Clinical courses and prognosis of spontaneous non-aneurysmal subarachnoid hemorrhage: a single institution experience

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Introduction

In spontaneous subarachnoid hemorrhage, patients without cerebral aneurysms detected on angiography (non-aneurysmal subarachnoid hemorrhage (NASAH)) account for 10-15%. These patients have been treated empirically and generally show a favorable prognosis. We retrospectively analyzed clinical course, complications and prognosis in NASAH patients.

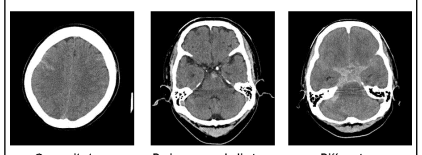
Methods

We collected information on 317 patients with spontaneous SAH admitted to our center between 2006 and 2011. Of these 317 patients, 23 (7.3%) were diagnosed with NASAH. All patients underwent cerebral angiography and/or 3-dimensional computed tomography (CT) angiography. Repeated cerebral angiography was usually performed about 2 weeks after first ictus, and confirmed the absence of both aneurysms and abnormal vessels. Based on the results of initial CT or magnetic resonance imaging, NASAH patients were classified as perimesencephalic, convexity or diffuse type. Clinical course, complications and Glasgow outcome scale (GOS) score were compared between these 3 subgroups.

Population characteristics (SAH and NASAH)

	SAH (n=317)	NASAH (n=23)
Mean age(years)	66	56
Sex		
Male	93	8
Female	224	15
Hunt & Kosnik grade		
I	32	11
II	111	10
III	48	0
IV	35	0
V	89	1
sedation	2	1
GOS at discharge		
I	73	0
II	15	0
III	20	1
IV	59	1
V	150	21

NASAH



Convexity type

Blood collections in 1 or several adjacent sulci in the absence of blood at the basal cystern or elsewhere

Perimesencephalic type

Blood collections located anterior to the midbrain, no extension to the anterior interhemispheric fissure and Sylvian fissure excwpt for a small amount of blood

Diffuse type

Blood collections located diffusely basal cystern, Sylvian fissure, anterior interhemispheric fissure and posterior fossa

Results

Population characteristics (NASAH)

	Conv (n=9)	PM (n=7)	Dif (n=7)
Mean age(years)	55	53	65
Sex			
Male	2	4	2
Female	7	3	5
H&K			
I	7	3	1
II	1	4	5
III	0	0	0
IV	0	0	0
V	0	0	1
sedation	1	0	0
GOS at discharge			
I	0	0	0
II	0	0	0
III	1	0	0
IV	0	0	1
V	8	7	6

Conv=convexity; PM=perimesensepharic; Dif=diffuse

Overview of DSA, origins, risk factors and outcomes in 9 patients with covexity SAH

Case No.	Age(yrs), Sex	DSA	Origin	Risk Factor	Seizure	GOS	Other
1	51/F	normal	unknown	HT	-	V	
2	55/F	normal	unknown	-	-	V	
3	46/F	normal	unknown	HT	-	V	
4	82/M	ND	unknown	HT/PKD	-	V	
5	41/M	normal	PRES?	HT, jellyfish sting	+	V	
6	45/F	normal	unknown	seizure	+	V	
7	62/F	venous angioma	venous angioma?	HT	+	V	ICH
8	60/F	normal	unknown	SAH	-	V	
9	57/F	ND	anticoagulation therapy?	HT, SSc, SAH, FH, heparin, PGE1	-	III	ICH

ND=not done; PRES=posterior reversible encephalopathy; HT=hypertension; PKD=polycystic kidney disease; SSc=systemic sclerosis; FH=family history; PGE1=prostaglandin E1; ICH=internal cerebral hemorrhage

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6	45/F	normal	unknown	seizure	+	V	
7	62/F	venous angioma	venous angioma?	HT	+	V	ICH
8	60/F	normal	unknown	SAH	-	V	
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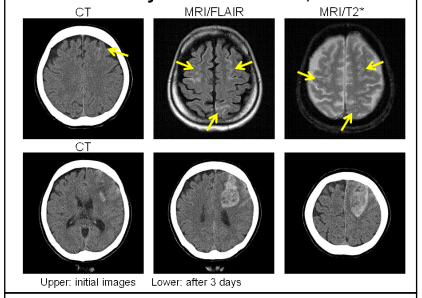
ND=not done; PRES=posterior reversible encephalopathy; HT=hypertension; PKD=polycystic kidney disease; SSc=systemic sclerosis; FH=family history; PGE1=prostaglandin E1; ICH=internal cerebral hemorrhage

One patient with systematic sclerosis suffered convexity SAH twice (GOS score, 3). 2 patients with convexity SAH developed intracerebral hemorrhage.

Conv-Case 9 Systemic sclerosis, vasculitis?



Overview of 7 patients with perimesencephalic SAH

Case No.	Age(yrs), Sex	H&K grade	presenting symptoms	DSA	Risk Factor	Seizure	GOS
1	47/M	2	sudden severe HA	normal	HT	-	V
2	61/F	2	sudden severe HA	rt. IC-PC infundibular dilatation	HT	-	V
3	37/F	2	sudden severe HA	normal	-	-	V
4	47/M	1	sudden severe HA	normal	HT, epidermoid, FH	-	V
5	64/M	1	HA	normal	HT	-	V
6	54/F	2	HA	normal	-	-	V
7	62/F	1	HA	normal	HT	-	V

All patients showed favorable outcome in perimesencephalic SAH.

A patient with diffuse SAH developed hydrocephalus (GOS score, 4).

Overview of imaging in 7 patients with diffuse SAH

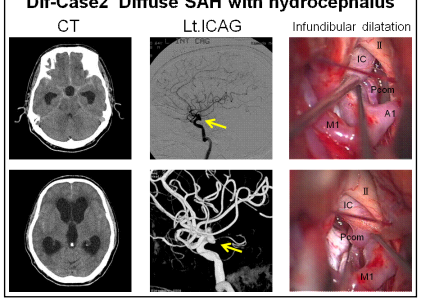
Case No.	Age(yrs), Sex	H&K grade	Preseinting Symptoms	CT scan	MRI/MRA
1	78/F	1	sudden severe HA	diffuse SAH, hydrocephalus	diffuse SAH, hydrocephalus
2	64/M	5	AMS	diffuse SAH, hydrocephalus	diffuse SAH, hydrocephalus, blt. frontal convexity, corpus callosum HI (FLAIR/DWI) LI(T2*)
3	52/F	1	sudden severe HA	diffuse SAH, hydrocephalus	diffuse SAH, hydrocephalus
4	62/F	1	sudden severe HA	diffuse SAH	ND (Pacemaker)
5	77/M	2	sudden severe HA	diffuse SAH, hydrocephalus	diffuse SAH, hydrocephalus MRA: spastic
6	66/F	1	sudden severe HA	diffuse SAH	Prepontine cistern SAH, HI (FLAIR)
7	59/F	1	sudden severe HA	diffuse SAH	diffuse SAH

Overview of DSA, origins, risk factors and outcomes in 7 patients with diffuse SAH

Case No.	Age(yrs), Sex	DSA	Origin	Risk Factor	seizure	GOS	Other
1	78/F	rt. IC-PC infundibular dilatation	unknown	HT	-	V	
2	64/M	rt. IC-PC infundibular dilatation	unknown	HT	-	IV	VPS
3	52/F	normal	unknown	HT	+	V	
4	62/F	VA stenosis	vasculitis?	HT, sarcoidosis	-	V	
5	77/M	normal	unknown	HT	-	V	
6	66/F	normal	unknown	HT	-	V	
7	59/F	normal	unknown	HT	-	V	

VPS=ventricle peritoneal shunt

Dif-Case2 Diffuse SAH with hydrocephalus



Discussion

The underlying cause of convexity SAH is varied as described in the literature 1). Seizures and focal neurological deficits were more frequent after convexity SAH. Although this group generally carries a more favorable prognosis than that of aneurysmal SAH, some factors were reported that relates to poor outcome 1).

Beitzke et al. reported subsequent intracerebral hemorrhage and ischemic infarctions had contributed to unfavorable outcomes 1). In our series, 2 patients complicated ICH and a patient was GOS III. Further evaluation is required to identify a potential underlying cause and direct therapy specific to origin of SAH.

In our series, patients with perimesencephalic SAH (PMSAH) tend to be younger and predominantly male compared with aneurysmal SAH as described in the literature. Hydrocephalus and clinical vasospasm was not seen in our cases. All had good prognosis.

Although some reported repeat DSA was likely to become obsolete 2), posterior circulation aneurysm should be ruled out. Schievink et al. reported that a posterior circulation aneurysm was found in 2-16% of patients with 3).

Some reported that diffuse SAH was a subgroup of angiographical negative patients who demonstrate significantly worse clinical courses. Hui HK reported patients with diffuse SAH were at increased risk for vasospasm and hydrocephalus. The morbidity and outcome rates more closely resemble that of aneurysmal subarachnoid hemorrhage 4). For this group of patients, aggressive management is important as well as further investigation of aneurysm4). In our series, 3/7 patients showed hydrocephalus and one required VPS.

Conclusions

Although the vast majority of patients with NASAH showed good prognosis, some non-negligible complications are occasionally encountered, such as hydrocephalus and intracerebral hemorrhage.

References 1. Beitzke M: Clinical presentation, etiology, and long-term prognosis in patients with nontraumatic convexal subarachnoid hemorrhage. Stroke 42:3055-60, 2011
2. Huttner HB: Repeated digital substraction angiography after perimesencephalic subarachnoid hemorrhage? J Neuroradiol 33:87-9, 2006
3. Schievink WI: Perimesencephalic subarachnoid hemorrhage: additional perspective from four cases. Stroke 25:1507-1511, 1994
4. Hui FK: Clinical differences between angiographically negative, diffuse subarachnoid hemorrhage and perimesencephalic subarachnoid hemorrhage. Neurocrit Care 11:6-70, 2009