RUPTURED ANTERIOR COMMUNICATING ARTERY ANEURYSMS TREATED BY COILING TECHNIQUE: CHARACTERISTICS, OUTCOMES AND PROGNOSISES

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ABSTRACT

A prospective study of 31 patients with ruptured anterior communicating artery aneurysm (ACoA) treated by endovascular coiling was carried out at Stroke center - Hue Central Hospital, from September 2018 - February 2020. The results obtained were: Male: female ratio = 2.1: 1, age 54.2 ± 15.3 (21-85); clinically sudden onset 100%, headache 87.1%, vomiting 45.2%, cranial nerve palsy 12.9%, hemiparesis 29%, aphasia 11%; Hunt-Hess 1-3 61.3%, Fisher 1-3 35.2%, Glasgow coma score ≤8 19.4%; aneurysm size 5.6 ± 2.0 mm (2.5-10 mm), complete obliteration 81%; delayed ischemia 19.4%, ventricular dilation 45.2%, in-hospital recurrent hemorrhage 0%, modified Rankin scale (mRS) 0-2 at discharge 51.6%; mRS 0-2 after 3 months 54.8%, in-hospital death 0%, death within 3 months 22.6%. There was a moderate correlation between Hunt-Hess, Glasgow score at admission and mortality within 3 months; there was a statistically significant relationship between Glasgow coma scale-based groups and mortality (OR 0.34; 95% CI: 0.12 - 0.99; p = 0.047, p-value 77.4%).

I. INTRODUCTION

According to necropsy and angiography series, about 5-6% of individuals have intracranial aneuryms [1]. The frequency of subarachnoid hemorrhage (SAH) from ruptured aneurysms is about 1 per 10000, and the proportion of SAH cases who will die before receiving medical attention is 33% [1]. The most frequent location of intracranial aneurysms is the anterior communicating artery (35%) [2]. Endovascular coiling used to treat brain aneurysms has been implemented in Hue Central Hospital since 2014. To study the characteristics, assess the results of intervention, as well as the outcomes and prognosises of patients hospitalized with ruptured ACoA, we carried out this study in order to: 1) Study clinical features and images of patients with ruptured anterior artery aneurysm. 2) Assess the results of intervention, outcome, prognosis of patients with ruptured anterior artery aneurysm.

II. MATERIALS AND METHODS

2.1. Study population

31 patients hospitalized in Stroke Center – Hue Central Hospital from September 2018 to February 2020 with ruptured ACoA aneurysms that were diagnosed by computed tomography (CT) and digital subtraction angiography (DSA) technique.

1. Hue Central Hospital

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2.2. Study parameter

We conducted a prospective study, longitudinal monitoring and evaluated the clinical, paraclinical characteristics at the time of admission, after endovascular coiling technique, discharge and 3 months from the time of admission:

-Clinical examination: general and neurological examination, assessment of clinical scales.

-Paraclinical information: collecting data from brain computed tomography, magnetic resonance imaging, DSA, paraclinical scales.

2.3. Statistical analysis

The analysis was performed using Microsoft Excel 2010 and SPSS 16.0.

III. RESULTS

Among 31 patients in our sample, the male:female ratio was 2.1:1; the average age was 54.2 ± 15.3 years, of which the youngest was 21 years old, the oldest was 85 years old. The hospitalization period lasted from 1 to 108 days (20.2 ± 27.6 days).

Risk factors: the proportions of patients who had hypertension, diabetes, dyslipidemia, smoking, alcohol use, coronary artery diseases, family history of brain aneurysms were 74.2%, 12.9%, 61.3%, 25.8%, 48.4%. 6.5% and 0%, respectively (Table 1).

Table 1: Clinical features at admisson

Clinical features	n	%
Sudden onset	31	100
Headache	27	87.1
Vomitting	14	45.2
Stiff neck	15	48.4
Cranial nerve palsy	4	12.9
Hemiparesis	9	29
Aphasia	11	35.5

Glasgow Coma Scale (GCS): 5 - 15 scores (12.5 ± 3.4), the percentages of patients with score ≤ 8, 9-12, 13-15 were 19.4%, 19.4% and 61.3% respectively.

Hunt-Hess scale: grade 1 - 5 (2.9 ± 1.5), the number of patients with grade 1-3 and 4-5 accounted for 61.3% and 38.7%, respectively.

Fisher grade: grade 2-4 (3.2 ± 0.9), Fisher grade 4 comprised 17 patients (54.8%).

Our patients'aneursysms were intervened by coiling technique, and we assessed the results according to Raymond-Roy classification (classes I, II and III) (Figure 1). Patients was transferred urgently to DSA lab, and severe cases (Hunt-Hess grade 4-5) were assisted with intensive care. ACoA aneurysms were 2.5 - 10.0 mm (5.6 ± 2.0 mm) in diameter, and theirs neck size were 1.4 - 5.4 mm (3 ± 0.98 mm) (Figure 2).
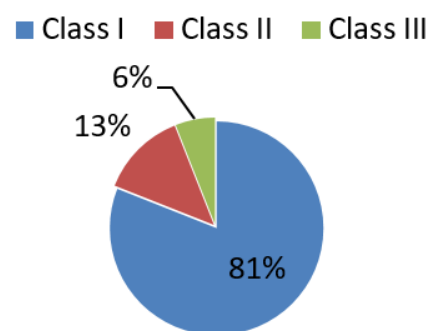
Raymond - Roy classification

■ Class I   ■ Class II   ■ Class III

6%
13%
81%

Figure 1: Raymond - Roy occlusion classification

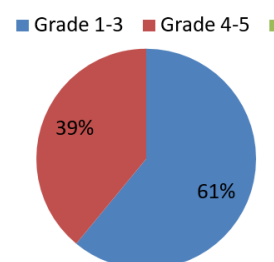**Hunt-Hess grade**

■ Grade 1-3   ■ Grade 4-5   ■

39%
61%

Figure 2: Hunt - Hess grade at admission

During the course of treatment, 6/31 patients (19.4%) had delayed ischemia; 14/31 patients (45.2%) had ventricular dilation which was seen on brain CT-scan. There wasnot any patient reported with recurrent hemorrhage that could be detected by a combination of clinical examination and images
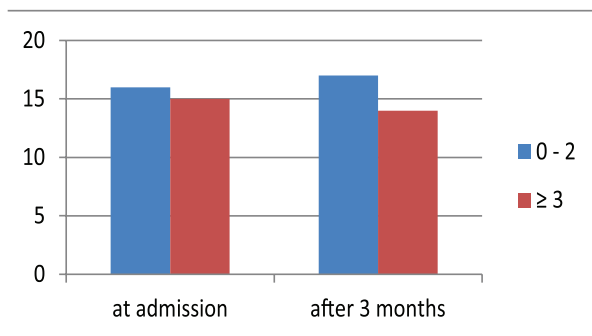
(Table 2). The mortality within 3 months was 22.6% (Table 3). Figure 3 presents the modified Rankin scale.

Table 2: Fisher grade

Grade	n	%
1	0	0
2	10	32.3
3	4	12.9
4	17	54.8

Table 3: Mortality rate

Mortality	n	%
In-hospital	0	0
Within 3 months	7	22.6

Figure 3: Modified Rankin scale

There was no correlation between length of hospital stay, Fisher grade at admission and mortality; there was a statistically significant relationship between Glasgow coma scale-based groups and mortality (OR 0.34; 95% CI: 0.12 - 0.99; p = 0.047, p-value 77.4%) (Table 4).

Table 4: The correlation between Glasgow score, Hunt - Hess grade and mortality within 3 months

	Mortality	
	r	p
Glasgow score	-0.451	0.011
Hunt - Hess grade	0.477	0.007

VI. DISCUSSION

The men's proportion in our study (67.7%) was higher than women's. In the literature and some studies, the annual incidence of men reported is lower than that of women [3-5]. However, our sample was small so that this percentage was not representative, although it was quite similar to some studies of other authors, such as Rinkel G.J.E (70%) [6].

The risk factors related to aneurysm recorded in our study were also mentioned in the literature [4,7]. According to the study of J.J Heit, the proportions of patients with hypertension, diabetes, dyslipidemia, coronary artery diseases, smoking, alcohol use, family history of brain aneurysms are 56%, 10% , 32%, 10%, 38%, 4% and 8% respectively [8]. Our study showed significantly higher proportions of patients with hypertension and dyslipidemia (74.2% and 61.3%), and there wasnot any patients who had a family history of brain aneurysms.

100% of patients had sudden clinical onset, this finding was consistent with studies of Tue H.N [9] and Dai Dinh Pham [10]. Headache in subarachnoid hemorrhage is caused by a rapid increase of intracranial pressure. 87.1% of our patients had a sudden headache, that was consistent with Tue H.N's study [9]; the remaining 12.9% were admitted to the hospital with impaired consciousness and coma, so this symptom could not be assessed. Other signs included vomiting (45.2%), stiff neck (48.4%), aphasia (35.5%), cranial nerve palsy (12.9%), hemiparesis (29%). In the literature, meningeal irritation signs are found in about 80% of subarachnoid hemorrhage cases. In the study of Thang C.T, 93.2% of patients had stiff neck [11]. This proportion of our study was lower, probably due to the small sample size.

To assess the clinical severity at admission, we used Glasgow coma scale (divided into mild, moderate, severe group) and Hunt-Hess grade (mild, severe grade). For the Glasgow scale, the prorpotions of moderate and severe groups were both 19.4%, this of mild group was 61.3%; mild Hunt-Hess grade presented 61.3% of patients, the rest (38.7%) was of severe grade. Hence, there was

a quantitative correlation between two mild subgroups patients of two scales. Our proportion of severe patients according to Hunt-Hess grade was higher than that of the authors J.J.Heit, R.L Ball (14.7%). The delayed ischemia percentage was 19.4%, lower than the 30% in Menno R.G.'s study [2]. We suggest that the reason of this difference is that our patients had brain MRI and CT-scan to be reassessed only when they had clinical and imaging indicators, so we might ignore some patients with tiny infarction; in addition, the study of Menno had a very large sample size (6713 patients). 45.2% of our patients had ventricular dilation (some of them had external ventricular drainage), lower than the 67% of J.J.Heit's study [8].

According to the Fisher classification, 100% of our patients had blood in the subarachnoid space saw on CT-scan images (Fisher grade 2-4), 67.7% of patients were in Fisher grade 3-4, this percentage was similar to that of Ritva Vanninen's study (61.5%) [12].

All patients' aneurysms were treated by coiling technique; 81% of 31 aneurysms were completely oblirated (Raymond-Ray grade I), this number is higher than the 50% in a study comprising 48 patients of Justin R.M [13].

To assess patients' outcome at discharge, we used the modified Rankin scale (mRS). 51.6% of patients had mRS 0-2 at discharge, higher than that of B.Zhao's study (36.1%) [14]. mRS 0-2 at 3 months after the admission accounted for 54.8%, higher than that of Isabel Fragata's study (30%) [15], and also higher than the result of Robert M. Starke's study (25%, because that study included 160 patients with severe Hunt - Hess grade) [16].

The mortality rate after 3 months in our study was 22.6% (7/31 patients); these 7 patients were admitted to our hospital in a serious clinical condition (with Glasgow coma score ≤8, Hunt-Hess grade 4-5). The mortality rate in Isabel F.'s study was 8.3% (5 patients) [15]. Although the numbers did not differ much, the mortality in our sample was higher because of the smaller sample. In addition, in a large-sample study (3973 patients), the mortality rate reported by the author Syed I.A was 26.2% [17] - begin/></run>z-tg<r.

There was a moderate, statistically significant correlation between Glasgow score, Hunt-Hess grade and mortality after 3 months (the correlation coefficient r was -0.451 and 0.477 respectively), consistent with the conclusion of Robert M.S's study (r = -0.584, p = 0.001) [16].

Besides, there was a statistically significant relationship between Glasgow coma scale-based groups and mortality: OR 0.34; 95% CI: 0.12 - 0.99; p = 0.047, predicted value 77.4%. This result provided us helpful informations to use in treatment of patients hospitalized with low GCS (severe group) in order to reduce the mortality rate.

V. CONCLUSION

By studying the clinical features, images, endovascular treatment, outcomes, prognosises of 31 SAH patients with ruptured ACoA aneurysm at Hue Central Hospital, we found that the proportion of severe cases and mortality rate are noteworthy as mentioned in the literature and many other studies. However, the endovascular technique in Hue Central Hospital has got many achievements, helps many patients to get better prognosises, along with other factors such as the severity at admission, medical treatment, neurointensive care... The relationship between the severity at admission (Glasgow coma scale-based groups) and mortality also helped us to have appropriate prognosis and management in order to reduce the poor prognosis for patients.

However, in the future, there should be studies with subgroups, larger sample sizes, and longer follow - up time.

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