made by means of clinical features and more reliably by CT or MRI scanning [5].Around 70% of the thrombotic strokes are due to large artery thrombosis and remaining are small infarcts or lacunars infarcts[6].

Pure cortical stroke tends to be associated with large vessel atherosclerosis and cardiac embolism[7] Lacunar infarcts are small sub cortical infarcts (<1.5 cm diameter) in the territory of deep penetrating artery usually involving basal ganglia, thalamus, internal capsule, corona radiata, pons, cerebellum[6]. Another type of infarct, the, large subcortical infarct, are also located in cortical territory and supposedly not caused by small vessel disease[5]. In intracerebral hemorrhage, bleeding occurs into brain parenchyma due to rupture of microscopic aneurysm known as Charcot Bouchard aneurysm causing haemorrhage usually involving deeper structure[8]. ICHs were typically located in the basal ganglia (35%–44%), thalamus (10%–25%), subcortical white matter (19%–25%), cerebellum (5%–10%), and pons (5%–9%). Location is a major determinant of etiology [9].Deep ICH is usually associated with hypertension and lobar haemorrhage may occur due to amyloid angiopathy, ruptured AVM, coagulopathy, etc[10].

When stroke is suspected, neuro imaging is done for diagnosis of stroke, subtyping and localization of lesion. A CT scan of head can diagnose haemorrhage immediately but cannot diagnose infarct within 6-12 hours of onset [11]. Diffusion weighted MRI is more sensitive for early brain infarction than standard MR sequence or CT[12].

Analysis of lesion locations for groups of patients is important. It can identify areas that have a high probability of being affected by disease[13]. Knowing sites of lesion in stroke patients is helpful in determining risk factor association, formulating immediate and further management plan, and outcome prediction in individual case.

This study is designed to find out pattern of distribution and sites of predilections of lesions in ischemic stroke and intracerebral haemorrhage as evident on CT head or MRI brain and also to evaluate risk factor association and clinical features in ischemic stroke (IS) and intracerebral haemorrhage (ICH).

Methodology:

Study Design: This was a retrospective cross sectional observational study.

Duration of study: This study was carried out from March 2010 to February 2011 for a period of one year.

Place of study: Department of Neurology and Department of Medicine, Dhaka Medical College Hospital (DMCH), Dhaka.

Study Population: Patients admitted with history of first stroke in Neurology Ward or Medicine Ward.

Sample size: Total sample size was 140, of which 70 were of ischemic stroke and 70 were of intracerebral haemorrhage.

Selection of Sample: The samples were selected purposively.

Inclusion criteria: Adult patients (Age: equal or more than 18 years), history of first stroke, Presenting within two weeks of onset of illness, evidence of stroke confirmed by CT head or MRI brain, having informed consent.

Exclusion criteria: CT or MRI not showing a relevant lesion, history of recurrent stroke cases of subarachnoid haemorrhage (SAH).

Study procedure:

Patients admitted in DMCH through emergency or outpatient department in Neurology ward and Medicine ward with first attack of stroke were enrolled in this study. Detailed history was taken from each patient and thorough physical examination was performed. Partial demographic profiles ie, age, sex, occupation were recorded. Information regarding hypertension, smoking, diabetes, IHD and other relevant history were recorded through a structured questionnaire.

CT scan of head of each patient was done at least 6 hours after the onset of the event and evaluated by a consultant radiologist in the department of Radiology and Imaging, DMCH. CT diagnosed cases of subarachnoid haemorrhage were excluded from the study. CT negative cases were further

investigated by MRI brain when the clinical suspicion of stroke was strong. MRI evident cases of infarcts were included. Cerebral infarct was defined if CT showed area of low attenuation in the vascular territory that corresponded to recent symptoms and signs or MRI showed relevant T1 hypo intense and T2 / FLAIR hyper intense lesion. ICH was defined when CT scan demonstrated area of hyper density within brain parenchyma with or without ventricular extension. So, 70 cases of cerebral infarct and 70 cases of ICH were purposively included in the study.

Investigations like complete blood count, urine R/M/E, blood sugar (fasting/random), serum creatinine, fasting lipid profile, serum electrolytes and ECG were done for each patient. Regarding risk factors, hypertension was labeled if recorded BP was 140/90 mm Hg[14] or patient was on antihypertensive drug .Among smokers, history included number of sticks per day and duration in pack year. Diabetes mellitus was diagnosed when FBS was 7.0-mmol/L (126 mg/dl) or RBS 11.1 mmol/L (200 mg/dl) [15] or patient was on anti diabetic medication. Arrhythmia and IHD was diagnosed from suggestive history or ECG findings. Dyslipidaemia was diagnosed if, total cholesterol was > 200 mg/dl or LDL cholesterol > 130 mg/dl or Triglyceride > 150 mg/dl [16] or patient was on lipid lowering agent.

Analysis of data result:

The different variables of the data were analyzed with the help of SPSS (Statistical Package for Social Sciences) software version 16. Statistical analysis was done by appropriate procedure like Chi-square test where applicable. P value d" 0.05 was considered significant with 95% confidence interval.

Results:

The mean age of the patients having features of ischemic stroke and intracerebral haemorrhage were 59.81±11.08 and 57.21±10.09 respectively. Male female ratio was 1.92:1 and 1.69:1 in IS group and ICH group respectively.

Regarding the risk factor hypertension and smoking were observed most common risk factors in the study patients in both groups. However, diabetes mellitus, arrhythmia, ischemic heart disease and dyslipidaemia were observed more common in patients of ischemic stroke than ICH patients.

In the current study ischemic stroke was observed in parietal region (20%), caudate nucleus and lentiform nucleus (15.71%), capsular region (17.14%), frontal region (4.29%), fronto-parietal region (4.29%), thalamic region (2.86%), parieto-occipital region (2.86%), occipital region (4.29%), temporo parietal region (2.86%), and temporal region (2.86%). ICH was observed most frequently 32.86% (n=23), 15.71% (n=11) and 5.71% (n=4) in lentiform nucleus/putamen, thalamus and combined gangliothalamic region respectively. In both group left sided lesion prevailed more than right side. In case of ischemic strokes, left side lesion was 61.43% .In intracerebral haemorrhage, left side lesion was 58.57%. It was also observed that deep intracerebral hemorrhage is the most common location (74.29%) than the lobar region (25.71%).

Table-I

Distribution of the respondents' age by group (n=140)

Age (In yrs)	Ischemic stroke (n=70)		Intracerebral haemorrhage (n=70)	
	n	%	N	%
18 -20	0	0.0	0	0.0
21-30	1	1.43	1	1.43
31-40	3	4.29	2	2.86
41-50	14	20.00	19	27.14
51-60	17	24.29	25	35.71
61-70	23	32.86	14	20.0
>70	12	17.14	9	12.86
Mean±SD	59.81±11.08		57.21±10.09	
Range (min-max)	30 to 80		26 to 75	

Table I shows that most cases of ischaemic and haemorrhagic strokes occurred in older age groups (above 40 yrs).

Table-II

Distribution of the respondents according to risk factors (n=140)

Risk Factor	Ischemic stroke* (n=70)		Intracerebral haemorrhage* (n=70)		pvalue
	n	%	n	%	
Hypertension	48	68.57	54	77.14	0.254
Smoking	36	51.43	31	44.29	0.397
Diabetes mellitus	32	45.71	20	28.57	0.035
Arrhythmia	13	18.6	4	5.71	0.019
Ischemic Heart Disease	23	32.86	11	15.71	0.018
Dyslipidaemia	27	38.57	14	20.00	0.015

* Multiple responses

Table II shows Hypertension, Smoking, DM and Dyslipidaemia were common risk factors for both Ischaemic and Haemorrhagic stroke.

Table-III

Distribution of the respondents according to site of lesion (n=140)

Region	Ischemic stroke* (n=70)		Intracerebral haemorrhage* (n=70)		pvalue
	n	%	n	%	
Frontal region	3	4.29	3	4.29	0.676
Parietal region	14	20.00	4	5.71	0.011
Occipital region	3	4.29	2	2.86	0.500
Temporal region	2	2.86	3	4.29	0.500
Fronto parietal region	3	4.29	2	2.86	0.500
Parieto Occipital region	2	2.86	1	1.43	0.500
Temporo parietal region	2	2.86	1	1.43	0.500
Internal Capsule	12	17.14	2	2.86	0.004
Caudate nucleus	7	10.0	1	1.43	0.031
Lentiform nucleus/Putamen	4	5.71	23	32.86	0.001
Thalamus	2	2.86	11	15.71	0.008
Midbrain	2	2.86	1	1.43	0.500
Pons	3	4.29	4	5.71	0.500
Medulla oblongata	3	4.29	2	2.86	0.500
Cerebellum	3	4.29	4	5.71	0.359
Combined Gangliothalamic	0	0.0	4	5.71	0.042
Multiple sites	5	7.14	2	2.86	0.220

Table III shows that ischaemic stroke most commonly occurred in Parietal cortical region (20%) and in Internal Capsular region (17.14%) while ICH were commonly found in Lentiform nucleus/ Putamen region (32.86%).

Table-IV

Distribution of the respondents according to side of lesion (n=140)

Side of lesion	Ischemic stroke* (n=70)		Intracerebral haemorrhage* (n=70)		pvalue
	n	%	n	%	
Left	43	61.43	41	58.57	
Right	27	38.57	29	41.43	

Table IV shows left predominance of both ischaemic and haemorrhagic stroke (left ischaemic stroke 61.43% and left ICH 58.57%)

Table-V

Distribution of the ICH respondents according to Lobar & Non Lobar type (n=70)

Lobar/Non Lobar	Number of patients (n=70)	Percentage
Lobar	18	25.71
Non Lobar	52	74.29

Table V shows 74.29% of patients developed non-lobar and 25.71% developed lobar ICH.

Discussion:

The present study was carried out with an aim to find out distribution of lesion sites in ischemic stroke and intracerebral haemorrhage. The clinical features, risk factors and the partial demographic profile (i.e. age, sex and occupation) of the patients were also evaluated. A total number of 140 patients were included in this study. Number of patients in each group was 70. In ischemic stroke, age group range was 30 to 80 years and in intracerebral haemorrhage, age group range was 26 to 75 years.

In the current study, the mean age of patients having features of ischemic stroke was found 59.81 ± 11.08 years ranging from 30- 80 years and maximum number (32.86%) was found in the age group of 61 to 70 years. On the other hand, the mean age of the patients having features of intracerebral haemorrhage was 57.21 ± 10.09 years ranging from 26 to 75 years and the highest frequency (35.71%) was found in the age group of 51 to 60 years.

In the current study HTN and smoking emerges as the most important and common risk factor in both ischemic stroke and hemorrhagic stroke. Among the studied patients 68.57% and 55% patients of ischemic stroke and 77.14% and 50% patients of hemorrhagic stroke were hypertensives and smokers respectively. Mohammad et al. (2003) found in their study, 67% of stroke patients were hypertensive [17]. According to Siddique et al (2009) study, smoking appeared as an important risk factor in both hemorrhagic and ischemic stroke[18].According to Karapanayiotides et al (2004), ischemic stroke was more prevalent in diabetics and haemorrhagic stroke was significantly less prevalent in diabetics i.e. diabetic individuals had a lower relative prevalence of intracerebral haemorrhage[19].These findings also correlate with the present study where significantly higher diabetic patients (45.71%) were present in ischemic group than hemorrhagic group (28.57%) .Rahman et al. (2001) found significant relation of ischemic heart disease with ischemic stroke, which supports the present study[20]. On the other hand Sarker et al. (2008) observed association of dyslipidaemia in ischemic stroke especially cortical type[21]. In the current study dyslipidaemia shows significant association in ischemic stroke, this matches with the study.

In the current study ischemic stroke was observed in parietal region (20%), caudate nucleus and lentiform nucleus (15.71%), capsular region (17.14%), frontal region (4.29%), fronto-parietal region (4.29%), thalamic region (2.86%), parieto occipital region (2.86%), occipital region (4.29%), temporo parietal region (2.86%), and temporal region (2.86%) which almost matches with the study of Rahman, Quddus and Salahuddin (1998). Rahman, Quddus and Salahuddin (1998), found distribution of cerebral infarct in the following locations such as parietal region (27%), basal ganglia (20 %), capsular region (16%), frontal region (6%), fronto parietal

region (5%), thalamic region (3%), parieto-occipital region (3%), occipital region (3%), temporo parietal region (3%), brainstem (2%), temporal region (1%), extra capsular(1%), pontine region(1%)[22]. Siddique et al. (2009) observed ischemic stroke in cortical region (58.75%), internal capsular region (12.25%), basal ganglia region (6.25%), insula (5%), thalamus (7.5%), cerebellum (7.75%) and multifocal (2.5%) [18] .According to Rahman, Quddus and Salahuddin (1998) findings, maximum number of infarct was found in parietal region followed by basal ganglia and capsular region[22]. The present study depicted that parietal region and capsular regions are the commoner sites of infarction.

Singh et al. (2006) observed the sites of intracerebral hemorrhages in order of frequency were putamen (65%), lobar (17%), thalamus (13%), Pons (3%) and cerebellum (2%) which is comparable with the present study where the frequency of putamen, lobar, thalamus, pons and cerebellum are 32.86%, 25.71%, 15.71%, 5.71%, 5.71% respectively[23]. In the current study intracerebral hemorrhages were also observed in combined gangliothalmic region (5.71%), medulla oblongata (2.86%), mid brain (1.43%), Caudate nucleus (2.86%) and multiple sites (2.86%). On the other hand, Tatu et al. (2000) found the locations of intracerebral hemorrhages were lobar (36.5%), lenticular (32%), thalamic (15.7%), cerebellar (8.8%), midbrain and pons (2%), intraventricular (2%), caudate (1%) and multiple (2%)[24]. Siddeque et al. (2009) also found ICH in cortical region (65%), internal capsular region (0%), basal ganglia region (25%)insula (0%), thalamus (5%), cerebellum (5%) and multifocal(5%)[18]. Junko Nagura et al. (2005) found the lesion sites of intracerebral haemorrhage in putamen (32%), thalamus (29%), combined haemorrhage in putamen and thalamus (3%), subcortex (16%), cerebellum (8%), pons (7%), caudate nucleus (0.7%) or others (2%)[25].

Regarding the most common sites of lesion in haemorrhagic stroke, Abro et al. (2007) found putamen (51.8%) followed by thalamus (33.3%)[26]. Nagura et al. (2005) observed intracerebral hemorrhages were more frequent in putamen (32%), and thalamic region (29%)[25]. Hadi et al. (2010) estimated more haemorrhage in basal ganglia region[26].Singh et al. (2006) observed the sites of intracerebral hemorrhages in order of frequency were putamen (65%), followed by lobar (17%), thalamus (13%)[23].All these findings support the current study where the most common lesion site of intracerebral hemorrhages were putamen followed by thalamus. In the present study, cerebral infarct in internal capsular region was significantly higher than hemorrhage, which is comparable to Siddeque et al. (2009) study where they found ischemic stroke in internal capsule (12.25%)[18]. In the current study ischemic stroke in parietal region and caudate nucleus region were also significantly higher than haemorrhagic stroke.

In the current study, haemorrhage in putamen region, thalamic region and combined gangliothalamic region were significantly higher than infarct. Abro et al (2007) found in putamenial haemorrhage and thalamic haemorrhage were 51.8% and 33.3% respectively, which were significantly higher than cerebral infarcts[27].These findings support the present study.

According to study of Flaherty, Deep ICH was the most common location (36-67%), followed by lobar ICH (15-25%), cerebellar(7-11%) and brain stem haemorrhage (4-9%) which is comparable to the present study, where deep ICH or non-lobar ICH (74.29%) is the most common location followed by lobar ICH (25.71%)[28].

In the current study both infarct and haemorrhage were found more on left side of brain. In a study by Rahman, (1998) of the patients of ischemic stroke, showed that the commonest side lesion was the left side of the brain[22].So variations in distribution of lesion sites occur in ischemic stroke and intracerebral hemorrhage.

Conclusion:

Site of predilection of lesions and their distribution pattern differ in ischemic stroke and intracerebral haemorrhage. This study revealed that infarcts were more common in parietal and capsular region and haemorrhage were more common in putamen, thalamus and combined gangliothalamic regions. Ischemic stroke and ICH also have differences in clinical presentation and risk factor profile.

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Bangladesh Journal of Neuroscience 2014; Vol. 30 (2): 77-83

Etiological Pattern of Dementia in Patients Attending Dementia Clinic in a Referal Hospital

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Abstract:

Background and objectives: *Dementia is characterized by loss of or decline in memory and other cognitive abilities and reduces the lifespan of affected people. The number of people with Alzheimer's Disease and other dementias is increasing every year because of the steady growth in the older population and stable increment in life expectancy and it is expected to increase two-fold by 2030 and three-fold by 2050.In addition to Alzheimer's disease there are so many reversible and irreversible causes of dementia. This study was aimed to explore the different etiological factors related to dementia patients. Risk factors for dementia, co-morbid conditions were also included.* ***Methods:*** *This cross sectional study was carried out from 2009 to 2014 at dementia clinic (OPD), department of Neurology, Bangabandhu Sheikh Mujib Medical University (BSMMU). A total number of 166 dementia patients, as diagnosed by Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) and confirmed by Mini Mental State Examination(MMSE) score were recruited in this study. Diagnosis of specific type of dementia was made on the basis of established criteria.* ***Results:*** *Alzheimer's disease(32.5%) and Vascular dementia(31.9%) were the most common etiological factor followed by Mixed dementia(19.9%), PD with dementia(8.4%) and others(7.2%) like hypothyroidism, head injury, epilepsy etc. Increasing age, hypertension, diabetes mellitus, dyslipidemia, IHD, smoking are potential risk factors for dementia.* **Conclusion:** *This study concludes Alzheimer's disease and Vascular dementia are almost equally occurring dementia. There are also some potential risk factors for development of dementia whose modification can bring a great change in dementia treatment and functional outcome of this group of elderly people of Bangladesh.*

Keywords: *Dementia, Alzheimer's Disease(AD),Vascular dementia(VaD), Etiology, risk factors.*

Introduction:

Dementia is a clinical syndrome characterized by "a global deterioration of mental functioning in its cognitive, emotional and conative aspects"[1]. Dementia is a syndrome consisting of a loss of several separable but overlapping intellectual abilities and present in a number of different combinations[2]. Memory is the most common cognitive ability lost with dementia; 10% of persons >70 and 20–40% of individuals >85 years of age have clinically identifiable memory loss[3]. In addition to memory, other mental faculties are also affected in dementia; these include language, visuospatial ability, calculation, judgment, and problem solving. Neuropsychiatric and social deficits also develop in many dementia syndromes, resulting in depression, withdrawal, hallucinations, delusions, agitation, insomnia, and disinhibition. Diagnoses of dementia require some sort of memory deficit, although there are many dementias, such as frontotemporal

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dementia, where memory loss is not a presenting feature[4]. The reported frequency of dementia due to potentially reversible causes varies from 0 to 23% [5]. Cases of dementia are increasing due to longer life expectancy of the world population. Annual rate of progression to dementia is 15%. Doubling the incidence of dementia above 65 yrs for every five yrs. Above the age of 85 yrs 50% have dementia[3]. Dementia affects 3-11% of the community dwelling adults who are more than 65 years of age[6]. By 2025, 75% of estimated 1200 million people aged 60 years and older will be in developing countries. This growing of the developing world will pose a great medical, social and financial impact and will create an accelerated burden to infectious diseases and poverty[3].It is estimated that the annual total cost of caring for a single AD patient in an advanced stage of the disease is >$50,000. The disease also exacts a heavy emotional toll on family members and caregivers[4]. Dementia is considered as the 3rd most expensive disease in USA bearing a care cost of about US$ 100 billion / year are direct care costs - US$ 50 billion / year. Major Burden is due to cost of long term home and institutional care. In UK care costs -US$ 11 billion / year and direct care - US$ 06 billion / year[7]. The prevalence of dementia in Bangladesh is 0.1% and among them 63.2% are male and 36.8% are female[8].The overall prevalence of dementia is estimated in India was 3.36%[9]. Alzheimer's disease (AD) is the most common sub-type of dementia with, approximately two-third of dementia cases in over 65 years being diagnosed as AD[10]. The other subtype of dementia includes vascular dementia or multi-infarct dementia (MID), Lewy body dementia, Parkinson's disease, Frontotemporal dementia, Creutzfeldt-Jakob disease etc.

The symptoms and problems linked to dementia can be best understood in three stages[11]: (1) Early stage: (developed in 1-2 years): The early stage of dementia is often overlooked because the onset of dementia is gradual, it is often difficult to be sure exactly when it begins[11]. The person may for example:

- Have problems talking properly (language problems).
- Have significant memory loss – particularly for things that have just happened.
- Not know the time of day or the day of the week.

(2) Middle stage: (developed in second to fifth year): As the disease progresses, limitations become clearer and more restricting. The person with dementia has difficulty with day-to-day living and:

- May become very forgetful – especially of recent events and people's names.
- Can no longer manage to live alone without problems.
- Is unable to cook, clean or shop.

(3) Late stage: (developed in fifth year or after): This stage is one of near total dependence and inactivity. Memory disturbances are serious and the physical side of the disease becomes more obvious. The person may:

- Have difficulty eating.
- Be incapable of communicating.
- Not recognize relatives, friends and familiar objects.
- Display inappropriate behavior in public.
- Be confined to a wheel chair or bed.

The DSM IV criteria (The Diagnostic and Statistical Manual for Mental Disorders, Fourth Edition)[12] : recommends that factors A-D must all be satisfied to make a diagnosis for dementia

A. The development of multiple cognitive deficits manifested by both

1. memory impairment (impaired ability to learn new information or to recall previously learned information)
2. one (or more) of the following cognitive disturbances:
   a. aphasia (language disturbance)
   b. apraxia (impaired ability to carry out motor activities despite intact motor function)
   c. agnosia (failure to recognize or identify objects despite intact sensory function)
   d. disturbance in executive functioning (i.e., planning, organizing, sequencing, abstracting)

B. The cognitive deficits in Criteria A1 and A2 each

1. cause significant impairment in social or occupational functioning
2. represent a significant decline from a previous level of functioning.

C. The deficits do not occur exclusively during the course of a delirium.

D. The disturbance is not better accounted for by another axis I disorder (for example, major depressive disorder, and schizophrenia)

The DSM IV criterion was developed by American Psychiatry Association[12] and has been widely used in both clinical and epidemiological research. Advanced age remains the main risk factor for most forms of dementia[13] . Onset before 65 year of age is rare and, in the case of AD, often suggests a genetic cause. Single gene mutations at one of three loci (Beta amyloid precursor protein, presenilin1 and presenilin2) account for most of these cases[14]. For late-onset of AD, both environmental (lifestyle) and genetic factors are important. A common genetic polymorphism, the apolipoprotein E (apoE) gene e4 allele, greatly increases risk of going on to suffer from dementia; up to 25% of the population has one or two copies[14]. The evidence strongly establishes a causal role of cardiovascular risk factors and cardiovascular disease in the aetiology of dementia and AD[15]. In short and longer latency incidence studies, smoking increases the risk for AD. However occasional negative finding have also been reported from large populations based prospective studies[16,17]. Those with high cardiovascular risk scores (incorporating hypertension, diabetes, hypercholesterolemia and smoking) have an increased risk for dementia incidence whether exposure is measured in midlife or a few years before dementia onset[18-19]. Recent studies report associations between metabolic syndrome and incident cognitive decline[20], and insulin resistance and impaired executive function [21]. Diabetes is also reported as a risk factor[22].There are some other reversible causes of dementia like hypothyroidism, deficiency of B vitamins specially Vit B_1 and B_{12},NPH, subdural haematoma, brain tumour, chronic infections, alcohol and other drug intoxication etc.

Methods:

This study was carried out in patients attending dementia clinic (OPD) of department of Neurology, Bangabandhu Sheikh Mujib Medical University (BSMMU),Dhaka from January 2009 to December 2012. A total number of 166 patients were enrolled in the study. This was a cross sectional study. The sampling technique was purposive (non- probability) sampling as per inclusion and exclusion criteria. Inclusion criteria were all patients with clinically diagnosed or documented to have dementia irrespective of age and sex; and attendants of participants, who gave consent and willing to comply with the study procedure. Acutely ill patients and patients unwilling to take part in the study were excluded.

Written informed consent was taken from the patients or their attendants before any interview. Data were collected by predesigned semi-structured questionnaire by the investigator consisting of medical history, physical examination, mini mental score examination, investigation as soon as possible after contact with the patient. Data obtained were recorded in predesigned data collection sheet.

i) Dementia was diagnosed by the criteria indicated by DSM-IV[1]. ii) Probable Alzheimer's disease was diagnosed by the criteria indicated by National Institute of Neurological Communicative Disorders and Stroke / Alzheimer's Disease and Related Disorders Association[23]. iii) Vascular dementia was diagnosed by DSM-IV criteria[1]. iv) Frontotemporal dementia was diagnosed by the clinical criteria[24]. v) Dementia with Lewy Bodies was diagnosed by Consensus Diagnostic criteria[25]. vi) Possible Creutzfeldt-Jakob disease (CJD) was diagnosed by the clinical criteria (CDC Diagnostic criteria for possible Creutzfeldt-Jakob disease 2010)[26]. vi) Others- Types of Dementia which were not fulfilling the established criteria were included here.

Data were processed and analyzed with the help of SPSS (statistical Package for Social Sciences) Version 16.0. Quantitative data were expressed as mean and standard deviation, while qualitative data were expressed as frequency and percentage.

Results:

Age of demented patients ranged from 14 to 90 years with the mean 56.68±17.52 years. Distributions of the age of the patients are shown in Table I. In this study 107(64.46%) patients were male and 59(35.54%) patients were female with a male to female ratio of 1.81:1 (Table II).

Table-I

Distribution of patients by age (n=166)

Age (years)	Number of patients	Percentage (%)
<30	6	3.6
31-40	2	1.2
41-50	17	10.2
51-60	33	19.8
61- 70	54	32.5
>70	54	32.5

Table-II

Distribution of patients according to sex (n=166)

Sex	Number of patients	Percentage (%)
Male	107	64.46
Female	59	35.54

Table III showed the distribution of various risk factors associated with dementia . Only HTN was associated in 18.07% patients, DM in3.01%, Dyslipidemia in 1.81% and smoking in 15.06% of cases ; HTN and DM were in 10.24% ; HTN and Dyslipidemia in 3.01% ; HTN,DM and Dyslipidemia in 3.61% ; ICSOL in 2.41% ; Head injury in1.81% ; Epilepsy in 1.20% ; Hypothyroidism in 1.81% ; Post encephalitic state in 1.20% and 36.75% cases having no risk factors (Table III).

Table-III

Distribution of risk factors among the study population (n=166)

Risk Factors	Number of patients	Percentage (%)
HTN	30	18.07
DM	5	3.01
Dyslipidemia	3	1.81
Smoking	25	15.06
HTN with DM	17	10.24
HTN with Dyslipidemia	5	3.01
HTN with DM with Dyslipidemia	6	3.61
ICSOL	4	2.41
Head injury	3	1.81
Epilepsy	2	1.20
Hypothyroidism	3	1.81
Post Encephalitis	2	1.20
No risk factors	61	36.75

Out of 160 patients 94.58% had no family history of dementia and only 54.2% had family history of dementia (Fig. 1).

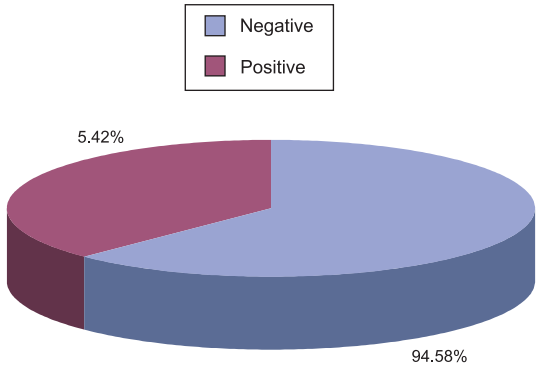

Fig.-1: *Distributions of patients by family history of dementia*

Regarding etiology, the study showed Alzheimer's disease as the highest number, next to it vascular dementia, followed by mixed dementia, PD with dementia and others (Table IV). Vascular dementia includes PSD, Multi infarct dementia, Small vessel disease; Mixed dementia comprises AD with VaD or PD and other dementias indicating secondary causes like ICSOL, Hypothyroidism, Epilepsy , Head injury, Post encephalitic state etc.

Table-IV

Distribution of etiological findings among the study population (n=166)

Etiological findings	No. of patients	Percentage(%)
Alzheimer's Disease	54	32.5
Vascular dementia	53	31.9
Mixed dementia	33	19.9
PD with dementia	14	8.4
Others	12	7.2

Discussion:

Dementia is an acquired and persistent compromise in multiple cognitive domains that is severe enough to interfere with everyday functioning[1]. In western world between 60% and 70% of people with the dementia syndrome have Alzheimer's disease. A smaller number have other causes such as Lewy

body dementia, frontotemporal dementia, PD, hypothyroidism and vitamin B_{12} deficiency[27].

In this study, male was predominant than female which was 107(64.46%) and 59 (35.54%) cases respectively. The ratio of male to female was 1.81:1.Similar result was reported by Hoffman et al[28] that in subjects under 75 years the prevalence of dementia was slightly higher in men than in women.Ravaglia et al.[29] reported that sex did not affect dementia risk which was inconsistent with the present study. In the present study , cases were taken from OPD(Dementia clinic) of Dept of Neurology, BSMMU where most of the patients were male.

Maximum patients(32.5%) were in the age group 61-70 years. In this study AD(54) and Vascular dementia(53) cases were closer in number and they were more common in age group 61-70 years. Similar result was reported by McCullagh et al.[30] that after 65 years of age, the incidence and prevalence of dementia doubles every 5 years.It was reasoned that older individuals have longer exposure to putative environmental and genetic influences. Rimmer[3] found a similar result and reported that cases of dementia are increasing due to longer life expectancy of the world population and 10% of all above 70 years has memory impairment.

Various risk factors associated with dementia among the study population was observed in this study. Only HTN was found in 30(18.07%) patients and DM in 5 (3.01%) cases. Similar result was reported by Ott et al.[16] that DM almost doubled the risk of dementia. Patients treated with insulin were at highest risk of dementia[16]. Mizrahi et al.[31] reported that non insulin dependent diabetes mellitus(NIDDM) is associated with an increased incidence of cognitive impairment which is consistent with the present study. In this study other co morbid conditions such as Dyslipidemia 3(1.81%), smoking 25(15.06%), HTN and DM 17(10.24%), HTN and Dyslipidemia in 5(3.01%), HTN,DM and Dyslipidemia 3.61% were found The study also found some reversible causes of dementia like ICSOL 4(2.41%), Head injury in 3(1.81%) ; Epilepsy in 2(1.20%) ; Hypothyroidism in 3(1.81%) cases.

Only 9(5.42%) cases gave positive family history. Similar finding was observed by Lindsay and Anderson[32] . They mentioned that there was no statistically significant association for family history of dementia.

The distribution of major categories of dementia among the study population were recorded in this study. It was observed that Alzheimer's dementia 54(32.5%) and Vascular dementia (VaD) 53(31.9%) were nearly same occurrence followed by mixed dementia, PD with dementia and other secondary dementias. But worldwide, AD is the most common form of dementia(70%) followed by VaD (10-15%)[33]. These findings differ with this study. Here VaD has nearly equal prevalence in our population because of higher incidence of stroke. In this study after AD and VaD the most common etiological factor dementia were Mixed dementia 33(19.9%) ;PD with Dementia 14(7.2%); Other dementias 12(7.2%). Similar results were reported by Ikeda et al.[34] that vascular dementia was 47% followed by AD which was 35% and others 18%. But most of the author claimed reverse. Hale[35] mentioned that AD is the most common cause of dementia, accounting for about half of all cases. Shelly et al[36] observed AD and VaD 52.6% and 24.1% respectively. Shaji et al[9] reported that prevalence of AD and VaD in an urban population in Kerala, was 54% and 39% respectively. Reports of this study differed from those studies may be due to patient selection. Most of the studies were carried out on elderly patients without age limit. In this study patients were enrolled from neurology unit where most of them were stroke patients and its complication related. It may also be true that AD is less common in our country. In this study secondary causes of dementia were ICSOL, Head injury Hypothyroidism, Epilepsy, Post Encephalitis state. Similar result was reported by Srikanth et al[37]. PD with dementia was found in 14(7.2%) cases which was supported by Hale[35] that dementia may develop late in the disease, but not everyone with PD has dementia.

Conclusion:

Alzheimer's Disease is the most common etiological factor of dementia worldwide. Next to this is the Vascular dementia. Increasing age is the single most

risk factor for development of dementia. Hypertension is associated with both vascular and degenerative dementia. Diabetes mellitus, Dyslipidemia, IHD are important co-morbid conditions. ICSOL, hypothyroidism, head injury, epilepsy are potentially reversible causes of dementia. Modification of risk factors and treatment of co morbid conditions can greatly improve the quality of life of these elderly demented patients.

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Bangladesh Journal of Neuroscience 2014; Vol. 30 (2): 84-89

Ischaemic Stroke and occult cardiac abnormality-A Transthoracic Echocardiography based study

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Summary:

Background: *Most of the cases of stroke are of ischemic origin. Various cardiac diseases have been shown to increase risk of stroke. Cerebral embolism derived from a diversity of cardiac disorders is responsible for H"20% of ischemic stroke. AF is the most powerful and treatable cardiac precursor of stroke. Cardiac abnormalities are important risk factors for stroke. A cardiac source of thromboembolism must be excluded in patients presenting with a definite embolic occlusion of a peripheral artery, or multiple thromboembolic episodes in diverse anatomical regions. These patients should undergo transthoracic echocardiography initially and transoesophageal echo if image quality is unsatisfactory because of obesity, lung disease or chest deformity.* ***Methods:*** *An descriptive and observational study done in Neurology unit, Chittagong Medical College hospital from January 2007 to December 2007.Patients presented primarily as ischemic stroke was examined to find out prevalence of occult cardiac abnormality and to find out the frequency of different type cardiac abnormality in ischemic stroke through echocardiography.* ***Results:*** *A total number of 265 patients were examined. Different types of cardiac findings, the maximum number are LV hypertrophy (23%) and followed by Diastolic dysfunction (17%), than multiple vulvular disease (8.5%). Small number of other abnormality found but no PFO and mitral valve prolapse identified in this study. In under 30yrs age group of cases all the abnormal findings found are valvular abnormality. They are mitral stenosis (2), multiple valvular disease (2) and mitral regurgitation (1). In 30 – 49 yrs age group different abnormal findings, most of which are also valvular lesions including aortic stenosis(2), multiple valvular disease(2) and mitral regurgitation(1). Intracardiac thrombus found in one case.In e"50-69 yrs age group of patients, maximum abnormality found is LVH(7) followed by Diastolic dysfunction(4).Maximum abnormality found in e"70 yrs of age group is LVH(3) and next to it is distolic dysfunction(2).* ***Interpretation:*** *Echocardiography may provide important information on the cause of ischemic stroke. Taking into account a low rate of findings with direct impact on evidence-based therapeutic strategies, routine use of echocardiography is not warranted in all patients with stroke. In patients younger than 50 years, echocardiography has higher diagnostic yield and should routinely be performed.*

Introduction:

Stroke is the third leading cause of death in most western countries.[1] Stroke can be ischemic (85%) or hemorrhagic (10% to 15%),[2,3] and ischemic stroke can be classified, according to etiology,[4] as: (1) large vessel atherosclerosis, (2) cardioembolic, (3) small vessel atherosclerosis (lacunes), (4) other determined etiology, or (5) undetermined etiology. Embolism accounts for 15% to 20% of all strokes.5 Several heart diseases are potentially embolic,[5–7]

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and some indicate anticoagulation as beneficial[8–11] and should therefore be identified. Stroke results from either ischemia, due to arterial occlusion or stenosis, or hemorrhage, due to leakage or rupture of an artery. Various cardiac diseases have been shown to increase risk of stroke. Cerebral embolism derived from a diversity of cardiac disorders is responsible for 20% of ischemic strokes[12,13]. 60% of the emboli of left ventricular origin have been associated with acute MI[12]. Although atrial fibrillation, responsible for 50% of cardioembolic strokes,[11] can be diagnosed by an ECG, echocardiography is an important test in the diagnosis of the remaining embolic heart diseases. Prevalence of Patent Foramen Ovale a pooled analysis of autopsy studies yielded an average prevalence of patent foramen ovale (PFO) of 26% (range 17% to 35%). In most echocardiographic studies on ischemic stroke patients, the prevalence of a PFO is higher in patients with a cryptogenic stroke. In a recent study of 61 patients, a PFO was found in 45% of those with cryptogenic stroke and in 23% of those with a stroke associated with large vessel atherosclerosis, lacunar ischemia, or cardiogenic embolism[3]. This discrepancy is larger in young patients than in the elderly[14]. Nevertheless, the role of echo-cardiography in the management of patients with acute stroke is not clear; recent recommendations on the management of acute stroke[15,16] fail to consider echocardiography as an essential test in all patients.

Echocardiography is the investigation of choice when a cardiac source of embolism is suspected. However, debate persists about which patients with a stroke or thromboembolism requires imaging.

Transthoracic echocardiography combines real-time two-dimensional imaging of the heart and cardiac valves with information about velocity and direction of blood flow obtained by doppler and colour flow mapping. It is non-invasive, and a complete examination can be performed in most patients in less than 25 min. So that it is of current issue whether use of echocardiography is useful to determine any occult cardiac abnormality in case of ischemic stroke. The goal of the current study was to determine the prevalence of heart disease that would have therapy implications (anticoagulation) in acute ischemic stroke patients without atria fibrillation.

Objectives: To find out prevalence of occult cardiac abnormality in ischemic stroke patients, through echocardiography. To find out the frequency of different type cardiac abnormality in ischaemic stroke.Age and sex ratio of cardiac abnormalities in stroke patients.

Methods:

It was a descriptive study conducted in Neurology unit, Chittagong Medical College hospital. Population was the patients presented primarily as ischaemic stroke in dept. of neurology , Chittagong medical college and hospital during the period from January 2007 to December 2007. All patients admitted in the Neuromedicine unit were included if they are with Ischaemic stroke. Patient were sent for Echocardiography after patient's condition becomes stable for at least 24 hours and GCS - ³ 10.Echocardiography will be done in Cardiology department of CMCH.Data were collected by direct interviewing the patient or there close attendants and examining the patients and collecting all information's and the results of relevant investigations will be noted in a data entry sheet for final analysis.

Sampling technique was purposive and I included number of patients available within the above mentioned time. All the patients presented as stroke which ischaemic, confirmed by CT scan of brain and GCS of the patient is ³ 10 and if patient is fit to bring to cardiology dept. for echocardiography was included in the study.

Exclusion criteria: a. Known cardiac abnormality. b. Known comorbid conditions that can cause stroke.(e.g. Vasculitis, Familial hypercholesterolemia, hyperhomocystinemia etc.)

Data Collection: The history and findings of physical examination including investigational findings will be recorded after informed consent of the patient or the patients guardian. All data will be collected in individual case record form (Annex). The necessary investigation results will be collected and recorded in an attached sheet. Collected data will be managed and analyzed using computer with

statistical package SPSS. P value < 0.05 was taken as minimum level of significance.

Observation and results: A total number of 265 patientswere examined. A total number of 350 patients were interviewed to obtain 265 cases. Among them, 85 patients were excluded from the study due to presence of Haemorrhagic stroke (55), Noncooperation (15) , severe cardio-respiratory condition (5), deep coma (6), and death (4) of patients respectively. No control subject has not been taken as this study is to observe the presence of underlying cardiac abnormality among stroke patients who are not previously known as cardiac patient.

Table-I

Distribution of patient by Sex and Inhabitance

Sex	Total	Rural	%	Urban	%
Male	163	131	80.4	32	19.6
Female	102	84	82.4	18	17.6
Total	265	215	81.13	50	18.87

Table-1 shows that maximum number of patients are from rural area(81.1%) and smaller number are from Urban area(18.9%).Male female ratio from urban and rural area are similar.

Table-II

Showing different Echocardiographic findings in different age group of patients.

SL	Echocardiography findings	Age				
		<30yrs	30-49yrs	>50-69yrs	e”70yrs	total
1	Cardiac arrythmia	0	0	2	1	3
2	PFO	0	0	0	0	0
3	Mitral stenosis	2	0	1	0	3
4	Mitral regurgitation	1	1	1	0	3
5	Aortic stenosis	0	2	0	0	2
6	Aortic regurgitation	0	0	1	0	1
7	Multiple valvular lesions	2	2	0	0	4
8	Aortic valve calcifications	0	0	2	1	3
9	LV hypertrophy	0	1	7	3	11
10	LV dilatations	0	0	2	0	2
11	Myocardial infarction	0	0	2	1	3
12	Diastolic dysfunctions	0	2	4	2	8
13	Intracardiac thrombus	0	1	1	0	2
14	Mitral valve prolapse	0	0	0	0	0
15	Left atrial dilatation	0	0	2	0	2
16	Normal findings	15	24	145	34	218
	Cases of echocardiographic abnormalities	5	9	25	8	47
	% of incedence of abnormalities	25	27	15	19	18

Table-III

Sex distribution of cases and findings.

Sex	No. of cases	% of total	No of Echo abnormality	% of Echo abnormality
Male	163	61.5%	36	22%
Female	102	38.5%	11	11%
Total	265	100%	47	18%

Table-IV

Showing age group distribution of patient and findings.

Age group	<30yrs	30-49yrs	>50-69 yrs	³70yrs	Total
Total patient	20	33	170	42	265
Abnormal cardiac findings	05	09	25	08	47
% of abnormality	25	27	15	19	18

Table-V

Shows distribution of risk factors among cases

Risk factors	Male	%	Female	%	Total	%
Smoking	117	72	11	11	128	48.3
DM	40	15.1	25	24.5	65	24.5
Hypertension	80	49	60	58.8	140	52.8
H/O TIA	6	3.68	2	1.96	8	
H/O Taking OCP			18	17.6	18	17.6
H/OAlcohol	4	1.5	nil			1.5

Table-2: Showing prevalence of different type of cardiac abnormality in different age group of patients.Highest % of abnormality found in 30-49 yrs age group(27%), followed by under 30yrs age group(25%).Overall prevalence is 18%.

Table-3 showing distribution of sex and echocardiographic findings in different sex group.Here 61.5% of patients are male and 31.5 % of patients are female.Abnormal echo findings found in 22% of male and 11% of female patients.

Table-IV showing maximum number of of patients(170) were of within 50-69 years of age .

Table-5 shows percentages of different risk factors among different sex. Overall 48.3% were smoker, of them 72% of male and 11% of female were smoker.DM present in 24.5%, HTN in 52.8%. Among female, 17.6% were taking OCP.Only 4 male patient was found Alcoholic.

Discussion:

This was a hospital based study and was carried out to see the prevalence of cardiac abnormality in patient of ischemic stroke. The study subjects were taken from the Department of Neurology, Chittagong Medical College and Hospital, Chittagong. During the study period, from January 2007 to December 2007. 265 patients, diagnosed as ischemic stroke clinically and confirmed by CT scan of head, were evaluated. In the study, majority (64%) of the subjects were in between 50-69 years of age . In this study the 61.50% were male and 38.50% were female. The male to female ratio was 1.6:1. Male involvement was higher than females. This difference may be due to the socio-cultural stigma prevailed in our country. Females are not generally brought to hospital.Majority of study

subject were rural(81%) inhabitance. This may be due to the fact that majority of the urban patient treated in Private Clinic and Doctor's chamber. This study showed majority of study subject were retired person (19.8%), businessman(19.8%) and housewife(19.8%).In the present study showed that 72% of male and 11% of female stroke patients were smoker . .In this study 10% stroke patients had family history of stroke. It is lower then the some previous study parameter(18.50%). This may be due to increase awareness of the population about prevention of stroke and increase awareness of diabetes mellitus and hypertension. In this study, history of OCP present in 17.5% of female patients. It is higher then the some previous study. This difference may be due to good impact of family planning program in our society.

In this study, Table-4 Shows that 18% of patients who are not previously bearing any known cardiac abnormality, found to have some cardiac abnormality in transthoracic echocardiography . Recognised textbook and journals showed that around 20% of patient of ischemic stroke patient bears underlying abnormality in heart[15]. In this study frequency of cardiac abnormality found slightly lower then recognized text , probably due to lack of facility to do the TEE, which can diagnose trivial abnormalities which has lack of sensitivity in TTE.

In this study there are different frequency of cardiac abnormality in different age group.Most structural cardiac abnormality found in under 30 age group.In this group 25% cases showed some abnormal findings. In this group all the cardiac abnormalities found are valvular abnormality, which are mitral stenosis(2), mitral regurgitation(1), multiple valvular disease(2).These structural lesions are probable culprit in many case of young stroke patients.

Other age group showed abnormality in 27% cases in 30-49yrs age group which is the highest frequency , 15% abnormal findings in 50-69 yrs age group which is lowest frequency and 19% echocardiographic findings found in over 70yrs age group.

In this study structural abnormality are frequent in <50 age group and functional cardiac abnormality are more in >50 age group of patients. Functional abnormality like diastolic dysfunctions , Left ventricular hypertrophy or dilatation are more common among over 50 years aged patients.

In this study most frequent abnormality are found LVH (11)(23%) which is consistent with previous similar study[17] .Most of the case of LVH are in patient of over 50 years of age. This is probably due to long standing uncontrolled hypertension, as in our rural area most of the hypertensive patients are either remain untreated or maltreated.

Previous study and literature showed that a significant number of patients with PFO[17], but in this study there were no case of PFO was found. Patent foramen ovale (PFO), a persistence of an embryonic defect in the interatrial septum, is present in up to 27% of the general population[16]. Thus, detection of a PFO during evaluation of a patient with a stroke is not surprising, and the frequency of PFO detection in these patients can be as high as 40-45%. This frequency of detection is especially high among people without any other obvious explanation for the stroke. Concluded from a meta-analysis of several studies that the relative risk of stroke compared to non-stroke controls increased by a factor of 1.83 if a PFO was present.We found no case of PFO probably due to lack of sensitivity of TTE in detecting PFO.If TEE could be done , than PFO could be identified.

Diastolic dysfunction found second commonest finding in this study. 17% of the abnormal findings found to have diastolic dysfunctions. Most of the cases of diastolic dysfunctions are found in over 50 years of age.Cardiac arrhythmia found in 3(6.38%) cases. All are over 50 years of age.

Valvular abnormality found in 16(34%) cases, among them most(62.5%) are of under 50 years age group. Aortic valve calcification found in 3 cases, all are aged over 50 years.

In conclusion of this study it can be said that significant number of patient of cryptogenic ischemic Ischemic stroke patient shows cardiac abnormality in echocardiography, which may be the contributor of the occurrence of stroke.

Conclusion:

Stroke is the 2nd leading cause of mortality in the world. Echocardiography may provide important information on the cause of ischemic stroke. Taking into account a low rate of findings with direct impact on evidence-based therapeutic strategies, routine use of echocardiography is not warranted in all patients with stroke. In patients younger than 50 years, echocardiography has higher diagnostic yield and should routinely be performed. Among older patients, routine echocardiography results in a high

rate of non-specific findings. To avoid unnecessary hazard and costs associated with redundant diagnostic procedures and unproven therapies, echocardiography can be done selectively in these patients, targeted at specific clinical problems.

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Surgical Outcome of Cerebellopontine Angle Tumors: A Study of 24 Cases at the Department of Neurosurgery, Bangabandhu Sheikh Mujib Medical University, Dhaka

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Abstract

Background: *The cerebellopontine angle is a space defined by the pyramid anterolaterally, the tentorium superiorly, the pons medially and cerebellum dorsomedially. It is difficult to approach for its complication and vital structures.* ***Objective:*** *To see the outcome of surgery of cerebellopontine angle tumors at the Bangabandhu Sheikh Mujib Medical University.* ***Results:*** *Among the 24 patients 16(66.66%) were males. It was evident that 14(58.33%) belonged to the age group 41-60 years. It was documented that the majority 19(79.16%) of patients had vestibular schwannoma. Among the clinical signs and symptoms the highest group had hearing loss 20(80%). Among 24 patients the tumor was removed completely in 15(62.50%). Among the post operative complications 4(16.66%) developed facial palsy. 2(8.33%) of patients had lower cranial nerve palsy. After operation 1(4.16%) patient died due to aspiration pneumonia.* ***Conclusion:*** *Cerebellopontine angle tumor surgery is a very difficulty operation. But at a tertiary hospital, with help of microscope, we can remove the tumor completely.*

Key words: *Posterior fossa, retrosigmoid retromastoid approach, vestibular schwannoma, craniectomy, park bench position.*

Introduction:

The first description of a vestibular schwannoma (VS) was given by Eduard Sandifort in 1777, while the first successful surgical removal of VS was reported in 1894 by Sir Charles Ballance. Major advancements were made later on by F. Krause, who introduced the retrosigmoid approach to the cerebellopon-tine angle (CPA), by V. Horsley, H. Cushing, W. Dandy, and H. Olivecrona. Dandy was the first to demonstrate that the complete removal of VS should be the goal of surgery in order to prevent recurrences and that- if the capsule was dissected meticulously- the mortality and morbidity could be reduced[1,2,3].

The translabyrinthine approach was developed by Panse in 1904 but was disfavored in the following 60 years. W. House introduced the microscope and microsurgical techniques and repopularized this approach as a method not only of achieving tumor removal but also of preserving the facial nerve. He developed also the middle fossa approach to the CPA[1,2,3].

The further elaboration of the retrosigmoid approach and the introduc-tion of the microsurgical principles in the VS surgery over the last 4 decades, transformed the surgery of VS. Nowadays it is a safe procedure; complete tumor removal has become the rule and functional preservation of all cranial nerves is achieved in exceeding numbers.

Vestibular schwannoma(VS) are histopathologically benign, typically slow-growing neoplasm's and comprise 75—86% of CPA (cerebellopontine angle) tumors. VS originate most frequently from the intracanalicular part of the vestibular nerve in the

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region of the transition zone between central and peripheral myelin, generally in the medial part of the internal acoustic canal (IAC). Their natural evolution is unpredictable, with an annual growth rate between 0.2 mm and 2 mm.

The CPA is a triangular space defined by the pyramid anterolaterally, the tentorium superiorly, the pons medially, and the cerebellum dorsomedially[4]. It is located between the superior and inferior limbs of the cerebellopontine fissure. The CPA cistern contains the trigeminal, abducent, facial, and vestibule-cochlear nerves, the superior cerebellar and anterior inferior cerebellar arteries, the flocculus of the cerebellum, and the choroid plexus that protrudes through the foramen of Luschka. VS are heterogeneous tumors with varying extension pattern and unpredictable displacement of the cranial nerves in the CPA. A detailed knowledge of the complex relationship of the tumor to cra-nial nerves, cerebellar arteries, and brain structures to the VS is a prerequisite for optimizing the outcome of surgery. At the brain stem and in the internal auditory canal (IAC) the course of the nerves is relatively constant. The facial nerve exits the brain stem in the lateral part of the pontomedullary sulcus, 1-2 mm anterior to the entry zone of the vestibulocochlear nerve. The posi-tion of the nerves in the lateral portion of the IAC is also constant: the facial lies in the superior-anterior quadrant, the cochlear nerve in the inferior-anterior quadrant, the superior vestibular nerve- in the superior-posterior quadrant, and the inferior vestibular nerve- in the posterior-inferior quad-rant. In the CPA the facial nerve is found most frequently anterior to the tu-mor in the middle or upper third of the capsule. The cochlear nerve has less anatomical variation and is usually found in the anterior-inferior portion of the tumor capsule. The ninth, tenth, and eleventh cranial nerves are located in the lower part of the cerebellopontine angle[5].

Tumors of the CPA account for 5 to 10% of all intracranial neoplasms. The most frequent are VS, followed by meningiomas and epidermoid tumors[5].[5]

Materials and methods:

This was a cross sectional study which was carried out at the Department of Neurosurgery in Bangabandhu Sheikh Mujib Medical University (BSMMU) during the period of January 2010 to December 2010 and July 2011 to June 2013. Diagnosis was made by history and clinical examination and computerized tomography scan (CT scan) and magnetic resonance imaging (MRI) findings. After operation diagnosis was confirmed by histopathological examination.

Results:

Table-I

Distribution of the patients by sex (n=24)

Sex	Number	Percentage
Male	16	66.66
Female	08	33.33
Total	24	100

It was evident that the majority of patients 16(66.66%) were males.

Table-II

Distribution of the patients by age (n=24)

Age	Number	Percentage
1-20 years	1	4.66
21-40	8	33.33
41-60	14	58.33
>60	03	12.50
Total	24	100

It was documented that the highest age group was between 41-60 years 14(58.33%).

Table-III

Distribution by types of histopathology

Type of tumor	Number	Percentage
Vestibular schwannoma	19	79.66
CP angle meningioma	2	8.33
Epidermoid	1	4.16
Tuberculoma	1	4.16
Arachnoid cyst	1	4.16

The majority of patients had 19(79.66%) vestibular schwannoma.

Table-IV

Distribution by patients clinical signs and symptoms (n=24)

Signs and symptoms	Number	Percentage
Hearing deficit	20	83.32
Tinnitus	8	33.33
Vertigo	8	33.33
Facial nerve weakness	8	33.33
5^{th} nerve dysfunction	2	8.16
Lower cranial nerve palsy	2	8.16
Cerebellar dysfunction	3	12.48

It was evident that the majority of the patients 20(80%) had hearing deficit.

Table-V

Distribution of patients by postoperative complications (n=24)

	Number	Percentage
Facial nerve weakness	04	16.66
CSF leakage	02	8.33
Lower cranial nerve palsy	02	8.33
Aspiration pneumonia	01	4.16
Cerebeller dysfunction	04	16.66
Died	01	4.16

It was evident that before surgery 8(33.33%) of patients had facial nerve palsy. Postoperatively 4(16.66%) of patients developed facial palsy. Before operation 02(8.33%) of patients had lower cranial nerve palsy and after operation 02(8.33%) of patients had developed lower cranial nerve palsy.

Table-VI

Distribution of patient by extent of removal of tumor (n=24)

Extent of removal	Number	Percentage
Total removal	15	62.50
Subtotal removal	08	33.33
Biopsy	01	4.66

It was documented that the majority of tumor removed completely 15(62.50%). This was substantiated by postoperative CT scan.

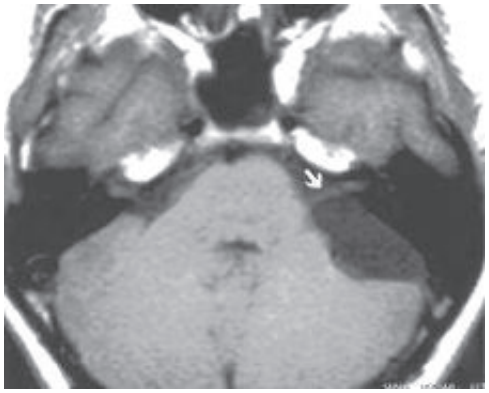

Fig.-1: *MRI of brain with contrast showed left CP angle arachnoid cyst*

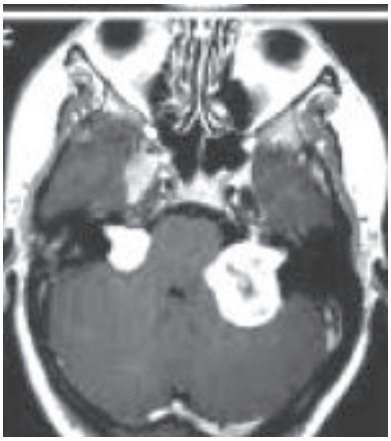

Fig.-2: *MRI of brain with contrast showed bilateral vestibular schwannoma*

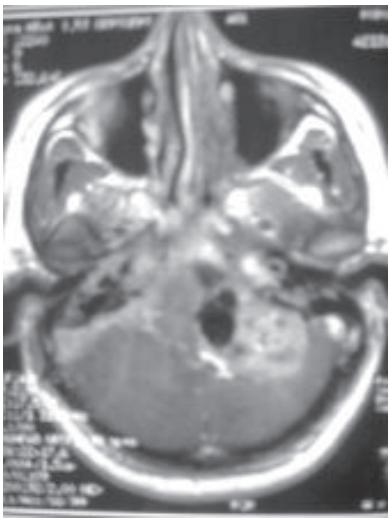

Fig.-3: *MRI of brain with contrast showed left CP angle schwannoma*

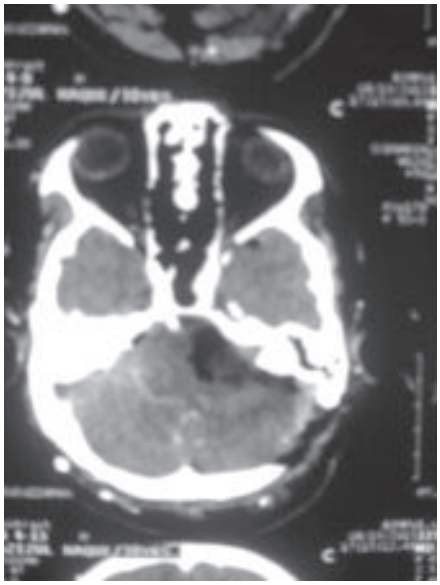

Fig.-4: *Postoperative CT scan of brain with left vestibular schwannoma with total removal of tumor*

Discussion:

In patients with CP angle tumor with hydrocephalous, we did ventriculo-peritonial shunt and did the tumor operation after shunt surgery.

VS are commonly classified according to their size or extension. However, the extension of the tumor in the CPA is more important than its diameter.

The diagnosis of VS relies on history, physical examination, and audiom-etry and is solidified by neuroradiologic examination. Audiograms generally reveal high frequency sensorineural hearing loss and speech discrimination is severely affected. Magnetic resonance imaging (MRI) is the diagnostic tool of choice for all CPA tumors. On T1-weighted MRI images VS are isointense or slightly hypointense to the normal brain and on T2-weighted images they are hyperintense. They show an intense and homogeneous contrast enhancement with the exception of cystic tumor parts.

All patient admitted with CP angle tumour undergoing surgery at the during the study period were included in this study.

The number of incidentally discovered small VS was increas-ing due to the wide spread of MRI facilities. Some of them might not show further growth or might even undergo spontaneous regression. Based on this, the conservative approach was recommended. As the natural evolution of VS still unpredictable, this strategy should be applied only in very carefully selected cases, with regular MRI follow-up at 6 to 12-month intervals. It was indicated for old and/or somatically unstable patients with small asymptomatic tumors or tumors causing mild stable symptoms. How-ever, long-term follow-up results indicate that majority of the tumors exhibit further growth and in case of larger tumors the chance of hearing preserva-tion might be much lower[7].

An alternative to microsurgical tumor removal is radiosurgery[7]. Its goal is to achieve tumor control and success rates of 93%—98% had been re-ported. Further tumor growth, however, was observed in 2% to 7% of the cases. The risk of late facial neuropathy varies from 1% to 24%, the rate of trigeminal dysfunction was 2%—27%, and hearing preservation was achieved in 40—74%. The optimal treatment of VS was complete tumor removal with preservation of all neurological functions. This goal was achieved in ever increasing numbers in different highly specialized centers. The three most commonly used opera-tive approaches are the translabyrinthine, the middle fossa and the retrosig-moid. The selection of the approach is related to factors such as tumor size, extension in the IAC, preoperative hearing level, and mostly — surgeon's ex-perience, preferences, and institutional tradition[1,2,3,8].

In our institution we had operated all the cases through suboccipital retromastoid and retrosigmoid approach. We feel comfort with this approach and excellent results have been achieved with each of these techniques and complete tumor removal was achieved in 80%—99%[1,2,3,8]. In our study we removed 15(62.50%) tumors completely.

The retrosigmoid suboccipital approach is the most popular among neu-rosurgeons[1,2,9]. It offers: an excellent panoramic visualization of the whole CPA; increased safety during dissection from the brain stem and lower cranial nerves; possibility to preserve hearing even in large VS; identification of the facial and cochlear 'cranial nerves both in their proximal (close to the brain stem) and lateral part (in the

IAC) thus increasing the chances for their preservation; and possibility to reconstruct the facial nerve in the CPA at the same surgery, if needed. Some drawbacks, traditionally ascribed to the ap-proach- need of cerebellar retraction, difficult visualization of the most lateral part of the IAC without endangering the integrity of the inner ear; higher rate of postoperative headache- have been largely overcome with some modification of the original technique described below.

In our study we had removed all tumors 24(100%) through the retrosigmoid, retromastoid and suboccipital approach.

The dissection of the capsule should begin only after adequate internal decompression is achieved. It is performed by strictly gripping the tumor capsule and dissecting in the level of the arachnoid plane under continuous saline irrigation. As most of the microvascular blood supply to the nerves is in the subarachnoid space, it is important that dissection of the nerves from the capsule should proceed in the correct plane[9,10]. The tumor was dis-sected medially along the brain stem for identification of the medial part of the facial nerve. Then, the nerve was dissected from the upper tumor por-tion. Pulling of the rest of the capsule medially and upward, allowed visualization of the lowest and most lateral aspects of the facial nerve. The dissection was alternated from different directions. In order to avoid thermal injury to the vulnerable cranial nerves, bipolar coagulation was reduced to a minimum and left up to the end of surgery for final hemostasis. In the area just medial to and inside the porus the facial and .cochlear nerves were generally extremely adher-ent to the tumor. This tumor part was dissected at the end[10,11].

We did all case in park bench position, as we had no CUSA (Cavintron Ultrasonic Aspirator) or any nerve evoke potential monitor. We had no facial nerve monitor, or lower cranial nerve monitor or pneumatic drill. It is very challenging for us to do the surgery of CP angle tumor with this limitations. We did all the operation with the help of microscope.

Before operation 8(33.33%) of patients had developed cerebellar dysfunction and after operation 4(16.66%) more patients had cerebellar dysfunction.

In our study we could preserve facial nerve function in 12 patients. In previous study at last follow-up examination 81% of the patients had excel-lent or good facial nerve function and there were no patients with total facial palsy. Hearing preservation is strongly dependent on the level of preoperative hearing and the auditory brain stem response, and to a lesser extent on tumor size. If functional hearing was available preoperatively, the anatomical integ-rity of the cochlear nerve was preserved in 84% and the overall rate of hearing preservation after surgery was 51%[12].

Before operation 2(8.33%) patients had lower cranial nerve palsy and after surgery 2(8.33%) patients had lower cranial nerve palsy. With our minimum facilities at operation theater, postoperative outcome was not satisfactory with compared to the better equipped centers .In vestibular schwannoma though it is difficult to approach early surgery with proper equipment and proper postoperative care can save many lives and prevent morbidity.

Conclusion:

Among the different approaches suboccipital retrosigmoid, retromastoid approach is the gold standard for CP angle surgery. Postoperative outcome is satisfactory with reducing morbidity and mortality with proper equipment and postoperative care.

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Relationship between Blood Lipids, Lipoproteins and Ischemic Stroke

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Abstract:

Objective: *To find out the relationship of different lipids, lipoproteins and ischemic stroke patients in Bangladesh.* ***Methodology:*** *This case control study was conducted among the patients having ischemic stroke who were admitted in Department of Neurology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh during the period from July, 1997 to June, 1999 and age, sex matched apparently healthy volunteers. Sixty ischemic stroke patients confirmed by CT scan of brain and sixty age and sex matched apparently healthy volunteers were enrolled as controls. 12 hours fasting lipid profile (Total cholesterol, LDL-cholesterol, HDL-cholesterol and Triglyceride) was done for both ischemic stroke patients and healthy volunteers for comparison. The students (unpaired) t test was used to compare group means for lipids and lipoproteins. Chi square test, odds ratio with confidence interval were done to evaluate differences between the groups for other variables. P<0.05 was considered as minimum level of significance.* ***Result:*** *The mean age (±SD) of the patients and controls were 58.45±10.12 and 59.40±10.41 years respectively and 44 (73.3%) were male and 16 (26.7%) were female and male- female ratio was 2.75:1 in both cases and controls. Total cholesterol (Means) was 201.62±5.52 mg/dl and 169.13±3.49 mg/dl in cases and controls respectively (P<0.001). HDL cholesterol (Means) was 38.36±0.81 mg/dl and 44.03±0.84 mg/dl in cases and controls respectively (P<0.001). LDL cholesterol (Mean±SE) in ischemic stroke patients and controls were 125.45±4.63 mg/dl and 96.40±3.23 mg/dl respectively (P<0.001). Triglyceride (Mean±SE) in cases and controls were 188.50±9.35 mg/dl and 142.85±4.72 mg/dl respectively (P<0.001).* ***Conclusion:*** *This case-control study showed significant differences of serum lipids and lipoproteins (Total cholesterol, HDL cholesterol, LDL cholesterol and triglyceride) in ischemic stroke patients than the controls in our community.*

Introduction:

Stroke is the third commonest cause of death after ischemic heart disease and cancer in developed countries and is responsible for a large proportion of physical disability[1]. WHO defined stroke as rapidly developing clinical signs of focal (at times global) disturbance of cerebral function, lasting more than 24 hours or leading to death with no apparent cause other than that of vascular origin[2].The main types of stroke and their occurrences are: Ischemic stroke 85% & Hemorrhagic stroke 15%[3].The ischemic stroke is the resultant effect of the occlusion of the cerebral blood vessels by thrombus or embolus, non-atheromatous diseases of the vessel wall, e.g. collagen diseases and vasculitis, diseases of blood e.g. coagulopathies and haemoglobinopathies, decreased cerebral perfusion due to shock of any cause and cardiac dysrhythmias which leads to infarction of brain[4].

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Atherosclerosis is a disease primarily of the elastic arteries (e.g. aorta, carotid and iliac arteries), large and medium sized muscular arteries (e.g. coronary and popliteal arteries). But any arteries may be affected and is a progressive disease that starts in childhood[5].The basic lesion- the atheroma or fibro-fatty plaque consists of a raised focal plque within the intima, having a core of lipid (mainly cholesterol and cholesterol esters) and a covering fibrous cap. Atheromas are sparsely distributed at first but as the disease advances, they become more and more numerous, sometimes covering the entire circumference of severely affected arteries. As the plaque increase in size, they progressively encroach on the lumen of the artery as well as the subjacent media. Consequently, in small ateries, thrombus are occlusive compromising blood flow to distal organs and causing ischemic injury, but in large arteries they are destructive weakening the affected vessel wall, causing aneurysm or rupture or favouring thrombosis. Moreover, extensive atheromas are friable often yields emboli of their grumous contents into the distal circulation (atheroemboli).

Epidemiological studies indicate that there are several risk factors of atherosclerosis e.g. age, sex, diet, hypertension, diabetes mellitus, hypercholesterolemia, cigarette smoking, obesity, physical inactivity, type A personality, high carbohydrate intake[5].Among the risk factors, hypercholesterolaemia and hypertriglyceridemia are important. The biologically important lipids are the fatty acids and their derivatives, the neutral fats (triglyceride), the phospholipids and related compounds and the sterols (cholesterol andtheir derivatives). The lipids are hydrophobic substances and cannot circulate in the plasma in free form. The free fatty acids are bounded to albumin whereas, cholesterol, phospholipids, triglycerides are transported in the form of lipoprotein complexes. There are six families of lipoprotein, e.g. chylomicrones, chylomicron remnants, very low density lipoprotein (VLDL), intermediate density lipoprotein (IDL),low density lipoprotein (LDL) and high density lipoprotein (HDL)[6].

A subject of great interest is the role of the cholesterol in the aetiology and course of atherosclerosis. It is characterized by infiltration of cholesterol and appearance of foam cells in the intima and growth factors that produces proliferative lesions. The normal range for plasma cholesterol is said to be 120-200 mg/dl, but it is now clear that there is tight, positive correlation between the death rate from ischaemic heart disease and plasma cholesterol levels above 180 mg/dl. Furthermore it is now clear that plasma cholesterol by diet and drugs slows and even reverse the progression of atherosclerotic lesions and the complications they cause[7].Plasma cholesterol levels are elevated by diet rich in cholesterol and saturated fats, such as egg yolk, animal fats and butter.

There is no doubt that increasing levels of total plasma cholesterol and LDL-cholesterol and to, a lesser extent, decreasing levels of HDL-cholesterol, are strong risk factors for coronary heart disease[8,9,] whereas blood triglyceride levels are not predictive[10].The relationship between cholesterol or lipid fractions and stroke is less clear-cut but there is almost certainly association[11].

In Bangladeshi population, there are studies which showhypercholesterolemia as a risk factor for stroke[12,13] and thepresence of hypercholesterolemia in higher and middle class Bangladeshi population[14].

This study may reflect the prevalance of hyper-lipidemia in normal Bangladeshi population and ischaemic stroke patient where the food habit is different from Western population. Therefore, the goal of this study was designed to determine the relationship between blood lipids, lipoproteins and ischaemic stroke.

Materials and Methods:

This case-control study carried out in the Department of Neurology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh during the period from July, 1997 to June, 1999. Men and women aged between 35 to 79 years who concord with the definition of cases and controls were eligible to enter into the study. Sixty ischemic stroke patients confirmed by CT scan of brain and sixty age and sex matched apperently healthy volunteers were enrolled as controls. Patients and guardians of the subjects were explained fully about the nature, benefit and the risk of the study. Prior consent from the subjects or from their attendants were taken for the same. The details

information about the present illness including mode of onset, subsequent course, associated features and duratinof illness were noted in a printed proforma. Age, sex, occupation, known hypertension, smoking habit, ischaemic heart disease, family history of stroke, past history of stroke/TIA were also recorded. Through general, systemic and neurological examination including heigh, weight, radial and peripheral pulses, blood pressure, carotid bruit, heart sound, xanthelesma, tendon xanthoma,arcus lipidus if present were also recorded in a printd proforma. All necessary investigations including complete blood count, platelet count, urine analysis, 12 hours fasting blood glucose and 2 hours after breakfast, 12 hour fasting lipid profile (Total cholesterol, LDL-cholesterol, HDL-cholesterol and Triglyceride), X-ray chest P/A view, ECG, echocardiography and CT scan of brain were done for each and every patient. Through history and clinicl examination, urine analysis, fasting blood sugar and fasting lipid profile were done for each control. Appropriate statistical analysis like mean, standard deviation and standard error were done. The students's (unpaired) t test was used to compare group means for lipids and lipoproteins. Chi square test, odds ratio with confidence interval were done to evaluate differences between the groups for other variables. P<0.05 was considered as minimum level of significance.

Results:

The mean age (±SD) age of the patients and controls were 58.45±10.12 and 59.40±10.41 years respectively. 44 (73.3%) were male and 16 (26.7%) were female and male- female ratio was 2.75:1 in both cases and controls. 55% and 33% of cases and controls were smokers. Odds ratio (2.44) and Chi square test showed significant result (P<0.02). 33% and 13% of cases and controls were diabetic.Odds ratio (3.25) and Chi square test were significant (P<0.02). In this study hypertension was a very importanr risk factor for ischaemic stroke. 55% of cases and 22% of controls were hypertensive.Odds ratio (4.41) and Chi square test were highly significant (P<0.001).32% of cases and 12% of controls had heart disease.Odds ratio (3.5) and Chi square test were significant (P<0.01). In this study case-control study, family history of stroke was not a significant risk factor for ischaemic stroke. 23% of cases and 17% of controls had family history of stroke.Odds ratio (1.52) and Chi square were insignificant (P>0.50).Increased BMI was 28% in cases and 8% of controls.Odds ratio (4.34) and Chi square test were significant (P<0.01). Total cholesterol (Mean±SE) was 201.62±5.52 mg/dl and 169.13±3.49 mg/dl in cases and controls respectively. Unpaired t test showed significant result (P<0.001).HDL cholesterol (Mean±SE) was 38.36±0.81 mg/dl and 44.03±0.84 mg/dl in cases and controls respectively. Unpaired t test showed significant result (P<0.001).LDL cholesterol (Mean±SE) in ischaemic stroke patients and controls were 125.45±4.63 mg/dl and 96.40±3.23 mg/dl respectively. Unpaired t test was significant (P<0.001).Triglyceride (Mean±SE) in cases and controls were 188.50±9.35 mg/dl and 142.85±4.72 mg/dl respectively. Unpaired t test was significant (P<0.001).

Table-I

Age and Sex distribution of ischaemic stroke patients and controls

Age group(in years)	Cases		Controls	
	Malen (%)	Femalen (%)	Malen (%)	Femalen (%)
35-39	1 (1.7)	1 (1.7)	1(1.7)	1 (1.7)
40-44	1 (1.7)	1 (1.7)	1(1.7)	1 (1.7)
45-49	6 (10)	1 (1.7)	6(10)	1 (1.7)
50-54	10 (16.7)	1 (1.7)	10(16.7)	1 (1.7)
55-59	3 (5)	2 (3.3)	3(5)	2 (3.3)
60-64	5 (8.2)	5 (8.2)	5(8.2)	5 (8.2)
65-69	9 (15)	1 (1.7)	9(15)	1(1.7)
70-74	8 (13.3)	3 (5)	8(13.3)	3 (5)
75-79	1 (1.7)	1 (1.7)	1(1.7)	1(1.7)

Table-II

Distribution of the study groups according to risk factors

Risk Factor		Casesn (%)	Controln (%)	P value
Smoker	Yes	33 (55%)	20 (33%)	<0.02[s]
	No	27 (45%)	40 (67%)	
Diabetes Mellitus	Yes	20 (33%)	8 (13%)	<0.02[s]
	No	40 (67%)	52 (87%)	
Hypertension	Yes	33 (55%)	27 (45%)	<0.001[s]
	No	13 (22%)	47 (78%)	
IHD	Yes	19 (32%)	41 (68%)	<0.01[s]
	No	7 (12%)	53 (88%)	
Family History	Yes	14 (23%)	46 (77%)	>0.50[ns]
	No	10 (17%)	50 (83%)	
BMI	Increased	17 (28%)	43 (72%)	<0.01[s]
	Normal	5 (8%)	55 (92%)	

s=significant; ns=notsignificant; P value reached from chi square test.

Table-III

Distribution of the study groups according to Lipid profile

Lipid	Cases(Mean±SE)	Controls(Mean±SE)	P value
Total Cholesterol	201.62±5.52	169.13±3.49	<0.001[s]
HDL Cholesterol	38.36±0.81	44.03±0.84	<0.001[s]
LDL Cholesterol	125.45±4.63	96.40±3.23	<0.001[s]
Triglyceride	188.50±9.35	142.85±4.72	<0.001[s]

s=significant; SE= Standard error; P value reached from chi square test.

Discussion:

This study was carried out in the department of Neurology, BSMMU, Dhaka during the period from July,1997 to June, 1999 to observe the role of lipids and lipoproteins (Total cholesterol, LDL-cholesterol, HDL-cholesterol and Triglyceride) in ischaemic stroke patients. The study subjects were sixty ischaemic stroke patients with age and sex matched sixty apparently healthy volunteers who gave blood sample for analysis.

In this study, the age range was 35 to 79 years with mean±SD 59.45±10.41 years in controls. The male female ratio 2.75 in both cases and controls. Since matching was done for age, sex, the age and sex distribution for cases and controls were very similar.

The majority of patients were in7thdecade 20(33%) and 6th decade 16(27%). Next common age group were 8th decade 13(21%) and 5th decade 9(15%). Mohammad et al[15] in their study of cerebral thombosis and risk factors found 41% in 5th decade and 16% in 6th decades. Increasing age is the strongest risk factor for cerebral infarction, primary intracerebral haemorrhage and subarachnoid haemorrhage[16] and transient ischaemic attack[17]. Mathur et al[18] in their study of correlation of the extent of severity of atherosclerosis in the coronary and cerebral arteries observed atherosclerotic lesions in coronary arteries in earlier age groups and cerebral arteries in older age groups.

There is a small male excess of strokes[19]and most strokes are ischaemic in nature (80%) and this differences are mostly due to male sex as ischaemic stroke occurs less in premenopausal women due to female hormonal protection. In this study, male-

female ratio 2.75:1, which is a bit higher than the western studies[20,21]. This male excess in our country is due to the fact that male beds are more than the females in this hospital as well as the culture that females are not given proper attention by the family. In this present study 55% of cases and 33% of controls were smoker. Odds ratio and X^2 test shows significant result (P<0.02).

Smoking is firmly established as a risk factor in diseases caused by atherosclerosis[5].Cigarette smoking may precipitate clinical events through association with high fribinogen levels, haemoglobin concentration and myocardical oxygen supply[22]. Fogelholm et al[23] in their study of ischaemic cerebrovascular disease in the young adult found 74% were smoker. Mohammad et al[15] found 50% of cerebral thrombosis parients were smoker in their study of risk factors. Quizibash et al[11]in a study of ischaemic stroke and TIA found 75%cases and 23% in control as smoker. Our findings are also consistent with other studies[24,25].

In this present series 33% cases were diabetic Vs 13% of controls. Odds ratio, $X^2$with Yates' correction was significant (P<0.02). Diabetes mellitus has long been recogniswd as a risk factor for vascular diseases in general. Atherosclerosis begins to appear in most diabetics within few years of onset.Atherosclerosis may result in arterial narrowing or occlusions with ischaemic injuries to organs. In brain, it produces ischaemic strokes. The susceptibility of the diabetic to atherosclerosis is due to several factors. Hyperlipidaemia occurs in one third to one-half of patients, but even those with normal lipids have severe atherosclerosis. Diabetes have increased platelet adhesiveness and response to aggregating agents[26]. Aronow et al[27] in their 3 years follow up study of risk factors correlated with atherothombotic brain infarct in 708 elderly patients found diabetes mellitus as significant risk factor (P<0.001). Rothrock et al[28] in the analysis of ischaemic stroke found diabetes mellitus in 23% cases.

This study reveals 55% of cases and 22% of controls were hypertensive. Odd ratio and X^2test shows a significant result (P<0.001). Hypertension is a strong risk factor for stroke in all the main pathological types[29]. It increases stroke risk by increasing the extent and severity of atheroma[30,31]. Hypertension also induces microvascular disease in the small penetrating arteries within the brain[32].

Quizibash et al[11] in their study of minor stroke & TIA found 51% and 29% as hypertensive in the patients and controls respectively with a significant difference having P value <0.001. Sandercock et al[33]intheir study of predisposing factors for cerebral infarction found hypertension in 52%of cases. Our study also correlates with the findings of Mohammad et al[15]. Several studies in home and abroad indicate that hypertension is a strong determinant of ischaemic stroke[34,35,36,37].

Present study shows 32% of patients and 12% of controls had heart disease. Odds ratio and X^2 test with Yates' correction shows that it is a risk factor for ischaemic stroke (P<0.01). Independent of age, coronary heart disease (i.e. angina or myocardial infarction) is clearly associated with ischaemic stroke. The evidence comes from postmortem[38,39], case-control[40] and cohort studies[20]. The most frequent potential of cardiac sources of embolism to the brain is atrial fibrillation, usually non-rheumatic in developed countries[33]. Both non-rheumatic and rheumatic atrial fibrillation have been associated with ischaemic stroke[37,40]. Some of the association must be coincidental because atrial fibrillation can be caused by coronary and hypertensive heart disease[41]. Our study also correlates with the findings of Sandercock et al[33]in their study of predisposinf factor for cerebral infarction found ischaemic heart disease in 38% cases.

In this study 23% cases had positive family history of stroke compared with control (17%). Odds ratio and X^2 test shows insignificant result (P>0.50). The genetic predisposition to cerebrovascular disease is presumably multifactorial, the inheritence of hypertension being itselfmultifactorial. However an interesting component of the genetic load has been uncovered recently e.g. homocystinuria is prone to premature atheromatous vascular disease. One type of cerebral amyloidosis, hereditary cystatin C amyloid angiopathy, is transmitted as an autosomal dominant. This disorder produces intracerebral haemorrhage[42]. Our study correlates with the study

of Kubota et al[43]in a case control study of stroke patients found family history of stroke as nonsignificant risk factor (odds ratio 1.41) in ischaemic stroke.

Increased BMI was present in 28% of cases and 8% of controls. Odds ratio and X^2 test after Yates' correction was significant (P<0.01).Obesity is a risk factor for cerebral infarction, probably through its association with Diabetes Mellitus, hypertension and alcohol consumption[42]. Aronow et al[27]in their study of three year follow up of risk factors correlated with atherothrombotic brain infarction found obesity as an important risk factor (P<0.005).

In this case-control study, the mean±SE of total cholesterol was 201.62±5.52 Vs 169.13±3.49 mg/dl; HDL=38.36±0.81 Vs 44.03±0.84 mg/dl; LDL cholesterol 125.45±4.63 Vs 96.40±3.23 mg/dl and Triglyceride 188.50±9.35 Vs 142.85±4.72 mg/dl; in cases and controls respectively. All the results show statistically significant differences. A number of mechanisms have been potulated to account for the role of lipids in atherogenesis leading to IHD, ischaemic stroke and peripheral vascular diseases. Increased in plasma level of LDL or some component of hyperlipidemic serum may increase the rate of lipid penetration into artery wall. Local modification of LDL may render it more atherogenic. Hyperlipoproteinemia may directly alter endothelial cell function, without leading to denudation, through focal endothelial cell death, increased permeability or increased monocyte adhesion[5]. Our study correlates with the following studies. Randrup et al[44]found significantly elevated plasma total cholesterol (220 mg/dl) and fasting Triglyceride (116 mg/dl) in apoplectic patients with total occlusion of a cerebral artery when compared with age and sex matched controls (203 mg/dl and 100 mg/dl, total cholesterol and triglyceride respectively).Duncan et al[45]examined plasma cholesterol in endarterectomy candidates with angiographic evidence for stenosis at least one internel carotid atery compared with age and sex matched controls, cases had significantly higher total cholesterol (221 Vs 193 mg/dl). Fasting triglyceride were also significantly higher in cases, than in controls (157 Vs 129 mg/dl). Iso et al[46]intheir studydetected highr cholesterol level in ischaemic stroke and lower value in haemorrhagic stroke. Quizibash et al[11]in their study of TIA and minor stroke detected significantly higher total cholesterol, LDL cholesterol and lower value for HDL cholesterol than their age and sex matched controls and concluded total, HDL, LDLcholesterol are risk factors for ischaemic stroke. Salonen et al[47]found positive association with serumcholesterol and TG level in their study of ischaemic stroke. Boutron et al[48]in a study of cerebral infarct (61 Cases) and 31 TIA cases compared with matched controls and observed maximum increased of totalcholesterol, VLDL, LDL and triglyceride withdecrease in HDLcholesterol.

Controversies also exist regarding the role of lipids in ischaemic strokes. The negative results from case-control studies[25,49,50]may have been derived from the influence of cerebrovascular disease on serum lipid concentrations due to physical inactivity, poor nutrition or changes in the diet.

Conclusion:

This case-control study showed significant differences of serum lipids and lipoproteins (Totalcholesterol, HDLcholesterol, LDLcholesterol and triglyceride) in cases and controls in our community. They are important risk factors for ischaemic stroke. Further community based prospective cohort study with large sample size is required to establish its role as risk factor for ischaemic stroke to take preventiveand curative measures in our country.

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Bangladesh Journal of Neuroscience 2014; Vol. 30 (2): 104-111

Economic Burden of Head Injury Patients Attending a Tertiary Level Hospital in a Developing Country Like Bangladesh

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Abstract:

Objective: *Objective of the study was to estimate the economic burden of head injury (HI) patients attending a tertiary level hospital. This study also tried to determine the socio-demographic characteristics, to estimate direct and indirect cost incurred by the head injury patients and to assess economic burden by different types of accidents causing head injury.* ***Methods:*** *The study was a cross-sectional descriptive study carried out to estimate the economic burden of head injury patients attending a tertiary level hospital during the period from January to June 2010, conducted at the neurosurgery department of Dhaka Medical College Hospital (DMCH). All the conscious head injury patients of both sexes, treated in Neurosurgery department of DMCH, willing to participate in the study were included in the study. Convenience type of non-probability sampling technique was followed and sample size of this study was 110. Face to face interview was conducted with the patient and / or attendant for data collection and specific pre-designed semi-structured and pre-tested questionnaire was used for the interview session. After Categorizing, coding, cleaning and summarizing, all data were analyzed by the software SPSS windows program version 12.0.* ***Result:*** *More than half (53.6%) of the patients of this study, were in younger age group (21 to 30 years) with mean (±SD) age of 29.1(±8.36) years. Majority of the patients (69.0%) were males, Average monthly family income of the patients was Tk.14,509.09 (±5762.49). Majority (36.4%) of the patients had primary level education while 20.9% were housewives. Major incidences of different types of accidents included road traffic accident (63.6%), assault (20.0%), industrial accident (8.0%) and fall from height (8.0%). Average length of the stay of the patients in the hospital was 7.43 (±3.64) days. In respect of direct cost, average travel cost incurred by the patients was Tk.3,628.18 (±2055.56), average drug cost was Tk.1,618 (±801.51), average laboratory investigation cost was Tk.2390 (±626.47) and average cost of food was Tk.2235.45 (±1208.19). Average direct treatment cost incurred by the patients was Tk.9590.10 (±4041.13). The average duration of absent from work place was 7.07 (±3.316) days and most of the patients average daily income (self) was Tk.340.65 (±158.97). Average loss of income due to illness was Tk.2415.32(±1623.68) and average cost behind giving tips to hospital staff by the patients was Tk.221.50 (±78.34). The average indirect cost of these study patients was Tk.2001.72 (±1869.27). Overall, average treatment cost incurred by the patients was Tk.12,008.05 (±5051.95). Majority (38.0%) had a cost from Tk10001 to Tk.15000.* ***Conclusion:*** *The study finding can help policy makers, public health specialists, future researchers and enthusiastic individuals to formulate specific strategies for reduction of economic burden of head injury patients by providing cost-effective health care services throughout the country.*

Key Word: *Head injury (HI), traumatic brain injury (TBI), economic burden,*

Introduction:

Head Injury (HI) is a nonspecific and antiquated term, which includes clinically evident external injuries to the face, scalp, and calvarium, such as lacerations, contusions, abrasions, and fractures, and may or may not be associated with Traumatic Brain Injury

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(TBI). TBI is more properly defined as an alteration in brain function manifest as confusion, altered level of consciousness, seizure, coma, or focal sensory or motor neurologic deficit resulting from blunt or penetrating force to the head[1]. TBI is a critical public health and socio-economic problem throughout the world. It is a major cause of death, especially among young adults, and lifelong disability is common in those who survive[2].TBI can result in impairments and disabilities, often leading to considerable loss of independence, productivity, and income potential in both industrial-ized and developing countries across the world[3,4].

The National Center for Injury Prevention and Control estimated that 2% of US population live with disability as a result of brain injury from traumatic causes alone each year in the USA, 1.7 million people sustains a TBI. 1.4 million of these injured individuals are treated in emergency depart-ments, with around 275,000 hospitaliza-tions and 52,000 fatalities, of which 50% in hospital, and 50% out of hospital. A meta-analysis of reports from 23 European countries revealed a hospital admission incidence of 235 per 100,000 people[1,2,5.] By the year 2020, an estimated 10 million people will be affected annually by TBI, and it will surpass many diseases as the major cause of death and disability. This makes TBI a pressing public health and medical problem[4].The World Health Organization has predicted that road accidents alone, which account for many instances of TBI, will constitute the third largest contributor to the global burden of disease and disability (after heart disease and depression)[4].

Motor vehicle accidents, falls from height or unintentional falls, fire arm injury, struck by / against a person or object or other types of physical assault, accidents at home, work, outdoors, or while playing sports are among the commonest causes of head injury and TBI[3,6].

Poverty and morbidity seem to be intertwined with each other. It is a well-recognized fact that, poverty leads to ill-health as poor people are also socially and economically vulnerable due to existing quality of health care along with difficulties in gaining access to and paying for treatment. But much is not known about how morbidity itself can lead to poverty in developing countries. Two things may play role. Firstly, the demise or disability of an income earner in the household reduces future income generation and the resulting depletion of wealth might lead to a lower capacity to invest in the education and well-being of the children in the household which again transmits poverty to the next generation. Secondly, when someone falls ill, the household faces several different costs (cost of care giving, transportation, treatment), and to cope with them, it follows diverse strategies. Sometimes the costs are limited, and the household is able to buffer them. Yet, sometimes, the costs are at, or increase to, a level where these coping mechanisms are not sufficient anymore. Some households recover from the financial shock, but others do not and the vicious cycle goes on[7,8].

In this study we tried to see the economic burden on the persons and their families in our perspective.

Methods:

The study was a cross-sectional descriptive study carried out to estimate the economic burden of head injury patients attending a tertiary level hospital during the period from January to June 2010. The study was conducted at the neurosurgery department of Dhaka Medical College Hospital. With convenience type of non-probability sampling technique, 110 conscious head injury patients of both sexes admitted in DMCH, meeting the inclusion criteria were enrolled in the study, and unconscious patients and patients with incomplete documentation of investigation data were excluded. Ethical permission for the study was obtained from National Institute of Preventive and Social Medicine (NIPSOM) Ethical Review Committee. Data were collected from the neurosurgery department of DMCH, for duration of 3 weeks from 1st week of May to 3rd week of May, 2010. Data collection was carried out through face to face interview of the patients and / or attendants by asking questions in bangla with specific pre-designed, semi-structured and pre-tested questionnaire. By direct cost it is meant i) hospital cost comprising admission fee and bed charge, ii) consultation fees in private chamber or outdoor, iii) laboratory cost for investigations, iv) drug cost other than supplied free from the hospital, v) attendant cost for the food and others for the attendants and vi) travel cost that

includes house to hospital and return journey costs of the patient. And the indirect cost includes i) tips / unofficial payment and ii) income loss. After categorizing, coding, cleaning and summarizing, all data were analyzed by the software SPSS windows program version 12.0. Descriptive statistics were done first and then appropriate statistical test were performed to find out the association between different variable as were necessary.

Result:

More than half of the patients (53.6%) were in the age group 21 to 30 years and a quarter of the total patients (25.5%) were in the age group 31 to 40 years. The average age of the patients was 29.1(±8.36) years. (Table 1) Majority of the patients (69%) were males and 31% of the patients were females.

Table-I

Age group of the head injury patients

Age group (years)	Frequency	Percentage
10-20	16	14.5
21-30	59	53.6
31-40	28	25.5
41-50	6	5.5
>50	1	0.9
Total	110	100.0

40 patients, that is more than one-third (36.4%) of the patients had primary level education followed by 19 (17.3%) illiterate patients, 12 (10.9%) in each were high school and college graduates, 17 (15.5%) were graduate and 10 (9%) patients completed post graduation. (Table 2).

Table-II

Educational qualification of the patients

Education level	Frequency	Percentage
Illiterate	19	17.3
Primary	40	36.4
Secondary	12	10.9
Higher secondary	12	10.9
Graduate	17	15.5
Masters	10	9.0
Total	110	100.0

Out of 34 women, 23 were housewives and rests of both sexes were of different occupations like service (19, 17.3%), driver (19, 17.3%), businessman (18, 16.3%), student (11, 10%) and of other occupations. (Table 3).

Table-III

Occupation of the patients

Occupation	Frequency	Percentage
Farmer	7	6.4
Service holder	19	17.3
Business	18	16.3
Teacher	6	5.5
Day labour	2	1.8
Rickshaw puller	5	4.5
Driver	19	17.3
Housewife	23	20.9
Student	11	10.0
Total	110	100.00

Major incidence of different types of accident was road traffic accident (63.6%) followed by 20% assault, 8.2% industrial accident and 8.2% fall from height. (Table 4).

Table-IV

Type of accident responsible for head injury

Income level (in taka)	Frequency	Percentage
Road traffic accident	70	63.6
Assault	22	20.0
Industrial accident	9	8.2
Fall from height	9	8.2
Total	110	100.0

Out of 110 patients, large portion (47,42.7%) needed to stay 2 to 5 days in the hospital followed by 38 patients (34.6%) requiring 6 to 10 days, 24 patients (21.8%) requiring 11 to 15 days and only one patient (.9%) requiring more than 15 days of hospital stay. (Table 5)

Table-V

Duration of hospital stay (days)

Duration of hospital stay	Frequency	Percentage
2-5 days	47	42.7
6-10 days	38	34.6
11-15 days	24	21.8
16-20 days	1	0.9
Total	110	100.0

Excluding housewives and students, out of 76 patients who had income, most of the patients' (74, 97.4%) daily income was below Tk.500. 44 (57.9%) had daily income of below Tk.300 and 30 (39.5%) had within Tk.301-Tk.500. Only 2 persons (2.6%) had daily income income above Tk.500. Average daily income was Tk.340.65(±158.974). (Figure 1)

Seventy six patients were divided into two equal groups of 38 patients each, whose monthly family income was within the range of Tk.5000 to Tk.10000 and Tk.10001 to Tk.15000 respectively. One fifth of the total patients (20%) had monthly family income between Tk.15001 to Tk.20000 followed by 10 individuals having income range of Tk.20001 to Tk.25000 and only 2 had a income range of Tk.25001 to Tk.30000. Average monthly income was Tk.14509.09(±5762.494) within a range of Tk.5000 to Tk.30000 per month per family. (Table 6)

Table-VI

Monthly family income of the patients

Income level (in taka)	Frequency	Percentage
5000-10000	38	34.5
10001-15000	38	34.5
15001-20000	22	20.0
20001-25000	10	9.2
25001-30000	2	1.8
Total	110	100.0
Mean ± SD	14509.09±5762.494	

Travel cost, on an average was Tk. 3628.18 (±2055.564). The lowest travel cost was Tk. 200 to the highest cost of Tk. 8000. Average cost of drug was Tk.1618 (±801.516) with minimum Tk. 500 to maximum Tk. 4000 of only one individual. Most of the patients (77.3%) spent below Tk. 2000 for buying drugs. Average lab investigation cost was Tk. 2390 (±626.472) with a range from Tk. 200 to Tk. 6000. Average cost of food was Tk. 2235.45 (±1208.197) with a range from Tk. 400 to Tk. 6500.

Most of the patients' total direct treatment cost was either from Tk. 5001 to Tk. 10000 (40%) or from Tk.10001 to Tk.15000 (31.8%). Some had cost below Tk.5000 (14.5%) or above Tk.15000 (13.6%). The average total direct treatment cost incurred by the patients was 9590.10 (±4041.138). (Table 7).

Table-VII

Total direct treatment cost

Cost (in taka)	Frequency	Percentage
1010-5000	16	14.6
5001-10000	44	40.0
10001-15000	35	31.8
15001-18200	15	13.6

Among 76 individuals out of total 110 patients, other than housewives and students who did not have any income generating work, 33 (43.4%) was absent from the workplace for 2-5 days, 28 (36.8%) for 6-10 days and 15 (19.8%) for 11-14 days. (Figure 2)

Average loss of income due to illness was Tk.2415.32 (±1623.69) and minimum Tk.200 to maximum Tk.7000 loss. Average cost behind giving tips to hospital staff by the patients was Tk.221.50(±78.341) and minimum rate was Tk.100 to maximum Tk.500. 4 patients did not give any tips to anybody.

Total average indirect cost was Tk.2001.72 (±1869.279) ranging from Tk.100 to maximum Tk.8210. (Table 8)

On an average the total cost of the patients was Tk.12008.05 (±5051.955) with minimum Tk. 3510 to maximum Tk. 23710. More than one-third (38%) had a cost from Tk.10001 to Tk.15000. (Table 9)

Discussion:

The aim of the present study was to estimate the economic burden of HI patients attending in a tertiary care hospital in terms of direct, indirect and total

costs. We also tried to have evaluation of some demographic characteristics in HI and TBI.

More than half of the patients (53.6%) of this study were in the age group 21 to 30 years and a quarter of the total patients (25.5%) were in the age group 31 to 40 years. Among the rest, 16 (14.5%) were in the age group 10 to 20 years, 6 (5.5%) were in the age group 41 to 50 years and only one respondent was above 50 years old in our study. In most of the studies the adolescent and the young adults ranging from 15 -25 years, had the highest incidence of TBI which is similar to our study[9-11] .A shift towards older age of patients with TBI has been observed, especially in high-income countries, with falls represent-ing the primary cause of TBI among the elderly[2].

Majority of the patients (69%) were males and 31% of the patients were females in this study. Like our study, in most of the studies, males were uniformly at higher risk of TBI than were females, with the highest male-to-female (M/F) ratios typically occurring in adolescence and young adulthood. Males are at a higher risk with a male to female ratio ranging from 1.5 - 4:1[12-14]. Males also tend to have higher rates of TBI-related deaths than females at all age levels[3].

40 patients that is more than one-third (36.4) of the patients had primary level education followed by 19 (17.3%) illiterate patients, 12 (10.9%) each were high school and college graduates, 17 (15.5%) were graduate and 10 (9%) patients completed post graduation. Schneider et al. [15] in their study found that, among different groups of patients with different modes of injuries, patients having fewer than 12 years of education had most injuries, followed by patients with 12 to 15 years of education and patients with more than 15 years of education respectively. Majority of patients in the series of Gururaj et al. were with lower levels of education constituting 30% of the patients. 21.8% and 11.2% of patients of that series were illiterate and had only primary education respectively[12].

Out of 34 women in this study, 23 were housewives and rests of patients of both sexes were of different occupations like service holder (19, 17.3%), driver (19, 17.3%), businessman (18, 16.3%), student (11, 10%) with other occupation. One study showed more than a third of the injured persons were involved in semi-professional or skilled occupational categories, 20.5% and 20.7% respectively. Housewives and students constituted 6.5% and 13.7% respectively in the injured groups in that study[12].

Commonest cause of injury, we found, was road traffic accidents (RTA) (63.6%), followed by 20% assault, 8% industrial accident and 8% fall from height. Among the RTA patients, which is the major cause of HI in our study, 40 (36.4%) were engaged in driving, one-quarter (25.5%) were engaged in working as helpers, 15 (13.6%) were pedestrians. In earlier studies, motor vehicle injury used to be the leading cause of TBI, followed by falls, sports and recreation, violence, firearms and others in different percentages[16,17]. But in one more recent study, unintentional falls were the most common cause of TBI (37%), followed by motor vehicle traffic crashes (26%), though, among the four major causes, motor vehicle traffic crashes (39%) led to the highest TBI-related deaths[3]. The scenario is similar as our one in the subcontinent, as in another study in India, among those injured, 59% of TBIs were due to road traffic injury, followed by falls (25.0%) and assaults (10.3%). Hit by or fall off an external object, work-related injuries and sports injuries accounted for only 2.5%, 0.1%, and 0.2%, respectively[12].

Seventy six patients were divided into two equal groups whose income was either within the range of monthly income of Tk.5000 to Tk.10000 or Tk.10001 to Tk.15000. One fifth of the total patients (20%) had monthly income between Tk.15001 to Tk.20000 followed by 10 individuals of Tk.20001 to Tk.25000 and only 2 had a income range of Tk.25001 to Tk.30000. Average income was Tk.14509.09 (±5762.494) within a range of Tk.5000 to Tk.30000. Most of the patients' (97.4%) daily income was below Tk.500 (57.9% below Tk.300 and 39.5% within Tk.301-Tk.500). Only 2 person had daily income above Tk.500. Average daily income was Tk.340.65 (±158.974). It was interesting to note in an Indian study that, nearly 88% were with income levels of < Rs. 3000 per month and only 3.7% had an income of > Rs. 6000 per month[12].

Large portion (43%) needed to stay 2 to 5 days in the hospital followed by 34.5% needed 6 to 10 days, 22% needed 11 to 15 days and only one needed more than 15 days. Information on duration of hospital stay was available for 5554 (82%) of the subjects in a study run by NIMHANS, India. Duration of hospital stay revealed that nearly 45% of the patients stayed in the hospital for approximately three hours. Among the remaining patients, 26%, 14% and 3% stayed for three to six hours, six to 12 hours and 12 to 24 hours, respectively. Nearly 641 (11%) patients stayed in the hospital for more than a day. The mean duration of stay for short-term and long-term stay patients was approximately four hours and seven days, respectively.[12] In the study by McGarry et al. average length of stay in hospital ranged from 6.7 days for moderate TBI to 17.5 days for critical TBI[18].

Among direct costs of the patients, travel cost was on an average Tk. 3628.18(±2055.564). The lowest cost was Tk. 200 and the highest cost was Tk. 8000. Average cost of drug was Tk.1618 (±801.516) with minimum Tk. 500 to maximum Tk. 4000 of only one individual. Most of the patients (77.3%) spent below Tk. 2000. Average lab investigation cost was Tk. 2390 (±626.472) ranging from Tk 200 to Tk 6000. Average cost of food was Tk. 2235.45 (±1208.197) with a range from Tk. 400 to Tk. 6500. In the study at NIMHANS apportioned costs for ambulance services was 34333.00 Rs. and apportioned costs for radiological services was 224415.00 Rs[12] .

Most of the patients' total direct treatment cost was either from Tk. 5001 to Tk. 10000 (40%) or from Tk.10001 to Tk.15000 (31.8%). Some had cost below Tk.5000 (14.5%) or above Tk.15000 (13.6%). The average total direct treatment cost incurred by the patients was 9590.10 (±4041.138). At NIMHANS, India, it was seen that the cost of managing one patient per day (in the EMS Department only) is estimated at Rs. 2,152. This is the lowest possible estimate and in actual values could be much higher. Also, this does not include medical/surgical/ ICU costs of inpatients, which constitute nearly one-third of the head injury patients. Apart from hospital expenses being influenced by severity, duration of stay and intervention procedures, the majority of the families of injured persons had incurred an average expenditure of Rs. 5000/- (sometimes reaching up to Rs.100, 000) during the time of hospital stay. However, this includes only direct medical expenditure and does not include indirect expenses (loss of work, loss of income and others) [12].Chen et al. showed in their study that emergency department visits were valued at $187 (CAD, 2007 prices) which was the average (non-weighted) cost of an ED visit and, the estimated average direct medical cost in the first year following an acute care admission for TBI patients was $32132[5].Runge et al. estimated annual direct cost burden of TBI (mild, moderate, and severe) to be $302 million (USD, 2009 prices), whereas Schulman et al. estimated the same direct cost burden as $98 million and $2.8 billion indirect costs; (USD, 2009 prices) [19.20].

Among the indirect cost due to injury during the hospital stay, average loss of

income due to illness was Tk.2415.32 (±1623.69) and minimum Tk.200 to maximum Tk.7000 loss. Average cost behind giving tips to hospital staff by the patients was Tk.221.50 (±78.341) and minimum rate was Tk.100 to maximum Tk.500. In the study at NIMHANS, nearly 50% each of patients and their family members had lost income during the 1st year after brain injury. Up to 75% had incurred heavy expenditure due to injury, even though the exact amount was difficult to quantify and was rated as moderate to severe in nature[12]. The researcher in USA estimated the total productivity loss due to TBI-related deaths at almost $1.1 billion annually in Missouri. They also estimated the rate of productivity loss at $18.8 million per 100,000 Missouri residents ($188 per person), with a three times higher rate for males ($31.7 million) than for females ($6.5 million) [3].

Total average indirect cost was Tk.2001.72 (±1869.279) with minimum Tk.100 to maximum Tk.8210. McGregor et al. in their review aimed to evaluate the economic importance and efficiency of rehabilitation programs for TBI patients and found that the costs per case were between $33,284 to $35,954 for mild and $25,174 to $81,153 for moderate TBI. These costs are mostly based on acute care[21]. The NIMHANS study showed, among the moderately and severely injured households,

50% and 22% each had taken substantial loans from outside sources to manage life after injury. Here again, nearly 22% had experienced serious impact of injury as they experienced severe hardships[12].

On an average the total cost of the patients was Tk.12008.05 (±5051.955) with minimum Tk.3510 to maximum Tk.23710. More than one-third (38%) had a cost from Tk.10001 to Tk.15000. Researchers attempted to assess the overall economic impact of brain injury during the first year after injury. While assessing the overall economic impact of brain injury during the first year after injury, the NIMHANS study found that nearly 25% had incurred expenditure of more than Rs. 100,000/- (US $1200) with half of them spending more than Rs.25,000/- as out-of-pocket expenses for health care alone. Several factors like age, working status, nature of injury, type of care and services utilized along with many other factors determine the total economic impact of brain injuries[12].

Conclusion:

Of the head injury and traumatic brain injury patients, road traffic accidents were the most in numbers in our country. Economic burden, especially travel cost, was also found to be higher among these patients. We feel that the government policy makers should make new strategies like extending specialized health care facilities for head injury patients at every peripheral and/or different levels of the country, developing preventive measures to reduce the occurrence of accidents. Strategies like health insurance, subsidized or free of cost treatment can also help in reducing economic burden of the victims. Loss of income was the highest indirect cost incurred by the patients. So, options for prompt and effective clinical interventions should be developed throughout the country to reduce disability and income loss of the head injury patients. All these policies can play a significant role in reducing the bad effects of head injuries and these measures can be implemented at a very low cost in comparison to the total economic burden sustained by the patients and the society.

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Bangladesh Journal of Neuroscience 2014; Vol. 30 (2): 112-116

REVIEW ARTICLE

Ischemic Stroke and Serum CPK: A Review

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Introduction:

Stroke is characterized by the rapid appearance (usually over minutes) of a non-convulsive, non-traumatic focal deficit of brain function, most commonly a hemiplegia with or without signs of focal higher cerebral dysfunction (such as aphasia), hemi sensory loss, and visual field defect or brain-stem deficit. Provided that there is a clear history of a rapid-onset focal deficit, the chance of the brain lesion being anything other than vascular is 5% or less[1]. The neurovascular syndromes enable the physician to localize the lesion—sometimes so precisely that even the affected arterial branch can be specified[1,2] . Neuroimaging is very important to establish the diagnosis of ischemic stroke and further investigation are needed for evaluation of risk factors and to predict its prognosis.

As the stroke syndrome is usually clearly delineated clinically but in some patients, laboratory evidence of the presence of cerebral infarction may provide additional diagnostic and prognostic information. Determinations of serum enzyme activity have the advantage of permitting repeated sampling without danger or inconvenience to the patient. The variations in serum creatine kinase (CK) activity in patients presenting with acute ischemic stroke may correlate with the severity of disease.

CK is a dimeric globular protein consisting of two subunits with a molecular mass of 43 kDa. It buffers cellular ATP and ADP concentrations by catalyzing the reversible exchange of high-energy phosphate bonds between phosphocreatine and ADP produced during contraction. At least five isoforms of CK exist: three isoenzymes in cytoplasm (CK-MM, CK-MB and CK-BB) and two isoenzymes (non-sarcomeric and sarcomeric) in mitocondria[3].

CK-MM is found in several domains of the myofibre where ATP consumption is high and is a marker of muscle disease[4]. CK-MB increases in acute myocardial infarction [5]and CK-BB increases in brain damage [6]. Patients with neurological conditions such as acute cerebrovascular accidents[7], proximal spinal muscular atrophy[8] show marked elevation of CK-BB. Brain is a rich source of a variety of enzymes and any injury (e.g. stroke) to brain tissue could similarly result in an increase in activity of these enzymes in cerebrospinal fluid. A simultaneous increase in serum levels will probably depend on integrity of blood brain barrier. If injury is severe enough to disrupt the blood brain barrier there might be some rise in enzymatic activity in serum.

Pathophysiology of ischemic stroke:

Normal adult brain cerebral blood flow is 50 to 60 mL/100g/minute. Cerebral blood flow between 10 and 20 mL/100g/minute is considered consistent with ischemic penumbra. Cerebral blood flow below 10 mL/100g/minute is considered compatible with infarction. These delineations are not absolute because time is also a factor in the fate of tissue. Cerebral blood flows of 5 mL/100g/minute result in infarction within 30 minutes, whereas those between 5 and 15 mL/100g/minute result in infarction after 1 to 3 hours[9].So, occlusion of an intracranial vessel causes reduction in blood flow to the brain region it supplies. Ischemia produces necrosis by starving neurons of glucose and oxygen, which in turn results in failure of mitochondria to produce ATP. Without ATP, membrane ion pumps

stop functioning and neurons depolarize, allowing intracellular calcium to rise and elevation of lactic acid level with acidosis. . Cellular depolarization also

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causes glutamate release from synaptic terminals; excess extracellular glutamate produces neurotoxicity by activating postsynaptic glutamate receptors. The greatly increased concentration of glutamate (and aspartate) in extracellular space in a depleted energy state results in the opening of calcium channels associated with N-methy1-D-asapartate (NMDA) and alpha-amino-3-hydroxy-5-methyl-4-isoxanole propionate (AMPA) receptors. Persistent membrane depolarization causes influx of calcium, sodium, and chloride ions and efflux of potassium ions. Activation of the N-methyl-D-aspartate receptor by an increase in glutamate leads to a cascade of chemical reactions that ultimately leads to cell death ("theory of excitotoxicity"). Free radicals are produced by membrane lipid degradation and mitochondrial dysfunction. Free radicals cause catalytic destruction of membranes and likely damage other vital functions of cells. Lesser degrees of ischemia, as are seen within the ischemic penumbra, favor apoptotic cellular death causing cells to die days to weeks later.

Serum creatine kinase

The Enzyme creatine phosphokinase (CPK) is widely distributed in various organs, but especially high activities are present in skeletal muscle, heart, and brain[10]. Recent studies have shown that this enzyme exists in a number of different molecular forms or isozymes which can be demonstrated by various techniques such as agar gel electrophoresis. The isozyme pattern of brain consists of a single fast-moving fraction which differs from the slower moving fractions found in heart and skeletal muscle [11].

Mechanism of elevated serum creatine kinase

Serum enzymes are altered during the course of a number of diseases. The usual alteration is an increase in enzyme activity that can most frequently be attributed to destruction of tissue by ischemic necrosis or inflammation with liberation of soluble enzymes into the circulation. Decreased plasma clearance or increased productions of enzyme by a particular tissue are other contributing factors. In brain, CPK is considered to play an important role in cerebral metabolism by maintaining adenosine triphosphate concentrations[12,13].

Elevated Serum Creatine Kinase

Alterations in serum CPK activity has proved to be of diagnostic value in patients with muscular dystrophy and myocardial infarctions (Dreyfus et al., 1960). In these conditions the isozyme form found in the serum is the same as that of the tissue involved in the pathological process. Total serum CPK activity has been found to be elevated in patients following acute cerebrovascular accidents, with a gradual return to normal being observed.' Studies of CPK activity in the cerebrospinal fluid (CSF) have shown that elevations do occur following cerebral infarction or recurrent ischemia with residuum[14,15,16](Sherwin et al., 1967; Acheson et al., 1964; Nathan et al., 1967).

Relation of Ischemic Stroke With CK

Stroke is one of the leading causes of death in the world as well as the leading cause of acquired disability in adult in most regions [17,18]. Due to the tremendous burden that stroke places on our society, there have been major efforts to identify the severity according to serum creatine kinase (CK) and given treatment on those findings which could reduce the incidence of ischemic stroke (IS). The related study findings around the world have been sought in the followings-

AyH et al (2002) compared between creatine kinase-MB (CK-MB) and troponin T after stroke to determine whether troponin T increases in parallel to CK-MB[19]. They made daily measurements of CK-MB, myoglobin, total creatine kinase (total CK), and troponin T levels up to day 5 in 32 patients with large hemispheric infarction and with no history of coronary heart disease. The daily enzyme levels were compared with those of a control group of 22 patients with neurological diseases other than stroke. Serum CK-MB, myoglobin, and total CK levels were elevated above the cutoff value in 11, 26, and 20 patients with stroke, respectively. These enzyme levels gradually increased within the first 3 days and declined afterward. Troponin T did not exceed the reference range in any patients. One patient had elevated myoglobin and 3 had elevated total CK in the control group. The difference between groups was significant for CK-MB, myoglobin, and total CK at various time points. They concluded as Troponin T whether total CK and CK-MB elevations in stroke patients are likely to be noncardiac in origin.

Capocchi et al (1987) correlated with severity of brain damage in acute ischemic stroke patients with

serum CK-BB level[20]. They measured BB-CK activity in 11 patients with stroke and in 10 controls. Blood samples were taken 36 hours after the clinical stroke onset in every patient. Sera were stored at -80 degrees and analyzed within two months. The creatine kinase isoenzymatic pattern was determined by ion-exchange column separation and gradient elution system. The mean BB-CK concentration in patients with stroke was significantly higher than in controls (p less than 0.01). In the group of "stroke" patients they found a correlation between severity of brain damage, as suggested by the clinical picture and CT scans, and serum values of BB-CK.

Eisen & Sherwin (1968) tried to reveal serum creatine phosphokinase activity in cerebral infarction[21]. The results of serial serum creatine phosphokinase (CPK) activity observed in 20 patients each presenting with an acute neurological deficit are reported. Thirteen patients who were considered to have sustained hemispheric infarcts showed a rise in serum CPK activity. Four patients proved to have an underlying tumor or angioma. In these patients the serum CPK activity remained within normal limits during the course of their acute neurological deficit. It is suggested that the presence of high peak activities and an early rise in serum CPK may indicate a poor prognosis. Serum CPK activity is easily and fairly rapidly determined by the method used in the present study and may be a useful ancillary investigation in the diagnosis of a stroke syndrome.

Parakh et al (2002) estimated levels of aspartate aminotransferase (AST), alanine aminotransferase (ALT), lactate dehydrogenase (LDH) and creatine kinase (CK) in serum and cerebrospinal fluid of 25 patients of stroke, and were correlated with severity of disease[22]. 21 (84%) patients had ischemic stroke and four (16%) had hemorrhagic stroke. Serum and CSF AST levels were significantly elevated in the study group. The rise in CSF AST was more in the hemorrhagic subtype than in the ischemic subtype. Serum ALT and CSF LDH levels were also significantly elevated in patients with ischemic stroke. None of the enzyme levels were related to the severity of disease as assessed by the Glasgow coma scale.

Frederick et al (1984) conducted a study on acute ischemic stroke patients where Serum creatine kinase B (CKB) concentrations were measured in 38 patients during acute cerebrovascular diseases and in nine controls[23]. Mean CKB concentration was 6.2 ± 0.8 ng/mL. The fluctuation of the CKB concentration following ischemic stroke was as notable as the elevation immediately after the ischemic event. The two abnormalities were observed in 13 of 17 patients with acute cerebral infarction, and the extent of abnormalities roughly correlated with the volume of tissue damage.

Norris et al (1979) estimated serum cardiac enzyme levels (CK, LDH, SCOT) in ischemic stroke patients[24]. For that, they collected 288 patients (Group I) from a stroke intensive care unit and sixty-four of these patients, subsequently found not to have strokes, served as controls. Mean serum levels of all 3 cardiac enzymes were elevated in 8% of the 224 patients with stroke. The mean serum enzyme levels in patients with transient ischemic attacks (TIA) did not differ from controls. In a second group of 230 patients with stroke (Group II) serum CK levels were measured and the isoenzymes were fractionated to determine the tissue source of the enzymes. One hundred and one patients had raised total CK values and 25 of these (11%) had raised CK-MB (heart) iso-enzyme, the remainder having CKMM (skeletal muscle) fraction. No serum CK-BB (brain) iso-enzyme was detected in any patient. Patients with positive serum levels of CK-MB had more evidence of acute myocardial ischemia on ECG ($p < 0.05$), and more cardiac arrhythmias ($p < 0.001$) than those with normal CK levels. The acute rise in serum cardiac enzymes which they have recorded in the initial stages of stroke suggest that acute myocardial involvement is a commoner complication than is generally recognized. Also, since the CKMB rises were modest and progressive, it is more likely that this acute myocardial dysfunction is a consequence, rather than a cause, of the acute cerebrovascular lesion.

Myers et al (1982) examined on acute stroke patients to reveal resultant cardiac abnormalities including serum CK level[25]. Continuous 24 hour Holter ECG tapings were performed and serum

cardiac enzymes and plasma norepinephrine concentrations were measured within 48 hours after admission. Significantly, ($p < .001$) more serious arrhythmias were observed during 24 hour Holter ECG monitoring in stroke patients compared with controls and the difference remained ($p < .01$) after matching for age and co-existing heart disease. Arrhythmias were more common in older stroke ($p < .001$) and older control ($p = .05$) patients and with infarction of the cerebral hemispheres ($p < .05$) as compared to brainstem lesions. However, the 15 stroke patients with abnormally high CK values (mean 34.3 units) had a higher ($p < .02$) mean plasma norepinephrine concentration (650.4 pg/ml) than stroke patients with normal CK (427.7 pg/ml). They concluded as acute stroke may cause cardiac arrhythmias and myocardial cell damage.

Kloss et al (1985) found increase in the activity of creatine kinase BB isoenzyme (CK-BB) in the serum of patients with cerebrovascular disease[26]. The serum CK-BB activity of 33 patients with ischemic brain infarction, subarachnoid hemorrhage or intracerebral hemorrhage was measured with a bioluminescence method (CK-B Kit, LKB-Wallac) in combination with immunoprecipitation. The results were compared with lesions determined by computed tomography. In the control group (N = 19) there was a mean activity of 0.35 +/- 0.26 U/l (means +/- SE). In patients with small lesions (N = 11) the activity was 0.41 +/- 0.21 U/l, which was not significantly elevated when compared to the control group (Mann/Whitney U test). Therefore, patients with more extensive lesions (N = 12) and the group with severe lesions (N = 10) showed a significant elevation, with a mean activity of 0.61 +/- 0.34 U/l and 1.12 +/- 0.52 U/l, respectively. The group with severe lesions had a maximum activity on the first day after the initial symptoms.

Kaste & Somer (1978) detected heart type creatine kinase isoenzyme (CK MB) in the serum in 23 out of 53 patients (43%) with acute cerebrovascular, traumatic, or infectious brain damage[27]. Electrocardiogram disclosed abnormalities suggestive of acute myocardial injury in 15 of these 23 patients. Eleven of them also showed increased LD1 activity. Subendocardial haemorrhage was detected in 3 out of 8 necropsied patients with serum CK MB activity. Best of the 30 patients in whom no CK MB activity was found electrocardiographic abnormalities suggestive of acute myocardial injury were observed in 2 and increased LD1 was seen in 4 cases. The mortality was higher if either CK MB isoenzyme or electrocardiographic abnormalities suggestive of acute myocardial injury were present, compared with the patients lacking these signs (P less than 0.01). Present findings suggest that acute brain damage may secondarily cause myocardial damage more often than has been believed before. Results also indicate that a combination of acute brain damage and acute myocardial injury often indicated a poor prognosis.

In conclusion, patients with stroke have elevation of CKMB levels. And unlike CK-MB, troponin T does not increase after ischemic stroke. ECG changes are also observed in these patients. The elevation of CK-MB does not necessarily indicate acute coronary injury and ECG changes also do not correlate with myocardial damage in all cases.Therefore, elevated CK-MB levels do not translate into in vivo evidence of myocytolysis occurring after stroke. Especially important is the fact that CK-MB elevation in a stroke patient does not necessarily reflect an acute coronary event. Troponin T promises to be a valuable marker in this regard. Patients with stroke have to be carefully investigated for cardiac injury and CK MB levels elevation in these patients does not necessarily indicate any myocardial injury.

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Bangladesh Journal of Neuroscience 2014; Vol. 30 (2): 117-119

CASE REPORT

Gradenigo's Syndrome: A Case Report

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Abstract

The syndrome of constant otorrhea, headache, diplopia and rarely ipsilateral Horner's syndrome, which is attributed to inflammation of the petrous apex, is known as Gradenigo's syndrome. We report a case of Gradenigo's syndrome, which was 50 yrs old man who presented with 6 months history of left-sided headache, facial pain, diplopia and dropping of left eyelid. Examination demonstrated a left eye lateral gaze palsy, diplopia, and dropping of left eyelid, otoscopy revealed a congested left tympanic membrane. X-ray mastoid Townes view shows mastoid air cell are reduced on left side. CT scan study confirmed mastoid air cell are reduced and scleroses on left side and MRI shows T1 hypo & T2 & FLAIR hyperintense areas are on left mastoid region which consistent with Gradenigo's Syndrome.

Introduction:

The syndrome, first described by Gradenigo in 1907, consists of the clinical triad of acute otitis media, unilateral pain in regions innervated by the first and second branch of the trigeminal nerve, and ipsilateral abducens nerve paralysis[1]. These cranial nerve dysfunctions are caused by osteitis of the petrous apex (petrous apicitis) and are very rare complications of otitis media, especially since the widespread use of antibiotics[2-3]. The trigeminal nerve ganglion and the abducens nerve are separated from the petrous apex only by dura mater and are therefore vulnerable to any inflammatory process occurring in this region[4-6].

Case Report:

A 50 years old man presented with left sided headache for 6 month. It was accompanied with left sided facial pain, diplopia and partial dropping of left eyelid (Fig : 1)

On examination: This afebrile patient was noted to have left sided six nerve palsy (Fig-2) and congested left tympanic membrane. The patient has left partial ptosis (Fig-3). The leukocyte count was 9,500/l, differential count was Neutrophil 66%, Lymphocytes 24% and Monocytes 6% while ESR was 15 mm/1st hours.

X-ray mastoid Townes view shows mastoid air cell are reduced on left side (Fig: 4). CT scan study reveals mastoid air cell are reduced and scleroses on left mastoid antrum and petrous bone (Fig: 4) and MRI shows T1 hypo & T2 & FLAIR hyperintense areas are on left mastoid region (Fig: 5, 6). The clinical, laboratory and radiological findings helped to establish the diagnosis of Gradenigo's syndrome. The patient was managed by intervenes cefotaxime.

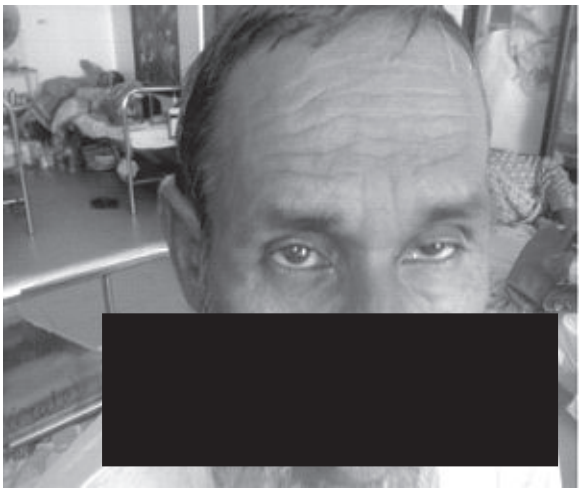

Fig.-1 : *File photograph of the patient with left partial ptosis.*

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Fig.-2 : *File photograph of the patient with left lateral rectus palsy.*

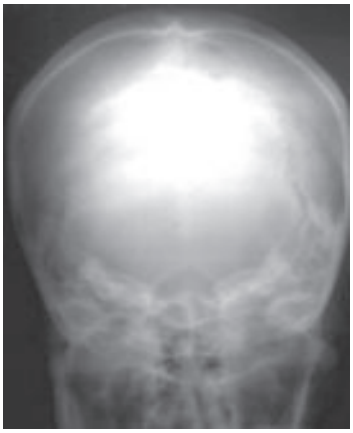

Fig.-3 : *X-ray mastoid Townes view shows mastoid air cell reduced on left side.*

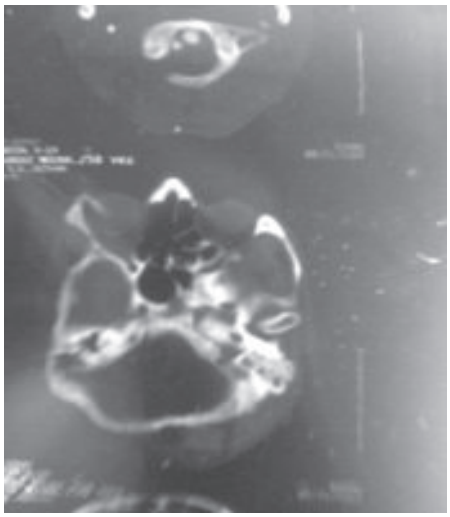

Fig.-4 : *CT showing obliterated left mastoid air cell and sclerosis.*

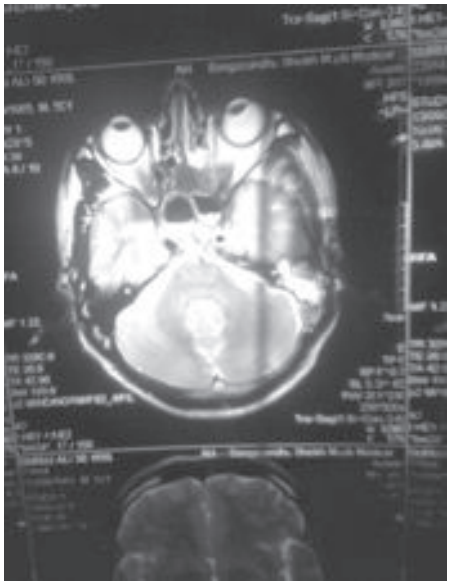

Fig.-5 : *T2 weighted MRI Image with hyperintense area are noted in the left middle era and mastoid region.*

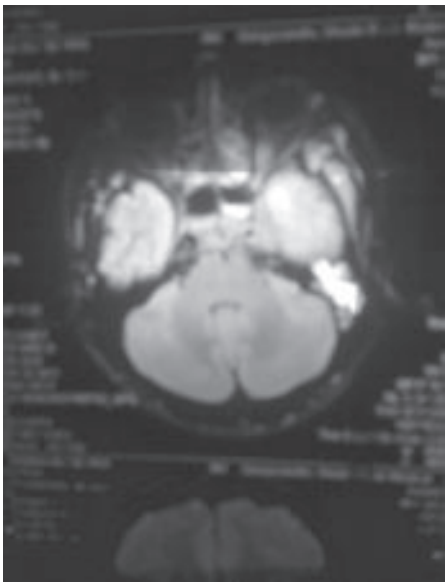

Fig.-6 : *FLAIR MRI Image with hyperintense area are noted in the left middle era and mastoid region*

Discussion:

Gradenigo's syndrome, characterised by persistent otorrhoea, pain in the region innervated by the first and second divisions of the trigeminal nerve and ipsilateral abducens nerve palsy, is one of the complications of middle ear infection. CT and MRI

scans provide evidence of this complication. However, there are only a few reports [2-6] in the literature describing these findings. Gradenigo's syndrome consists of abducens nerve paralysis, retro-orbital pain and middle ear infection. Although classically attributed to petrositis, the syndrome has also been described in association with extradural abscess, pachymeningitis overlying the petrous apex and lateral sinus phlebitis[7]. It is thought that the manifestations of the syndrome result from the extension of the inflammatory process that begins in the middle ear to the top of the petrous part of the temporal bone[8]. The raised intracranial pressure itself is, probably due to, a combination of lateral sinus thrombosis and superior sagittal sinus obstruction. The former impedes the cranial venous outflow while the latter impedes the CSF absorption by pacchionian bodies[9]. The main isolated agents are Streptococcus pneumonia and pseudomonas aeruginosa. There is also Proteus mirabilis and Staphylococcus aureus, as well as mycobacterias.

The CT scans demonstrate obliteration of mastoid air cells and sclerosis of the bones and one can assess the degree of periosteal reaction and status of the middle ear structures based on CT scan findings[2]. The MRI scans are best for assessing the soft tissue lesions. These lesions appear hypointense on T1-weighted images and hyperintense on T2 weighted images.

The main differential diagnosis includes cholesteatoma and mastoiditis. Other diseases include chondroma, clival chordoma, epidural abscess, cholesterol cyst and rarely metastases. When consider of 6th cranial nerve palsy, remember the possibility of a false localising sign of raised intracranial pressure.

Management consists of administration of appropriate antimicrobial agents and surgical intervention. However, improvement without the administration of anti-microbial agents has also been described.

Complications like brain abscess have been described[5]. Homer et al[7]. reported three cases with middle ear infection and sixth nerve palsy without petrositis and raised intracranial pressure.

As otitic hydrocephalus, another complication of the middle ear infection is also associated with abducens nerve palsy, neuroimaging should be employed to differentiate between these two conditions. Surgical treatment is restricted to refractory cases, with intense mastoiditis, intracranial complications and osteomyelitits[10].

Conclusion:

Gradenigo syndrome is a very rare but serious complication of acute otitis media and should be suspected in the presence of unilateral headache and abducens nerve palsy. The management varies from conservative therapy to radical surgery depending on the clinical presentation.

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