Emerging Utility of Endovascular Thrombectomy in the Philippines: A Single-center Clinical Experience

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ABSTRACT

Background and Objective. Stroke has remained one of the primary causes of significant morbidity and mortality. Among the therapeutic options for acute stroke management, endovascular thrombectomy is intended to remove the thrombi within the intracerebral vasculature and restore adequate perfusion to the surrounding penumbra. It is recommended up to 24 hours from onset of neurologic symptom. In the Philippines, only a few tertiary healthcare institutions are able to offer and perform endovascular thrombectomies. The aim was to describe the profile and discharge outcomes of endovascular thrombectomy for acute ischemic stroke at a tertiary hospital in our country.

Methods. We conducted a retrospective records review among 924 patients admitted for acute ischemic stroke from October 2018 to August 2021 who underwent mechanical thrombectomy. Clinical and functional outcomes were measured using the National Institutes of Health Stroke Scale (NIHSS) and Modified Rankin Score (mRS).

Results. Among 31 patients included in the study, 29 subjects (93.5%) had moderate to severe disability (mRS 3–5), and 25 (80.6%) had moderate stroke (NIHSS 6–21) on admission. The identified site of the cerebrovascular thrombi was within the M1 segment of the middle cerebral artery (41.9%, n=13). The stent retriever approach was performed in 19 participants (61.2%). Upon discharge, only 7 (22.6%) had favorable functional outcomes (MRS 0–2), and 9 (29.0%) resulted in mortality. Successful reperfusion was achieved in 92.3% of the patients.

Conclusion. Overall, endovascular thrombectomy is a possible treatment option for large vessel acute ischemic stroke in developing countries.

Keywords: thrombectomy, endovascular procedures, ischemic stroke, treatment outcomes

INTRODUCTION

Acute ischemic stroke remains a neurologic emergency that leads to significant mortality and morbidity worldwide.[1] Asia, which has many countries with developing economies, holds 60% of the world's population and carries some of the highest stroke disease burden. Although epidemiological data on stroke incidence is available for the countries in East Asia, there remains a paucity of data in the Southeast region of the continent.[2] In the Philippines, there is no reliable epidemiologic data – whether nationwide, community-based, and hospital-based – on stroke incidence and overall burden.[3,4] In addition to this, much fewer data have been published about acute ischemic stroke management and therapies for recanalization in the country.

In 2015, the Multicenter Randomized Clinical Trial of Endovascular Treatment for Acute Ischemic Stroke in the Netherlands (MR CLEAN) presented the results of their study comparing the safety and efficacy of intra-arterial

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therapies. These were broadly divided into clot retrieval or endovascular thrombectomy versus clot dissolution with the use of a thrombolytic agent, intravenous recombinant tissue plasminogen activator (IV-rTPA), for acute ischemic stroke within 6 hours of neurologic symptom onset. They determined that endovascular thrombectomy (EVT) in the anterior circulation large vessel occlusion setting was safe and effective, which led to favorable outcomes post-intervention such as functional independence, smaller final infarct volume, and good reperfusion.[5] The synthesis of these results, along with other numerous trials, supported the role of EVT as a standard treatment in a carefully defined population. However, in our local setting, there has not been any data documenting the utilization and outcomes of patients who have undergone EVT. This is, in part, due to the cost of treatment and availability of appropriate equipment and resources, including the number of trained endovascular interventionalists. This study describes the demographic and clinical profiles and discharge outcomes of patients who have undergone EVT for acute ischemic stroke in a tertiary hospital in the Philippines.

METHODS

This was a retrospective descriptive study of patients who underwent EVT at a single tertiary center in the Philippines from September 2018 to August 2021. The study protocol for this research was approved by the hospital's Institutional Review Board (IRB), which waived the informed consent since the study utilized medical record review. Eligible patients were 18 to 90 years old, clinically assessed to have an acute ischemic stroke, and with radiographic evidence of large vessel occlusion as seen either on magnetic resonance angiography (MRA) or computed tomographic angiography (CTA), had National Institutes of Health Stroke Scale (NIHSS) score of 4 or greater (range 0 [no symptoms] to 42 [most severe neurologic condition]), previously functionally independent, and within 24 hours from last known well. The NIHSS was assessed at baseline, 24 hours post-intervention, and upon discharge. The Modified Rankin Score (mRS) was assessed at baseline and upon discharge. Excluded in the study were those who had radiographic evidence of any intracranial hemorrhage and those who did not have any occlusion on either MRA or CTA. In some patients, intravenous recombinant tissue plasminogen activator (rTPA) was administered before EVT. The decision regarding the neuroimaging (CT or MRI) and dose of IV-rTPA, whether 0.9 mg/kg body weight or 0.6 mg/kg body weight, was left to the discretion of the attending neurologist.

The baseline demographic characteristics of the patients were gathered, such as age, sex, and co-morbid medical conditions considered to be vascular risk factors. These vascular risk factors were defined as, but were not limited to, arterial hypertension (systolic blood pressure or SBP ≥ 140 mmHg, and/or diastolic blood pressure or DBP ≥90 mmHg on repeated examination or a patient on any antihypertensive medication), diabetes mellitus (fasting plasma glucose [FPG] ≥ 126mg/dL [7.0 mmol/L], HbA1C ≥ 6.5% [48 mmol/mol], or a patient on insulin therapy or any oral hypoglycemic medication), atrial fibrillation (previously or newly documented on electrocardiogram [EKG] or 24 hour Holter monitoring), dyslipidemia (a patient on statin therapy or any lipid-lowering medication, or with elevated triglyceride and or low-density lipoprotein [LDL] levels), with previous history of cerebrovascular disease or coronary artery disease including myocardial infarction, valvular heart disease, congestive heart failure (whether with preserved [≥ 40%] or reduced [< 40%] ejection fraction), bronchial asthma or chronic obstructive pulmonary disease, chronic kidney disease, and significant smoking history. Additionally, baseline capillary blood glucose (CBG), systolic and diastolic blood pressure levels upon arrival at the hospital, intake of either antiplatelet or anticoagulant, initial neuroimaging modality used, and administration of IV-rTPA before thrombectomy were included.

The primary outcomes included the clinical status (using the NIHSS) and functional independence, using the mRS (range from 0 [no symptoms] to 6 [death]). The NIHSS was assessed at baseline, 24 hours after the procedure, and upon discharge. Stroke severity was categorized as mild (NIHSS 0–5), moderate (NIHSS 6–21), and severe (NIHSS ≥22).[6] Similarly, functional independence was assessed before onset of stroke, upon admission, and upon discharge. The mRS was dichotomized as favorable/independent, mRS 0–2, and unfavorable/dependent mRS 3–5. Additional outcome measures were common occlusion sites as documented on angiography and timeline from stroke onset to groin puncture and recanalization. The primary endovascular approach – use of stent retriever, aspiration embolectomy, combined stent retriever and aspiration technique, or deployment of intravascular stent – and the number of stent passes were also documented. The modified Thrombolysis In Cerebral Infarction (mTICI) was used to determine the degree of reperfusion, with mTICI 2B or 3 regarded as successful reperfusion. Finally, hemorrhagic transformation was determined using non-contrast CT scan (NCCT) 24 hours after EVT and was categorized using the radiologic classification that arose from the European Cooperative Acute Stroke Study (ECASS). Symptomatic intracerebral hemorrhage (sICH) was defined by Safe Implementation of Thrombolysis in Stroke-Monitoring Study (SITS-MOST) as (1) of parenchymal hemorrhage type 2 as defined by ECASS seen on neuroimaging 22 to 36 hours after intervention or earlier if the imaging was done due to clinical and neurologic deterioration, (2) increase in the NIHSS ≥4 from baseline or the lowest NIHSS between baseline, (3) or resultant to mortality within 24 hours.[7]

Additional analysis of the collected data was determined by dividing the treated patients based on the etiology or origin of the stroke (those with atrial fibrillation and

possibly cardioembolic or atherosclerotic). After which, the endovascular approach (stent retriever or aspiration embolectomy) used in these subgroups was analyzed by comparing the recanalization time and the patients' functional outcome on discharge.

RESULTS

A total of 31 patients out of 924 acute ischemic stroke patients underwent EVT from September 2018 until August 2021. EVT was first done at our institution in September 2018 and since then has had a steady increase in the number of procedures done per year. The mean age was 64 (IQR, 60–71), and there were more men than women (17:14). About half of the patients had hypertension and atrial fibrillation. Less frequently, patients had diabetes mellitus, previous history of stroke, coronary heart disease, and valvular heart disease. More than half of the patients were smokers or had a significant previous smoking history. The median (IQR) capillary blood glucose on hospital arrival was 8 (7–9), systolic blood pressure was 140 (125–170), and diastolic blood pressure 80 (70–90). Among the patients, 16 (52%) were taking either antiplatelets (Aspirin, clopidogrel) or anticoagulants (Warfarin, dabigatran, apixaban, rivaroxaban) before stroke onset (Table 1). The primary neuroimaging modality utilized in this study was computed tomography with angiography (CT/CTA) accounting for 64.5% of the population, and the remainder (35.5%) used non-contrast magnetic resonance imaging with angiography (MRI/MRA). A total of 11 patients (35.5%) received rTPA. Ten patients received a dose of 0.9 mg/kg body weight, and one patient received a dose of 0.6 mg/kg body weight. Majority of the patients (n=25, 80.6%) had moderate stroke on admission, while 3.2% had mild and 16.2 % severe strokes on admission.

Table 2 shows the clinical and functional outcomes measured in this study. The median (IQR) NIHSS score at baseline (14, 11–19) did not differ from 24 hours post-thrombectomy (15, 9-21) (p-value=1), but was significantly lower at discharge (8, 2–10) (p-value <0.00001). For functional outcomes, majority (93.5%) had a premorbid mRS of 0–2 and the remainder had mRS 3–5 as sequelae of previous stroke. Subsequently, on admission, 29 (94%) of

Table 1. Demographic profile and baseline characteristics

Age, mean (IQR)	64.0 (60–71)
Gender (M:F ratio)	17:14
Vascular Risk Factors	**n = 31 (%)**
Smoking	18.0 (58)
Hypertension	17.0 (54.8)
Atrial fibrillation	17.0 (54.8)
Diabetes mellitus	12.0 (38.7)
History of cerebrovascular disease (CVD)	5.0 (16.1)
Valvular heart disease	4.0 (12.9)
Coronary artery disease (CAD) and/or history of acute coronary syndrome (ACS)	4.0 (12.9)
Dyslipidemia	2.0 (6.5)
Chronic kidney disease	2.0 (6.5)
Bronchial asthma and/or chronic obstructive pulmonary disease (COPD)	2.0 (6.5)
Others:	
Benign prostatic hyperplasia	1.0 (3.2)
Pulmonary tuberculosis	1.0 (3.2)
Hyperuricemia	1.0 (3.2)
Liver cirrhosis	1.0 (3.2)
Malignancy	2.0 (6.5)
Pre-stroke antithrombotic agents	**n = 31 (%)**
Antiplatelet	9.0 (29)
Anticoagulant	7.0 (22.6)
Capillary blood glucose on hospital arrival, mg/dL, median (IQR)	8.0 (7–9)
Systolic blood pressure on hospital arrival, mmHg, median (IQR)	140.0 (125–170)
Diastolic blood pressure on hospital arrival, mmHg, median (IQR)	80.0 (70–90)
Imaging Modality	**n = 31 (%)**
CT with angiography	20.0 (64.5)
Non-contrast MRI with angiography	11.0 (35.5)
Pre-EVT Stroke Severity	**n = 31 (%)**
Mild (NIHSS 0–5)	1 (3.2)
Moderate (NIHSS 6–21)	25 (80.6)
Severe (NIHSS ≥22)	5 (16.2)

EVT, Endovascular thrombectomy; NIHSS, National Institutes of Health Stroke Scale

Table 2. Clinical and functional outcomes

Outcome	Median (IQR)	p-value
NIHSS		
Pre-EVT	14 (11–19)	
24 hours post-EVT	15 (9–21)	1*
Discharge	8 (2–10)	<0.00001*
Outcome	**n (%)**	**p-value**
Functional Capacity (mRS)		
Baseline		
0–2	29.0 (93.5)	
3–5	2.0 (6.5)	
Admission		
0–2	2.0 (6.5)	
3–5	29.0 (93.5)	
Discharge		
0–2	7.0 (22.6)	
3–5	15.0 (48.4)	0.041†
6	9.0 (29.0)	
Outcome	**n (%)**	**p-value**
Mortality (n=9)		
Mortality due to complications of prolonged hospitalization	5.0 (55.6)	
Septic and/or cardiogenic shock	3.0 (60)	
Respiratory failure from to chronic lung disease	1.0 (20)	
Sudden cardiac death	1.0 (20)	
Mortality due to severe stroke *(Brainstem compression with herniation)*	4.0 (44.4)	

**paired t-test; †McNemar's test*
NIHSS, National Institutes of Health Stroke Scale; EVT, Endovascular thrombectomy; mRS, Modified Rankin Score

the patients had mRS of 3–5, while only 2 (7%) remained to have mRS of 0–2. On discharge, 7 (23%) was able to regain good functional capacity while 15 patients (48%) maintained functional dependence, and a total of 9 patients (29%) resulted in in-hospital mortality. It is important to note, however, that among these deaths, 5 were due to complications of prolonged hospitalization and the most common cause was shock state (septic and/or cardiogenic), followed by respiratory failure, and sudden cardiac death. The rest of the deaths (n=4) were due to stroke severity leading to brainstem compression and herniation. Figure 1 shows the comparison between the quality of reperfusion (mTICI) and functional outcome (mRS). It demonstrated that among the 26 participants who completed the procedure, majority of the patients (n=20, 77%) had complete antegrade reperfusion post-EVT (mTICI 3), while 4 (15%) had antegrade reperfusion of more than half of the previously occluded artery (mTICI 2B), and 2 (8%) had antegrade reperfusion of less than half of the previously occluded artery (mTICI 2A). Most of those who had mTICI 3 (n=9, 45%) and mTICI 2B (n=3, 75%) had unfavorable functional outcomes on discharge. A few of those who had mTICI 3 (n=7, 35%) had favorable functional outcomes on discharge.

Procedural characteristics determined include occlusion site, timelines from symptom onset to groin puncture and recanalization, endovascular technique, number of stent passes, and degree of reperfusion (Table 3). Post-EVT complication included the evidence of hemorrhagic transformation as documented by NCCT at any time within 24 hours. The major sites of endovascular thrombi were the proximal segments of the middle cerebral artery (MCA). Specifically, 41.9% of the occlusion was within the M1 segment and 12.9% was within the M2 segment of the MCA. Furthermore, 11 (35.5%) of the patients had occlusion in their intracranial internal carotid artery (ICA). Uncommon sites of occlusion involved the distal M3 segment of the MCA, the P1 segment of the posterior cerebral artery (PCA), and the basilar trunk. The mean ictus to groin time was 6.7 hours (SD 2.2), and the mean ictus to recanalization time was 7.8 hours (SD 1.9). Among the 31 endovascular procedures performed, 3 were terminated intra-operatively due to arduous vascular access and futility of attempts. The intra-operative findings in these aborted procedures were occlusive thrombus at the C7 segment of the ICA, partially occluded basilar trunk, and calcified thrombosis at the post bifurcation branches of the M2 segment of the MCA. These precluded adequate passage of the vascular microcatheters and stent retrievers. Two of the procedures resulted instead to intra-operative intra-arterial administration of rTPA as there was no angiographic evidence of a large vessel occlusion. Overall, only 26 out of the 31 procedures went on to complete the EVT. The primary techniques used were stent retriever approach (61.3%), aspiration embolectomy (9.7%), and a combined stent retriever and aspiration technique (12.9%). Single passage of the stent retriever was achieved in 14 (60.9%) of the 23 patients to whom stent retriever or combined stent retriever/aspiration approach was used. Successful post-thrombectomy reperfusion seen on final angiography was achieved in 24 (92.3%) of the patients. Finally, intracranial hemorrhage was seen in nine of the patients following endovascular intervention, and one did not have post-procedure neuroimaging. Eleven patients (35.5%) received IV thrombolysis prior to EVT. Among the nine patients who had post-procedural hemorrhage, only three received IV rTPA. Using the ECASS radiologic classification for hemorrhagic transformation, a little over half of the patients with intracerebral hemorrhage had massive bleeding (PH1 and PH2) following the endovascular intervention. Among nine

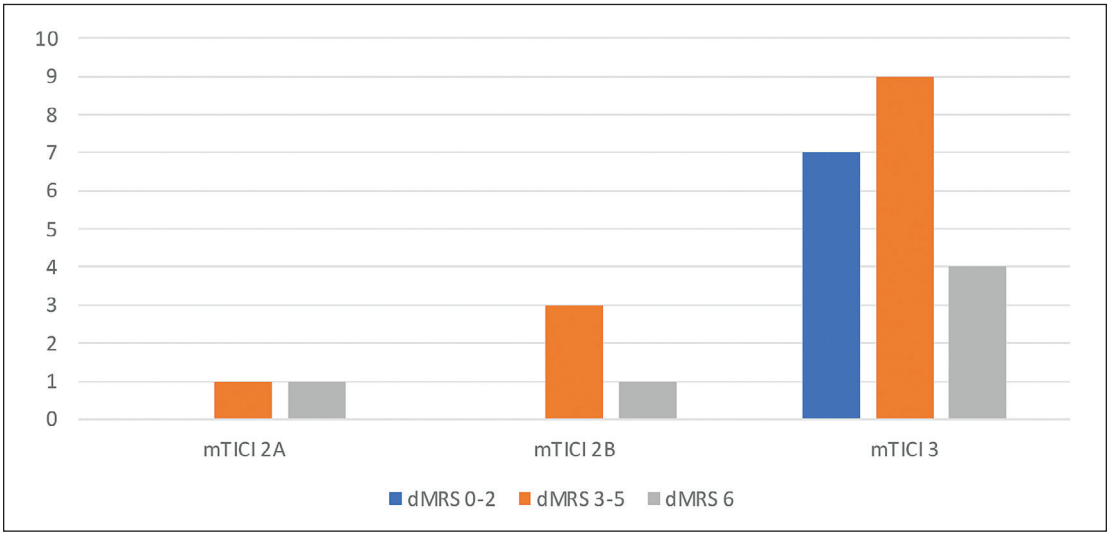

Figure 1. Comparison of reperfusion quality post-EVT and functional outcome.

mTICI, Modified Thrombolysis In Cerebral Infarction; dMRS, discharge Modified Rankin Score

Table 3. Procedural characteristics

	n (%)
Timeline from Ictus *(hrs.) (mean, SD)*	
Groin puncture	6.7 (SD 2.2)
Recanalization	7.8 (SD 1.9)
Site of occlusion *(n=31)*	
Internal carotid artery (ICA)	11.0 (35.5)
Middle cerebral artery (MCA)	18.0 (58.1)
M1	13.0 (41.9)
M2	4.0 (12.9)
M3	1.0 (3.2)
Posterior cerebral artery (PCA)	1.0 (3.2)
Basilar artery (BA)	1.0 (3.2)
Endovascular approach *(n=31)*	
Stent retriever	19.0 (61.3)
Aspiration embolectomy	3.0 (9.7)
Combined stent retriever and aspiration embolectomy	4.0 (12.9)
Intra-arterial rTPA	2.0 (6.5)
Terminated procedure	3.0 (9.7)
Number of passes *(n=23)*	
1 pass	14.0 (60.9)
> 1 pass	9.0 (39.1)
mTICI *(n=26)*	
2b-3	24.0 (92.3)
1-2a	2.0 (7.7)
Presence of post-EVT hemorrhage	
No	21.0 (67.7)
Yes	9.0 (29.0)
Anatomic Description of Hemorrhage	9.0 (29.0)
HI 1	2.0 (22.2)
HI 2	2.0 (22.2)
PH 1	4.0 (44.4)
PH 2	1.0 (11.1)
Symptomatic intracerebral hemorrhage (sICH)	5.0 (55.6)
Asymptomatic intracerebral hemorrhage	4.0 (44.4)
No neuroimaging done after EVT	1.0 (3.2)
Received IV Thrombolysis pre-EVT	11.0 (35.5)

rTPA, recombinant tissue plasminogen activator; mTICI, Modified Thrombolysis In Cerebral Infarction; HI, Hemorrhagic infarct; PH, Parenchymal Hemorrhage; EVT, Endovascular thrombectomy

patients who had post-thrombectomy hemorrhage, five had symptomatic ICH (sICH) while four were asymptomatic.

Finally, majority of the patients included in the study had atrial fibrillation and possible cardioembolic etiology of the stroke (n=17, 55%). On the other hand, the remainder of the population (n=14, 45%) had atherosclerotic origin. Between these groups, the primary technique used was analyzed using the recanalization time and discharge mRS.

Among the 17 patients with atrial fibrillation and possible cardioembolic origin of the stroke, 11 patients had the stent retriever approach, 2 underwent aspiration embolectomy, 3 had combined stent retriever and aspiration embolectomy techniques, and 1 procedure did not continue

Table 4. Comparison of recanalization time and functional outcome based on stroke etiology and endovascular technique

Stent Retriever Technique Alone	Cardioembolic Etiology	Atherosclerotic Etiology
Mean recanalization time *(hours)*	7.4	8
Discharge mRS	n=11	n=8
0–2	2	4
3–5	6	1
6	2	3
Not documented	1	0
Aspiration Embolectomy Alone	**Cardioembolic Etiology**	**Atherosclerotic Etiology**
Mean recanalization time *(hours)*	7.5	9
Discharge mRS	n=2	n=1
0–2	0	0
3–5	2	1
6	0	0
Not documented	0	0
Combined Stent Retriever and Aspiration Embolectomy	**Cardioembolic Etiology**	**Atherosclerotic Etiology**
Mean recanalization time *(hours)*	9	6
Discharge mRS	n=3	n=2
0–2	0	0
3–5	2	1
6	1	1
Not documented	0	0

mRS, Modified Rankin Score

with EVT and instead resulted in intra-arterial rTPA (Table 4). In this cardioembolic stroke etiology group, the mean recanalization times were 7.4 hours for the stent retriever technique, 7.5 for aspiration embolectomy, and 9 for combined stent retriever and aspiration embolectomy technique. Majority (n=6) of 11 patients in the cardioembolic group who had stent retriever alone resulted in functional dependence, while 2 were assessed to be functionally independent on discharge, another 2 resulted in mortalities, and 1 had no formal documentation of the outcome. Only two patients from the cardioembolic group had aspiration embolectomy alone and both were also functionally dependent on discharge. Out of three who underwent the combined stent retriever and aspiration embolectomy technique, two remained functionally dependent on discharge and one resulted in mortality. On the other hand, out of 14 in the atherosclerotic stroke etiology group, 8 had the stent retriever alone, only 1 underwent aspiration embolectomy alone, 2 patients had a combination of stent retriever and aspiration techniques, 1 patient did not proceed to EVT and had intra-arterial rTPA, and 2 had termination of the procedure. In this group, the mean recanalization times were 8 hours for the stent retriever technique, 9 hours for the aspiration embolectomy technique, and 6 hours for the combined stent retriever and aspiration embolectomy technique. Discharge outcomes within the atherosclerotic stroke etiology group

were as follows: half of the patients who underwent stent retriever were functionally independent on discharge, only 1 (was functionally dependent on discharge, and there were 3 mortalities. The single patient who underwent aspiration embolectomy did not achieve a favorable functional ability upon discharge. Lastly, one the two patients who underwent the combined stent retriever and aspiration embolectomy maintained functional dependence upon discharge and the other one resulted in mortality.

DISCUSSION

Among 31 patients who underwent EVT at a single tertiary center in the Philippines, majority were males with a mean age of 64 years. The common risk factors were smoking, hypertension, and atrial fibrillation. Intake of antithrombotic agents prior to stroke was noted in 16 (52%) patients. The primary neuroimaging modality of choice was CT with angiography (65%). Intravenous rTPA was administered in 11 patients (36%) prior to the endovascular intervention. The mean NIHSS was 15 at baseline and and 7 upon discharge. The differences between the NIHSS scores and MRS from admission to discharge were statistically significant. The primary endovascular approach used was the stent retriever technique (61%) and majority was successful with a single stent pass. The common sites of thrombi occlusion were noted within the proximal segments of the middle cerebral artery (58%) and the intracranial segments of the internal carotid artery (36%). The mean time from onset of neurologic symptoms to groin puncture was 6.7 hours and recanalization was achieved at a mean time of 7.8 hours from stroke onset. Out of the 31 patients, only 26 (84%) completed the procedure. Complete antegrade reperfusion (mTICI 2b-3) was seen in 24 (92%) and severe and symptomatic post-thrombectomy intracranial hemorrhage was seen in 5 (19%) of the patients. Among the patients who had hemorrhagic transformation after EVT, one-third (33.3%) had IV thrombolysis before undergoing the procedure.

Compared to an RCT by LeCouffe et al. (2020) (n=539), which showed that 35% of the patients had resultant intracerebral hemorrhage for both EVT alone and IV thrombolysis plus EVT study groups,[8] our study appear to have a lower incidence of intracerebral hemorrhage at 23% (n=6) for those who underwent EVT alone and 12% (n=3) for those who had IV thrombolysis plus EVT. The in-hospital mortality rate in our study was 9 (29%) with 5 resulting from complications of prolonged hospitalization and the remainder (4) as a direct sequela of the stroke. Comparing these with the MR CLEAN trial that had a greater number of included patients with 7-day mortality rate of 11%–12% and 30-day mortality rate of 18%, there is a seemingly higher mortality in our study, which may be attributed to the low number of included subjects. Consequently, functional dependence upon discharge was seen in 15 (48.4%) of the patients. The stroke etiology and endovascular techniques did not show any difference regarding the recanalization time and functional outcome upon discharge.

Endovascular thrombectomy has become a standard intervention in acute ischemic stroke patients with large vessel occlusion within 24 hours from last seen well following the publication of 5 randomized clinical trials back in 2015.[9-13] In Asia, there is still limited data in the utilization of EVT in the management of acute ischemic stroke patients. Tsang et al reviewed the accessibility gap of EVT for acute ischemic stroke in Asia. They gathered data from 42 respondents representing 19 countries, and 35 cities. It was revealed that there was large disproportion in the accessibility of EVT in Asia. High-income countries had undoubtedly better access to both EVT and intravenous thrombolysis (IVT) in comparison to middle- and low-income countries. The Philippines was one of the countries – together with Bangladesh, Mongolia, Nepal, and Pakistan – who had limited access to both EVT and IVT despite a high stroke disease burden. The primary impediments that were identified as contributory to the underwhelming EVT practice were lack of a unified territory-wide triage system, insufficient comprehensive stroke hospitals, and inadequate number of neuro-interventionists who will perform the procedures. Additionally, inadequate awareness and education of both the physicians and the patients about this therapy as well as the prohibitive cost of treatment and the device were also identified as common issues. This is of major concern for the developing countries where patients shoulder the burden of cost as out-of-pocket.[10] Ng et al. conducted a pilot survey reviewing the state of acute stroke care specific to the Southeast Asia (SEA) region. They identified the status of EVT in Southeast Asian countries. Specifically, they determined the availability of acute stroke thrombectomy devices, number of EVT sites and interventional neuroradiologists (INR), number of EVT procedures in each Southeast Asian country, and the projected growth of in number of EVT cases. Stent retrievers were introduced in majority of the SEA countries in 2016 only after the publication of successful EVT trials in 2015. They found that EVT service was not available in 4 of 10 SEA countries, namely Myanmar, Laos, Cambodia, and Brunei. Among the countries that offer EVT, majority of the sites were in city centers and not all offered a round-the-clock service. Moreover, a peculiar situation was noted in the Philippines, as there was disparity between the number of EVT sites and number of active INRs. This reflected the under-utilization of available resources.[14] As such, our institution only documented its first EVT procedure only in 2018.

Though there was a lack of published data on EVT in the SEA, China was able to provide a view of EVT utility in their country. Yang et al. (2019) conducted a trial in 41 academic tertiary centers in China to evaluate the efficacy and safety of EVT with or without intravenous rTPA. They screened 1586 patients and were able to enroll 656 patients who were then randomized into two groups, thrombectomy-

alone and combination-therapy groups. The primary outcome they measured was functional capacity at 90 days post intervention using the modified Rankin Scale score (mRS). Their results showed that EVT alone was non-inferior to combination therapy with IV-rTPA.[15]

Comparing our experience with the large clinical trials, EVT in the Philippines is a possible stroke therapy for eligible patients. To the best of our knowledge, this study showed the greatest number of endovascular thrombectomies performed in the Philippines. This mirrors the previously identified gap between accessibility and utility of EVT. Our study was designed to demonstrate the clinical and functional outcomes of EVT among Filipinos in order to increase awareness regarding this technology among the Filipino patients and physicians. Our results showed that the extent of neurologic deficit was significantly reduced, and the functional outcomes were improved after EVT.

Our study has limitations. First, it was a retrospective study and the data collected were mainly from review of medical records. Second, the sample population was significantly smaller in comparison to the clinical trials. Third, the outcomes measured in this study did not include the standard 90-day follow-up limiting an accurate assessment of efficacy. Lastly, this study documents the experience of only a single center in the entire country. Despite these limitations, we are optimistic that this study will initiate a cascade of similar inquiry that will augment our local data and knowledge to this therapy and hopefully embolden Filipino physicians to offer and utilize EVT to Filipino patients.

CONCLUSION

Endovascular thrombectomy has been a standard component of comprehensive stroke care in the developed countries. In the Philippines, endovascular thrombectomy is in slow emergence as only a few patients have undergone the procedure. Based on the results of study, the clinical and functional outcomes are equivocal. These results do not intend to deter clinicians from exploring and offering this reperfusion therapy to eligible candidates. Contrarily, this study should incline greater utility of endovascular thrombectomy to bolster clinical experience and cultivate progress in stroke management.

Statement of Authorship

All authors contributed in the conceptualization of work, acquisition and analysis of data, drafting and revising and approved the final version submitted.

Author Disclosure

All authors declared no conflicts of interest.

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